Content

1. Abstract

Purpose of the section "Evaluation of the impact on the environment" as a part of the soya processing complex building project at the LLC "Globinskyy pererobnyy zavod" ("Globinskyy processing plant") in Globyne city, Poltava region, 203, Karla Marksa Str., is ecological statement of reasons for the activity and its implementation means, determination of ways and means of the environment state standardization and assurance of the ecological safety requirements.

By the natural environment is meant the whole scope of natural elements and its complexes in the construction or reconstruction zone area and adjacent territories.

Purpose of the environment protection is to exclude or maximum limit the construction and upkeep adverse effect, natural resources rational use, its resumption and reconstruction.

Environmental measures include all kinds of economic activities of the domain, directed to reduce or eliminate the adverse anthropogenic effect on the natural environment, to conserve, to improve and to use natural resources rationally.

Substances, being emitted into the atmosphere and ejected into water objects, coming to the soil, as a result of human economic activity, constitute a reason of many actual and potential problems, related to the environment state. They include: air quality deterioration, warming, climate change, infliction of damage to buildings and other constructions, reduction of stratosphere ozone layer, soil pollution.

As a result of EIA execution, there should be defined and recommended for implementation some engineering solutions related to creation of the object, which activity:

- does not constitute a health-threat for a human directly, indirectly, cumulatively or in any other kind considering long-term effects;
- is not related to the environmental unfriendly products manufacture;
- shall not lead to irreversible or crisis environmental alterations.

In course of evaluation of the environmental effects during the object up keep

the followings effects are examined:

- on the atmospheric air;
- on water resources;
- on land resources;
- acoustic impact;
- on the social environment;
- planned activity risk evaluation;
- on the anthropogenic environment;
- on the geological environment;
- on flora and fauna.

2. Grounds for the EIA development

Evaluation of the technological processes impact on the environment of the soya processing complex building project at the LLC "Globinskyy pererobnyy zavod" ("Globinskyy processing plant") in Globyne city, Poltava region, 203, Karla Marksa Str., is performed on the basis of the "Grounds for the EIA development" with the purpose of ecological safety assurance and natural environment protection.

The EIA purpose is to define the reasons and acceptability of the planned activity and statement of economic, technical, organizational, sanitary, state and legal and other measures, related to natural environment safety assurance.

The EIA materials are provided as a part of the design documentation to the authorized governmental bodies for expert evaluation and should thoroughly characterize the results of the impact assessment on the natural, social, including population vital activity, and anthropogenic environment (hereinafter - environment) as well as to substantiate the planned activity acceptability.

The EIA main tasks are:

- actual state general characteristics of the area territory, where the planned activity is scheduled to be performed;
- determination of the list of possible environmental unfriendly effects and planned activity effects areas on the environment as per the location variants (if further study of several ones is recommended);
- determination of scopes and levels of the planned activity effects on the environment;
- environment state changes forecast as per the effects list;
- determination of measures complex as for prevention or limitation of planned activity adverse effects on the environment, required to keep with the requirements of the environmental and sanitary legislation and other enactments and regulatory documents, related to the environment safety;
- acceptability determination of the expected long-term effects on the environment, which may occur subject to implementation of all stipulated measures;

Section of the economic activity effect evaluation is made considering requirements of the SBR A.2.2-1.2003 "State building regulation of Ukraine. Composition and content of materials of the environment impact assessment (EIA) in course of design and construction of enterprises, buildings and constructions. Main design provisions", considering requirements of the land, water, subsoil and atmospheric air protection legislation. "EIA" is performed considering ecological factors priority in its interaction with social and economic factors.

The following was used during development of the EIA:

- Law of Ukraine on natural environment protection.
- SBR A.2.2-1.2003 State building regulation of Ukraine. Composition and content of materials of the environment impact assessment (EIA) in course of design and construction of enterprises, buildings and constructions. Main design provisions.
- Alarm concentrations and relatively safe levels of pollutants in the settlements atmospheric air, Kyiv, 2002.
- Collection of calculations methods for pollutants content in wastes from the non-organized air pollution sources, PC "UKRINTECK", Donetsk, 1994.
- OND-86. Goskomgidromet (State committee on hydrometeorology). Calculation methods for pollutant concentration in atmospheric air, contained in enterprises wastes;
- Collection of pollutants emission indices (specific emission) into the atmospheric air by different productions", Ukrainian scientific centre of technical ecology, Donetsk, 2004.

Calculations of pollutants diffusion in atmosphere were made as per the "EOL" program. Utilization of this program to set the MPE (maximum permitted emissions) is agreed with the Ministry of ecology and natural resources of Ukraine.

EIA developer:

Full name as per the registration certificate - LLC "Khimtechnologia" License of the Ministry of regional development and construction of Ukraine: Series AV No. 490609 dated 17.12.2009. License valid till 22.12.2014.

Qualification certificate of the Ministry of regional development and HPU (housing and public utilities) of Ukraine, Series AR No.003972 dated 05.10.2012.

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3. Brief characteristics of the physiographic and climatic conditions of the area

Construction of the soya processing complex is being performed at the territory of the LLC "Globinskyy pererobnyy zavod" ("Globinskyy processing plant") in Globyne city, Poltava region, 203, Karla Marksa Str."

The city of Globyne is situated in the southern-western part of Poltava region. The average annual air temperature is +7.7°C. The coldest month is January, the average years-long temperature is minus 6.3°C. The warmest month is July, which average temperature is 20.1 °C.

As per the precipitations amount the Globyne area is related to the insufficient humidity area. At the average the annual precipitations amount is 511 mm, including 326 mm in warm period of the year (April - October), which is 64%, and in cold period of the year (November - March) fall 185 mm or 36% of the annual precipitations amount.

The average date of the snow cover appearance - November 19, and its melting falls on March 28. The average fogs duration is in average 45 days.

Southern-western winds predominate over all the region during the year. Exceedance frequency of 16 m/s wind and more is 5%. In average winds up to 5m/s have the highest frequency and constitute 74% per year.

Engineering and geological research works at the soya processing construction site of the LLC "Globinskyy pererobnyy zavod" ("Globinskyy processing plant") were conducted by the Sumy branch of the UkrNIINTIZ. As per the technical report on the engineering and geological research works, geological structure of the plot is represented by the following engineering and geological elements (EGE):

EGE-Ia - fill grounds (asphalt, sand, crushed stone, loams, vegetative layer, bricks fragments, slag), piled nonhomogeneously, noncaking, layer's thickness 0.4- 2.7m; ІГЕ-I - vegetative layer (loams from stiff to high-plastic), layer's thickness 0.4- 1.1 m; ІГЕ-II - forest-like loams, high-plastic with vegetative residues adulterations, thickness 0.6-1.9 m; ІГЕ-III - forest-like loams, high-plastic, with carbonate burs fractions, thickness 1.0-3.8 m; ІГЕ-IIIa - forest-like loams, very soft, with carbonates fractions, lie locally, thickness 1.1-4.3 m; ІГЕ-IY - clays from stiff to high-plastic, lie locally, thickness 3.3-3.8 m;

ІГЕ-Y - very soft loafs, locally ferruginized, with sand interlayers, lie locally, thickness 2.0-6.0 m; ІГЕ-YI – plastic sandy loams, with cristalline rocks fractions, with sand interlayers, layer thickness 2.2-5.7 m; ІГЕ-YII – plastic sandy loams, seldom with cristalline rocks fractions, with sand layers, layer thickness is not made in.

Seasonal freeze standard depth - 1.20 m.

Engineering and geological conditions of the construction site pertain to the III difficulty category.

As for geomorphologic characteristics, the plot pertains to the IV terrace above the flood-plain of the Dnipro river. The territory's relief is gently sloping with a minor slope towards northern, northern-eastern direction. The surface is levelled using fill grounds with thickness 0.3 - 2.7 m. The plot's filing is made without land use engineering on the topsoil-vegetative layer. Absolute heights vary from 94.7 to 96.80 m.

Subsoil waters were revealed at the depth 0.9 - 3.3. m from the soil surface (absolute heights 93.30 - 94.40 m). Subsoil waters seasonal fluctuations ±1.2m. As per the potential underflooding, the plot pertains to the flood-prone territories. Subsoil waters are non-aggressive towards concretes, are slightly aggressive towards reinforced concrete structures with occasional steeping and are moderately aggressive towards metal structures.

Meteorological characteristics and coefficients, which determine pollutants diffusion conditions in a city atmosphere are given in a Table 1.

Table 1

Characteristics name	Size
Coefficient, dependent on the atmosphere stratification, A	205
lay of land coefficient	1.0
Average maximum ambient air temperature of the hottest month of the year, T °C	+26.1
Average minimum ambient air temperature of the coldest month of the year, T °C	-9.5
Average annual wind rose, %	
N	12.0
N-E	12.0
E	13.0
S-E	13.0
S	10.0
S-W	14.0
W	13.0
S-W	13.0
Average annual wind velocity, m/s	4.2

4. General information about the object

Purpose of the soya processing complex building project development at the LLC "Globinskyy pererobnyy zavod" ("Globinskyy processing plant") in Globyne city, Poltava region, 203, Karla Marksa Str. is production of vegetable oil, soya granulated solvent cake and granulated soya coat from soya seeds. Production is performed by means of seeds preparation (storage, shelling, drying, decortication, roasting, wet processing and heat treatment) and oil extraction from soya granules, which are formed after preparation.

Construction of the soya processing complex is being performed at the territory of the LLC "Globinskyy pererobnyy zavod" ("Globinskyy processing plant") in Globyne city, Poltava region, 203, Karla Marksa Str.

The construction plot area is 5.75 ha and is located in the eastern part of Globyne city, Poltava region, at the address: 203, Karla Marksa Str., at the territory previously occupied by the canning factory, and borders on: on the west - Karla Marksa Str.; on the south-east - elevator LLC "INTER-AGRO"; on the east - incomplete construction of an industrial enterprise; on the northern east - motor road along Lenina Str and territory of the LLC SP Nibulon.

There were designed two entrance points to the territory, as well as approaching railway lines (being developed by a specialized design organization as per a separate contract). The construction site is built over by mainly one-storey industrial buildings, utility and auxiliary constructions, and is partly laid with asphalt. Actual buildings and constructions, not involved in new construction process as well as construction, which get for building construction, should be demolished.

The are inoperative water-supply and sewage lines, as well as electric cables, which pass through the site and subject to be dismantled.

Main technical and economic indices as per the master plan:

- plot area - 5.75 ha;

- building area - 1.1144 ha, incl.:
- designed - 0.7052 ha;
- actual - 0.4092 ha;
- building density - 20%;
- highways area - 1.248 ha;
- landscaping area - 2.14 ha;
- pavement surfacing area - 0.79 ha;
- railway track ballast area - 0.393 ha.

Object power

Efficiency of the soya processing complex on the LLC "Globinskyy pererobnyy zavod" ("Globinskyy processing plant"), as per the technical design assignment, constitute 700 t/day as for the prepared soya seeds (after shelling and drying at the stock-preparation inlet of the cornhouse).

Operating practice of the soya processing complex - 24H, with no break.

Total annual production time - 315 days or 7560 hours.

Thus, annual power of the soya processing complex on the LLC "Globinskyy pererobnyy zavod" ("Globinskyy processing plant") constitute 220 500 t/year.

The soya processing complex output as for the ready products is:

- hydrated soya oil: 122.82 t/day or 38 688.3 t/year;
- soya granulated solvent cake: 507.68 t/day or 159 919.2 t/year;
- granulated soya coat: 23.07 t/day or 7 267.05 t/year;

Technological part

Manufacture procedure of oil seeds processing by means of extraction provides for a fully closed cycle from the technological process start till its completion due to the transport galleries system with production lines, pipelines and tanks.

Approved soya seeds vegetative oil manufacturing procedure lies in acceptance of raw products, preliminary shelling and drying, soya seeds preparation, shells and kernels separation, kernels chipping on rolling mills, wet processing and heat treatment.

Being wet processed and heat treated, soya flakes are sent for extraction, where using solvent the oil is extracted from soya as a miscella. Miscella is filtered and sent for distillation to desolventize.

Fat-free material (solvent cake) is refined from the solvent and sent for granulation. Granulated solvent cake is transported to the solvent cake storehouse. From the storehouse the granulated solvent cake is dispatched to the automotive or railway transport.

Extraction oil is sent for purification (water hydration). Hydrated oil is sent to the oil service tanks, and from there it is dispatched to the automotive or railway transport.

Soya seeds coat is sent for granulation. Granulated coat is transported to the solvent cake and coat storehouse. From the storehouse the granulated coat is dispatched to the automotive or railway transport.

Stock-preparation workshop. Building No.25.

Prepared soya seed (shelled and dried) is sent to the stock-preparation workshop using conveyors system from the day bin pos. 12.1.1. (building No. 12) of the cornhouse (project of the PE "Korporatyvni zernovi systemy" ("Corporate corn systems").

In the stock-preparation workshop the following processing procedures are performed:

- soya seeds final shelling;
- shells and kernels separation;
- wet processing and heat treatment, milling;
- oil hydration;
- solvent cake granulation;
- soya beans coat granulation.

Production lines of the stock-preparation division, vegetative oil hydration divisions, soya solvent cake and seeds coat granulation - are manufactured abroad. Supplier - "Europa Crown" company, Great Britain. Production lines of the stock-preparation workshop of the "Europa Crown" company are certified and correspond to the standards and rules, currently in force in Ukraine. Detailed description of these production lines is given in documentation of the "Europa Crown" company .

Preparation division of the "Europa Crown" company (decortication and preparation of soya seeds (soya beans)).

From the cornhouse the soya seeds through a day silo is sent by the conveyors system to the final purification section. The raw materials shelling section comprises the following equipment: magnetic separator to pull out foreign metal objects from the seeds before they are sent for the processing; scales for continuous tracking of the processing speed; beans refiner as a two-stage scalper to pull out rubbish, stones and weeds seeds out of the material. Further on soya is sent to the intact beans aspirator, where soya peeled mixture middle fraction or single-piece beans, that are delivered to the process, are selected. This aspirator's purpose is to eliminate field dust and

loose coat from the single-piece beans before they are sent to the vertical conditioner.

Regulated volume of shelled single-piece beans is transported to the conditioner's upper part. As soon as these beans are transported along it down by action of gravity, they are evenly heated due to the contact with pipes series, heated by water steam. Meanwhile, the beans temperature is increasing roughly from 60°C to 70 °C, forcing out moisture, contained in it, closer to the beans surface, thus contributing to the soya coat softening. Moisture, exuded from the beans, is removed from this heating device using aspiration system. Raw materials retention time in the conditioner is about 20-30 minutes (depending on the beans moisture level), which is sufficient to force out moisture from the beans centre to its surface. Beans travel speed inside the device is relatively low, as it is fully filled with beans. In the conditioner's lower part there is a discharging device with speed frequency adjustment drive, providing for the beans volume control, being discharged in a time unit. This device is delivering beans to its delivery conveyor to the jet drier.

In the drier beans get into a special chain, being fanned with air, pass through this device, at that they are evenly heated and dried due to the hot air, fanned though them, creating a fluidized bed. This additional warming increases the beans temperature at another 27 °C, thus increasing its surface temperature up to 87 °C, in less than three minutes. Such sharp temperature rise loosens the coat's adhesion with the beans kernel and reduces humidity. The drier's aspiration system removes the loose coat in an amount of 5% from the total removed coat volume. Such construction of the drier provides for uniform heating and drying, with considerably lower energy consumption as to compare with a current layer drier. Air, circulating in the system, is passed through a cyclone to remove dropping and loose coats, afterwards it goes again to the air heater. After the drier, beans are poured through a rotor applicator to the grinding mills.

On the grinding mills, equipped with magnetic separators, the beans pass through a pair of mills, which grind it into one-half fractions and simultaneously shell the kernels. Split and shelled beans (together with coat, that left in it) are coming out of the grinding mills and are poured to the cascade container. In the conditioner the ground material falls down in a cascade and reaches the lower part of the device with temperature and humidity, required for further flattening. Rests of the coat and soya small fractions are removed by aspiration through the conditioner's upper part using an recirculating air counterflow. This air and coat mixture is separated in the conditioner's cyclone. For an air mass, used in recirculation, there is a possibility to change a recirculating and fresh air correlation, thus assuring the cooling process control. From the cyclone, the loose coat is sent to the coat scalper.

The coat scalper is a two-stage vibration scalper table with mesh aperture No.10 and No.14. From the scalper with mesh aperture No.14 small soya fractions are sent further on to the bruising rollers. From the scalper with mesh aperture No.10 big coat fractions are sent further on to the coat processing system. Middle fraction is a mixture of small coat fractions and ground soya beans, which further on are separated in the secondary aspirator. This secondary aspirator is similar as per its structure to the cascade conditioner and uses air counterflow to separate inlet material, due to density distinction of its components. Light substances and coats particles are sent to the coat system, and heavy material and beans splinters go for the milling.

In bruising rollers, equipped with magnetic separators, ground and conditioned beans are rolled to the middle thickness 0.28÷0.30 mm. Bruising rollers aspiration system, installed after it, provides for the natural air flow through the rollers. This reduces the dust emissions and helps to reduce flakes humidity due to the previous heating of air, used for aspiration.

After the bruising rollers the soya flakes, received in it, are sent to the extraction workshop using conveyors system (building No.27) for oil extraction.

Water hydration division by "Europa Crown" company.

The term "hydration" means removal of phosphatides and other "sticky" components from the raw extraction oil. Oil acidity during the water hydration

stays unchanged. Hydration method is used to transfer phosphatides to a form, insoluble in oil.

Phosphatides, staying in oil, increase its loss in course of its refinement, which is the reason of oil foaming and colour change in course of further treatment, as well as problems arising while storing oil, as they lead to sedimentation.

Raw oil from the extraction workshop (building No.27) is sent to the stock-preparation workshop buffer capacity. From the buffer capacity, raw oil is delivered to the hydration reservoir using a pump through a heat exchanger, in which oil is heated to the optimum hydration temperature, and through an oil and water mixer hot.

The mixture is kept in the hydration reservoir until reaction is not fully completed, so as to give time for phosphatides to agglomerate. The hydration tank is equipped with a stirring rod, mixing the oil and phosphatides mixture with low speed.

From the hydration tank the mixture is then using hydrated oil pump delivered to a hydration separator, where phosphatides and dissoluble admixtures are removed due to centrifugation...

After separator the hydrated oil is heated to the temperature around 80/90 °C in the heat exchanger before it is delivered to the vacuum oil drier, where residual moisture is removed from the oil using vacuum system.

Drained hydrated oil is delivered to the service tanks (building No.33) using oil pump through hydrated oil cooler, in which oil is cooled down to the storage temperature.

Phosphatides, removed in the hydration separator, are collected in a phosphatides storage tank and are delivered by a phosphatides pump to the desolventizer toaster of the extraction workshop (building No.27) for solvent cake enrichment.

Waste water from the process goes to the stock-preparation workshop grease-trap.

Solvent cake processing and granulation division by the "Europa Crown" company.

Extracted solvent cake from the extraction workshop (building No.27) using the conveyor system is transported to the stock-preparation workshop for grinding and sieving before granulation.

During soya solvent cake processing there is a possibility of extremely hard "kneaded lumps" to be formed in the toaster. These lumps are first ground on a solvent cake lumps crusher. All the solvent cake, which failed to be ground, then will be ground on the solvent cake crusher. Thereafter, all small and ground solvent cake is mixed in a uniform mixture.

All extracted and ground solvent cake goes to the solvent cake buffer tank, which is installed before the granulation, and is discharged to the solvent cake conditioner. In the conditioner the solvent cake humidity correction is performed by adding water or water steam to it, which is supplied from the water distribution system or steam distribution system.

Conditioned solvent cake goes to the solvent cake grainer, from which solvent cake granules through a granules cooler and scales by conveyor system are delivered to the solvent cake storage (project of the PE "Korporatyvni zernovi systemy" ("Corporate corn systems").

Coat processing and granulation division by the "Europa Crown" company.

Coat, removed in course of the decortication, together with admixtures from the beans refiner is delivered to the coat bin, where from it is dosed out to the conditioner-mixer. In the conditioner the coat humidity correction is performed by adding water or water steam to it, which is supplied from the water or steam distribution system.

Conditioned coat and rubbish mixture goes to the coat grainer, from which coat granules through a granules cooler and scales by conveyor system are delivered to the solvent cake storage (project of the PE "Korporatyvni zernovi systemy" ("Corporate corn systems").

The project of the LLC "Khimtechnologia" in the stock-preparation workshop provides for the following additional assemblies:

- raw materials receiver and ready products issuance assembly;
- compressor house;
- communications inlet-outlet, stock-preparation workshop provision with energy sources.

Raw materials receipt and issuance assembly (design documentation by the LLC "Khimtechnologia")

Prepared soya seeds (shelled and dried) from the day bin (building No.12 - project of the PE "Korporatyvni zernovi systemy" ("Corporate corn systems") are delivered through conveyors to the stock-preparation division of the "Europa Crown" company using sequentially installed.

Cooled granulated solvent cake and non-granulated solvent cake from the solvent cake granulation division conveyor by the "Europa Crown" company are weighed on scales and then using conveyor and bucket elevator are delivered to the solvent cake storage (building No.30 - project of the PE "Korporatyvni zernovi systemy" ("Corporate corn systems").

Cooled coat granules from the coat granulation division cooler of the "Europa Crown" company are weighed on scales and then using conveyors and bucket elevator are delivered to the coat storage assembly (building No.31 - project of the PE "Korporatyvni zernovi systemy" ("Corporate corn systems").

Scales are connected to corresponding aspiration system of the solvent cake granules cooler and coat granules cooler of the "Europa Crown" company.

For aspiration of the "Europa Crown" company equipment (bucket elevators, conveyor and bins) there is an aspiration system provided by the project, the system includes a cyclone, a fan and a rotary valve. Dust from the cyclone is poured through a rotary valve to the conveyor of the "Europa Crown" company and together with solvent cake is delivered to the solvent cake granulation. Cleaned air after the cyclone is emitted to the atmosphere using fan.

Rubbish from the beans refiner of the "Europa Crown" company is delivered through a screw conveyor to the rubbish bin, from which through a valve with electric drive it is dispatched to the automotive transport. The bin's volume is designed to accept rubbish in course of one shift.

Compressor house (design documentation LLC "Khimtechnologia")

To ensure the soya processing complex with instrumental air (CMD&A) there is a compressor house provided by the project in the stock-preparation workshop building No.25.

Atmospheric air compression is performed by rotary-screw compressors pos. 37012.01, 37012.02 (one operating, one stand-by) with efficiency 8.67 m3/minute each, the automation means kit enables to control the process parameters on the compressor's panel: environment temperature; deferential pressure on the inlet filter; deferential pressure on the separator; oil temperature in the system, with compressor's stop in case of temperature's rise above maximum admissible; compressed air temperature before the cooler, with compressor's stop in case of pressure's rise above maximum

admissible; compressed air temperature after the cooler; compressed air pressure after the cooler, with compressor stop in case of pressure rise above maximum admissible.

Air bleeding for compressor's air suction is performed directly from the compressor house premises.

Compressed air after compressors is delivered through an oil separator and filters system (coarse and fine mesh) to the adsorption dehumidifier to dehydrate air to the dew point minus 40 °C. Adsorption dehumidifier consists of two columns, filled with hygroscopic adsorbent. After the air dehumidifier, the instrumental air through a filter is delivered to the 10 m3 volume receiver. Air receiver is designed to provide with air the automation means and equipment of the stock-preparation workshop building No.25, the extraction workshop building No.27; oil service tanks building No.33.

In case of air pressure drop in the system below 0.6 MPa, the cut-off valve at the air inlet pipeline to the stock-preparation workshop consumers is automatically closed. This locking and receiver's volume are calculated on the basis of air provision for the CMD&A of the extraction workshop automation systems in course of one hour with compressor house full stop. Instrumental air issuance to the extraction workshop is made by process communications.

Water-oil condensate, being formed in course of air compression and cooling, from the oil separator, filters system and adsorption dehumidifier is removed to the condensate separator. In the separator water and oil stratification is made on account of its density difference. Waste water through a trappean sewerage is delivered to the sewerage system. Oil from the separator is poured to the portable storage tank and is sent for disposal.

To provide the extraction workshop building 27 with nitrogen purse gas for the extractor purging before startup and before its putting under repair, the project provides for installation in the compressor house of a nitrogen generator, equipped with its proper monitor and control cabinet. Nitrogen generator is an air separation membrane plant. Dehydrated air, taken out from collector after receiver, is delivered to the generator for separation. Derived nitrogen gas comes to the receiver with 4m3 volume, from which by process communication it is delivered to the extraction workshop building No.27.

Communications inlet-outlet. Stock-preparation workshop provision with energy sources (design documentation by the LLC "Khimtechnologia")

The project provides for process communications piping in to the stock-preparation workshop:

- water steam 1.3MPa from the boiler-house building No.41.1;

- softened water from the water conditioning and purification plant of the boiler-house building No.41.1;

- extraction raw oil from the extraction workshop building No.27;

- direct district heating water from the boiler-house heat supply station building No.41.1 to the stock-preparation workshop heating and water supply system.

The project provides for process communications piping out from the stock-preparation workshop:

- water steam condensate to the boiler-house building No.41.1;
- hydrated oil from the hydration division to the service tanks building No.33;
- phosphatides to the desolventizing stage of the extraction workshop building No.27;
- reverse district heating water to boiler-house heat supply station building No.41.1 from the stock-preparation workshop heating and water supply system.

Water steam 1.3 MPa through condensate's separator is delivered to the steam pressure reduction spool from 1.3 to 1.1 MPa. Reduction spool includes isolating fittings, automatic control valve and safety valve on the low pressure side. Steam system 1.1 MPa includes manifold valve, from which water steam is delivered to process users of the "Europa Crown" company divisions.

Softened water comes to the manifold valve, from which it is distributed on the hydration divisions.

Service and potable water is delivered to the solvent cake and coat granulation plot of the stock-preparation workshop from the water supply and sewerage systems (part of the project WS &S (water supply and sewage).

Water steam condensate from the steam conduit lower points is delivered to the condensate collector

of the "Europa Crown" company. Water steam condensate from the collector of the "Europa Crown" company through process communications is delivered to the boiler-house building No.41.1.

To provide the hydration division of the "Europa Crown" company with recycling water, the project provides for the chiller installation with cooling power 250 kW (40 m3/hour of water with inlet temperature 25 °C and outlet temperature 20 °C). Chiller represents a water cooling installation, assembled in a single unit, comprising:

- sealed freon scroll compressors (4 pcs);
- evaporator;
- condenser;
- fans group;
- two independent freon cooling loops, equipped with high and low pressure pressostat, safety valves, isolating fittings, dehydration filter, moisture indicator, electronic expendable valve;
- body and panel;
- power and control cabinet;
- microprocessor controller, using which installation inlet liquid temperature control, visualisation and measurement of inlet and outlet temperature of the liquid, which is being cooled, visualization and measurement of the freon evaporation pressure, automatic adjustment of the installation efficiency, etc. are performed;
- hydromodulus, which includes storage container with level gauge, circulating centrifugal pumps, by which water gets to consumer.

From chiller direct recycling water with 20°C temperature is delivered to cool down the hydrated oil in the cooler of the "Europa Crown" company and to cool down the recirculated water in vacuum system cooler. Reverse recycling water with 25 °C temperature from coolers comes back to the chiller to be cooled down.

For perspiration of the evaporation, formed in course of oil dying, in the vacuum system condenser of the "Europa Crown" company the project provides for the recirculated water loop. Water from a barometric container of the "Europa Crown" company by a pump through the cooler, in which recirculating water is cooled down from 50 °C to 34 °C by recycling water from chiller, is delivered to the vacuum system condenser of the "Europa Crown" company. From condenser the recirculating water is poured down to the barometric container. Water surplus from the barometric container is drained to the sewerage system.

Sewage waters from the oil hydration plot of the stock-preparation workshop through a trappean sewerage are delivered to the grease-trap, from where purified sewage waters go to the sewerage system.

All process technologies, performed in the stock-preparation workshop, are monitored and controlled at site and from operator's automated workstation at the stock-preparation workshop. Automatic control system of the stock-preparation workshop provides for full display of the object and all processes at the computer (object visualisation).

All main aspects of the process are tracked, processed and regulated due to the automation system SCADA. It is based on utilization of the programmable logic controller Siemens S7 PLC and computer visualisation system. The workshop control is automated and provides for processes development tendencies analysis, required safety blocking and possibility to switch to manual control modes.

As soon as the control program (visualisation) is launched, process chart of the stock-preparation workshop appears on the computer screen. With the help of visualisation program it is possible to monitor and control all equipment of the object, namely: processes of seeds decortication, coat and solvent cake granulation, oil hydration, condensate collection assembly, energy sources distribution assembly, air compression assembly; material transportation processes by all possible workflows of this workshop. While controlling the complex using visualisation, all processes are performed automatically, without operator's intervention. All process ways of the material movement at the installed equipment are easily chosen by the operator depending on a task set and available possibilities.

Launch of every link of the chosen way starts from this link's end, and the stop - from its start.

All bucket elevators are equipped with: explosion relieves, automatic brake arrangements, run-off switch, products propping-up gauge, link breaking-down gauge, speed control gauge, alarm condition.

All conveyors are equipped with: products propping-up gauge, link breaking-down gauge, speed control gauge, alarm condition.

Extraction workshop. Building No.27

Production line of the extraction workshop is manufactured abroad. Supplier - "Europa Crown" company, Great Britain. Production line of the extraction workshop of the "Europa Crown" company is certified and corresponds to the standards and rules, currently in force in Ukraine. Detailed description of the extraction workshop production line is given in documentation of the "Europa Crown" company .

Manufacturing procedure is oil uptake from soya flakes by solvent extraction. In course of extraction there are no chemical reactions taking place, and, therefore, no new chemically active substances are formed. Production extraction hexane is used as a /solvent, it represents a carbohydrates mixture with direct ties along carbon chains, identical to ordinary petrol for combustion engines.

Manufacturing process comprises the following stages:

- oil extraction from prepared soya flakes using solvent;
- solvent distillation from oil;
- solvent recuperation;
- solvent cake desolventizing (solvent stripper).

Extraction division by "Europa Crown" company.

Prepared soya flakes from the stock-preparation workshop building No.25 are delivered to the extraction workshop using conveyors system. As a safety measure, there was provided an air gap between stock-preparation workshop conveyors and extractor's loading conveyor, and as an additional safety measure, in this conveyor's head part there is a soya elevator's fan, which switches on automatically with low level in the extractor's loading bin.

Solvent's steam packing is ensured at the extractor's inlet due to extractor's delivery conveyor, which is a screw conveyor. Soya flakes constantly fill the extractor's acceptance bin, its level in the bin is kept by the level control system due to the extractor's speed adjustment. Safety sliding

shutter, as well as extractor's purging fan are used during extractor's maintenance stops.

Extractor provides for the oil uptake from the cattle cake due to a series of countercurrent miscella and hexane washings. In case, when coming cattle cake is extremely hot, there is an extractor's condenser provided, in which solvent's steams from the extractor are condensed. Material is moving in the extractor through a loop unit towards a drainage unit, after that it is discharged from the device using extractor's unloading conveyor, which delivers material to the toaster's inlet (desolventizer). Miscella (oil and hexane mixture) goes (from extractor) for distillation.

Toaster comprises two section DT (upper) and DC (lower). DT section provides for the solvent stripper, solvent cake toasting. DC section provides for the solvent cake's drying and cooling. Hot and damp solvent cake is blown round with preheated air in upper tanks of the DC section. In the last tank of the solvent cake cooling device the outside air is used. Solid particles, taken by the outgoing air flow, separate from it by force of cyclones and are poured down to the conveyor of solvent cake, discharged from the toaster's last tank.

From the toaster, the solvent cake by conveyors system is delivered fro granulation to

the stock-preparation workshop building No.25.

Concentrated miscella is discharged from extractor using concentrated miscella pump through hydro cyclones, in which small particles are removed from it and turned back to the extractor. This miscella concentration is increased in 1st stage distiller, which represents a vertical tube shell of film boiling. To evaporate the solvent from the fluid stream inside the pipes hot steams from toaster in the tube space are used. Solvent steams, evaporating from miscella, are rising to the upper separation section of the distiller. Hot steam residual from the toaster, leaving this distiller, is used to heat fresh hexane in the heat exchanger steam/solvent. Steams, non-condensed in the heat-exchanger, are condensing in the toaster's condenser.

Received concentrated miscella is gravitating to the 2nd stage distiller through a heat recuperation heat-exchanger, where miscella is heated up with ready oil heat, coming out of the process. This distiller is also a vertical tube shell of film boiling with tube space heating using water steam. Hexane, having evaporated from both distillers (1st and 2nd stage), is condensed in the distillation condenser, which operates under vacuum, created by the distiller ejector.

Hot oil from 2nd stage distiller comes to the 3rd stage distiller to remove residual hexane on account of vacuum and direct steam combined action. Distiller of the 3rd stage is a disc-and-plate unit, in which oil is poured down in cascade in countercurrent to the oncoming direct steam. Solvent's steams, being formed, are condensed in the 3rd stage distiller's condenser, operating under vacuum, created by the 3rd stage distiller's ejector.

From the 3rd stage distiller, oil is pumped to a stripper to remove moisture and solvent's residual. Stripper is an open vacuum unit, from which steam is removed using stripper's ejector and is coming to the tube space of the 3rd stage distiller's condenser.

Raw extraction oil is delivered using a ready oil pump through a heat recuperation heat-exchanger to the oil service tanks to check its conformity to the certification requirements. From service tanks oil is pumped through a ready oil cooler to the service tank of the stock-preparation workshop hydration division building 25.

Water and hexane mixture from condensers is delivered to the hydroextractor using distiller condensate pump. Lighter "hexane" fraction from the hydroextractor comes back tot he extraction process by clean solvent pump through hydraulic cyclone

solvent/water, where residual water is removed from the solvent. hexane level in the hydroextractor is maintained by feeding it with fresh solvent from solvent tanks using solvent tanks' pump. Heavier water phase, separated in the hydroextractor, is delivered to remove solvent to the sludge evaporator through heat-exchanger of the sludge evaporator, in which polluted water is heated by purified water, drained from the sludge evaporator to the petrol interceptor.

Oil absorption system (mineral oil) reduces the solvent vapour's content in air emissions of the extraction workshop. After steams condenser, non-condensed steams are passed through solvent steams absorber, where hexane residuals are intercepted in it in countercurrent with cold mineral oil cascade. This oil is then heated up in a mineral oil heater and released from hexane steam in the solvent steams desorber, hot mineral oil from the desorber is cooled down in combined cooler/ heat-exchanger and is delivered to the absorber. Released hexane steams come to the steam condenser inlet to be renewed.

Energy sources distribution inside workshop.

Production line of the vegetative oil extraction of the "Europa Crown" company is equipped with energy sources distribution system (water steam, instrumental air, recycling water), which includes corresponding fittings (manual, adjustable, preventable) and monitoring and control means.

Water steam condensate from steam conduits' lower points and steam-using equipment is delivered to the collector, from which it is pumped to the boiler-house building No.41.1.

Reversible petrol store and waste waters cleaning assembly in the petrol interceptor by

"Europa Crown" company.

Solvent comes to the reversible solvent in the supplier's automotive tanks. Outside reversible solvent storages plant consists of four deepened capacities:

- capacity for fresh solvent (2 pcs) with 40 m^3 volume each - used to feed the circulation system with solvent and to fill the equipment with solvent before start-up;

- miscella capacity with 40 m^3 volume - used for emergency and before-repairs miscella drainage from the extraction workshop equipment and to fill the equipment with miscella before start-up, to collect and return hexane and oil from the petrol interceptor to the extraction division;

- emergency capacity with 17 m^3 volume - used for emergency and before-repairs drainage of solvent from the extraction workshop equipment;

Extractor's and distillation section content can be drained by gravitation to the miscella capacity, from which products return to the process using miscella capacity pump. Hydroextractor's content may be drained into the emergency capacity and returned back using the solvent capacity's pump.

Solvent's drainage from the truck tank is made by gravitation through a fire protector and filter in the solvent's capacity. Deepened capacities for overflow protection are additionally equipped with overflow lines in-between (project of the LLC "Khimtechnologia").

Hexane from deepened capacities is pumped for filling in and feeding of the solvent's circulation system for the solvent's recuperation stage.

Previewed control of the solvent and miscella level (maximum level gauges and signalling indicators) in hexane, miscella capacities and in the emergency capacity, level in the later one

should be absent. In case the solvent's level in capacities is higher than maximum admissible, sound-and-light alarm at the extraction workshop operator's automated workstation is activated. In case the solvent's level in capacities is lower than minimum admissible, the pump is automatically stopped and sound-and-light alarm at the extraction workshop operator's automated workstation is activated.

Reversible solvent and miscella capacities are connected via a gaseous phase with solvent recuperation system through solvent's recuperation stage condenser.

Project of the LLC "Khimtechnologia" provides for the possibility of before-repair solvent's residual emptying from the reversible petrol store into an automotive tank, which is performed by miscella capacity pump.

Waste water with hexane residual from the equipment and extraction workshop is delivered for separation to the petrol interceptor. Hexane, separated due to density difference from the distribution part is poured to the "dry" part of the petrol interceptor. From the petrol interceptor's "dry" part, hexane or miscella is poured to the miscella deepened capacity. Separated water from the petrol interceptor's lower part is drained by gravitation through the inspection well to the production sewage system.

Petrol interceptor's pump is designed to pump put occasionally various slushes from water surface in the petrol interceptor.

Provision of the extraction workshop with energy sources (design documentation LLC "Khimtechnologia")

The project provides for process communications piping in to the

extraction workshop:

- water steam 1.3MPa from the boiler-house building No.41.1;

- phosphatides to the desolventizing stage from the hydration division of the stock-preparation workshop building No.25;

- instrumental air (CMD&A) from compressor-house of the stock-preparation workshop building No.25;

- nitrogen gas for extractor's purging before repairs and startup from the compressor-house of the

stock-preparation workshop building No.25;

- direct district heating water from the boiler-house of the heat supply station building No.41.1 to the stock-preparation workshop heating and water supply system.

- direct recycling water from the cooling tower building No.45.

The project provides for process communications piping out from the extraction workshop:

- water steam condensate to the boiler-house building No.41.1;

- raw oil to the hydration division of the stock-preparation workshop building No.25;

- reverse district heating water to boiler-house of the heat supply station building No.41.1 from the stock-preparation workshop heating and water supply system.

- direct recycling water to the cooling tower building No.45.

Water steam 1.3 MPa through condensate's separator is delivered to the steam pressure reduction spool from 1.3 to 0.9 MPa. Reduction spool includes isolating fittings, automatic control valve and safety valve on the low pressure side. Steam

system 0.9 MPa includes manifold valve, from which water steam is delivered to extraction division process users of the "Europa Crown" company divisions.

Water steam condensate from the steam conduit lower points is delivered to the condensate collector of the "Europa Crown" company. Water steam condensate from the collector is delivered to the boiler-house building No.41.1 using "Europa Crown" company pump.

All process technologies, performed in the extraction workshop, are monitored and controlled at site and from operator's automated workstation of the extraction workshop. Automatic control system of the extraction workshop provides for full display of the object and all processes at the computer (object visualisation).

All main aspects of the process are tracked, processed and regulated due to the automation system SCADA. It is based on utilization of the programmable logic controller Siemens S7 PLC and computer visualisation system. The workshop control is automated and provides for processes development tendencies analysis, required safety blocking and possibility to switch to manual control modes.

As soon as the control program (visualisation) is launched, process chart of all the extraction workshop appears on the computer screen. With the help of visualisation program it is possible to monitor and control all equipment of the object, namely: processes of oil extraction from soya flakes, solvent distillation from oil, solvent recuperation, solvent cake desolventizing, condensate collection assembly, energy sources distribution assemble, reversible petrol store and petrol interceptor assembly; material transportation processes by all possible workflows of this workshop. While controlling the complex using visualisation, all processes are performed automatically, without operator's intervention. All process ways of the material movement at the installed appliances are easily chosen by the operator depending on a task set and available possibilities.

Launch of every link of the chosen way starts from this link's end, and the stop - from its start.

System performs automatic control of the hexane explosive concentrations content in the air of the extraction workshop production area and outside plants (incl. inspection well) with sound-and-light alarm at the operator's automated workstation and emergency ventilation switching on in corresponding premises in case of hexane steam concentration above 0.115 volume percent (10% from LEL (lower explosive limit). In case hexane steam concentration is rising above 0.575 volume percent (10% from LEL) the extraction workshop is stopped as per the emergency shutdown (ESD) system layout and sound-and-light alarm at the operator's automated workstation is activated.

Oil service reservoirs. Building No. 33. Pumphouse of the oil service reservoirs. Building No. 34. Motor transport loading point. Building No. 35 Railway transport loading point. Building No. 36

Oil feed tanks (2 pcs. V=3000 м3) designed to accept hydrated oil from the preparation workshop building No.25 and to dispatch it to the customer's railway and automotive transport.

Using process communication hydrated oil goes to the stock-preparation workshop building No.25 through manifold valves to the oil service tanks pos. E1/1,2.

From service tanks the oil through process communications is delivered :

- by centrifugal pump with 50.5 m^3/hour efficiency to the motor transport loading point building No.35. Motor transport loading is performed through an upper loading device;
- by centrifugal pump with 100 m3/hour efficiency to the railway transport loading point building No.36. Railway transport loading is performed through an upper loading device.

The project provides for the possibility to pump out one of the tanks into another in case of emergency. In the pumps suction piping there is a filtration unit to remove possible foreign admixtures.

With the purpose of service tanks occasional cleaning from sludge (organic sediments), formed as a result of long-term oil storage in tanks, the project provides for sludge tanks (2 pcs V=50 m3), equipped with "breathing" pipelines with fire protectors and level control gauges in tanks. Sludge through drainage piping of oil service tanks, while scraping it, using portable pump is transferred to the sludge tanks. After gravity sedimentation, during which the sludge is separated (0around 45%) in the lower part and oil (around 55%), sludge from the tanks is transferred by portable pump to the automotive transport through upper loading device.

When sludge is dispatched, the rests of oil from the sludge tanks are returned to the oil service tanks using portable pump.

In order to limit overflow in case of emergencies, oil tanks are installed in dibhole and pallet trays. In case of emergency depressurization of any tank, dibhole emptying is made using pump through inlet valve at the pumps suction piping into a free tank. Emptying of dibhole pallet from rainfall run-off is performed using portable drainage pump after analysis is made for oil absence in the run-off. Polluted rainfall run-off goes from the dibhole tray along the piping into a grease-trap (part of SPK).

In order to steam equipment thoroughly, the project provides for process communications piping of water steam from the boiler-house building No. 41.1. Condensate drainage from the steam conduit lower point is made to the wet well.

For CMD&A devices and to enable before repairs pipelines purging, the project provides for process communications piping of compressed air from the compressor house of the stock-preparation workshop building 25.

Production laboratory. Building No. 40.

Production laboratory is designed to carry out raw materials quality control, technological processes conduct, intermediary and by-products, wastes and ready products.

Production laboratory main task is products quality control as per physical and chemical indices; technological processes conduct control, raw materials, wastes and by-products quality control.

While performing its main task the laboratory is controlling: indexes of wetness; acid, peroxide number; phosphorous-containing substances; nonoleaginous impurities; flash temperature; soap; determination of protein, water-soluble protein and generally soluble proteins; determination of crude fiber; determination of solvent's residual quantity; determination of ready products consumer appeal (water-retaining property, grease-retaining property, grease-emulsifying power, solubility).

Study objects: raw materials; ready and by-products; wastes; auxiliary materials;

Production laboratory departments business hours are defined in conformity with the enterprise's business hours - full working week, two shifts, average annual working days number - 315.

The following premises are provided in the production laboratory:

- raw materials laboratory;
- physical-and-chemical laboratory;

- chromatographic;

- extraction laboratory;

- staff room with a shower and WC;

- laboratory head office;

- stockroom to store chemical agents;

- premises to store samples;

- stockroom;

- place for cleaning facilities with WC;

- technical premises (heating, ventilation). Process

technology diagram

- raw materials, test samples, ready products input;
- dishware preparation;
- samples preparation;
- experiments conduct;
- results treatment;
- cultures sterilizing;
- removal of the sterilized samples from the laboratory.

While oleaginous seeds are accepted for processing, the laboratory is performing control as per the following indices - humidity, degree of fineness of the oil admixture.

Control of these indices is performed by raw materials laboratory, equipped with laboratory side-tables, analytical and technical electronic scales, laboratory scalpers, mill, water laboratory bath, baking oven, laboratory washing sink.

Techno-chemical control of the vegetative oil production is performed by physicochemical laboratory.

The laboratory's employees perform daily quality control of the oil, produced as per the controlled parameters (acid number, nonoleaginous impurities, phosphorous-containing substances, moisture and volatile substances, soap, iodine number, substances, not passing solution film test, etc.).

Physicochemical laboratory is equipped with laboratory workbench (echelon-type and side-type), test-tube centrifuge, analytical laboratory scale, chemical fume hood, gas chromatograph "Kristal 2000M", dialogue computer system, etc. Using chromatograph they also define fatty acid content of vegetative oils, amine oxidants content, as well as define pesticides and herbicides residual quantity content.

There is also an infra-red analyser "Infra-Lum FT-10" installed in the extraction laboratory premises, besides extraction plant SOX 414 macro. This is a fixed laboratory device, designed to define crude fat, crude protein, moisture, cellulose, crude ash in soya cattle cake and solvent cake, as well as weight content of fatty acids trans-isomers in vegetative oils. Using SOX 414 macro plant an extraction analysis, based on Soxhlet methods, is performed, providing for reference accuracy and precision.

Extraction laboratory premises are equipped with side-type laboratory tables, cabinets and laboratory washing sink.

Chromatographic premises is equipped with fume hood, side-type table, "Kryshtal-2000M" plant, designed for simultaneous quantitative and qualitative analysis of volatile and semi-volatile organic compounds mixtures.

Laboratory glassware washing premises is equipped with laboratory washing sink, air steriliser "Stericell-55", laboratory glassware cupboard. Distilling apparatus DE-4 is provided to get distilled water.

Special premises are provided for the laboratory staff - laboratory chief room, wardrobe, shower-room, WC. Another premises are designed for the cleaning facilities storage. In order to store chemical agents and samples there are stockrooms provided, equipped with racks and laboratory cabinets.

Laboratory equipment provision (chromatograph, combined gas chromatograph mass-spectrometer and extraction plant) with process gases is performed by helium, hydrogen, oxygen gas cylinders, installed in special metal cabinets, located outside the building next to the external wall.

Gas supply from cylinders to the laboratory equipment is made through pipelines, gas offtake from the cylinder is made through a reducer. Manometers are installed to control gas supply to the gauges.

Compressed air supply is made by compressor plant, equipped with a dehumidifier. Compressed-air line pressure is 0.35÷0.4 MPa.

Production laboratory equipment configuration is previewed in compliance with a chosen technological process. Equipment location ensures free access to conduct works, considering possibility of wet cleaning and disinfection conduct. The staff is provided with service premises, personal protective equipment, special clothes, footwear, primary fire fighting means and first-aid equipment.

There is lighting - natural and artificial - previewed in the production laboratory premises. The laboratory is provided with combined extract and input ventilation and fume hoods.

All the equipment and measuring gauges are maintained in conditions, providing for its safekeeping and protection against damages and early wear.

Boiler-house. Building No.41.

In the boiler-house it is designed to install two steam steel fire-tube boilers of the type Buderus Logano S815 15000x13bar with gas burners of the type OILON GP-1000 Monox – 1 pc., OILON GP-1000 ME Bio – 1 pc.

Designed boiler-house is meant for technological needs of the production steam supply and heating, ventilation and hot-water supply needs of the complex's buildings.

The boiler-house water supply is to be performed from designed raw water supply lines, reversed water supply lines from the reverse osmosis and installation and softened water from the water treatment and water supply workshop of the plant, drainage and waste lines from the boiler-house shall be led to the designed sewerage network of the designed production.

The project provides for the steam boilers installation with auxiliary devices, mounted in the designed boiler-house.

As per the project technical design assignment the calculated steam producing output shall be 30 t/hour with steam working pressure 13 bar.

Projected CMD&A system of the boiler-house provides for full control of the gas assemblies operation, control and protection along the boiler-house operation parameters.

Electric power supply of the boiler-house is envisaged from the available networks of the enterprise. In order to ensure preset parameters, this project provides for the following fundamental technological concepts of the boiler-house construction:

- installation of required capacities on saturated steam production;

- installation of required capacities on heat energy production;

- water for boilers and heat supply system is given from the water purification plant;

- installation of required pumping facilities of the boiler-house;

- installation of the boiler-house automation as per the boiler-house functional assignment and current regulatory documents.

The project provides for installation of the following nain equipment:

- three-way steel steam boiler Buderus Logano S815 , 2 pcs., Q=15000 kg/hour, P = 13 bar;

- boiler's gas burner, OILON GP-1000 Monox – 1 pc., OILON GP-1000 ME Bio – 1 pc., Q=10220 kW, Pp = 0.3 bar;

- heat exchanger of delivery water heating;
- ventilation system pump, WILO IL 65/140-5,5/2, Q=42.5m³/h, H=25 m H2O;
- heating loop pump, WILO IL 65/140-5,5/2, Q=42,5m³/h, H=25 m H2O;
- steel deaerating tank, volume 20 m3 with EGR 30 head, Efficiency 35 m3/hour;
- condensate collection tank, steel tank , volume 14,8 м^3;
- membrane expansion tank for the heating system, REFLEX N1000-750
- condensate transfer pump, WILO MVI 3202/PN16, Q=39m3/hour, H=17 m H2O,

Gas supply of the boiler-house is performed from the designed medium pressure 0.3 kgf/cm^2 gas main. Hourly need in natural gas with one Buderus Logano S815 boiler operating - shall constitute 1134 nm^3/hour. Gas pressure before burners - 0.03 MPa.

Maximum daily gas consumption of the boiler-house 1134x2x24= 54432 nm^3/day (calculations made for the natural gas with Qi_p = 8200 kkal\nm^3 ; density –0.733 kg\nm^3, boiler's efficiency output 0.93).

Locking features placement on the gas conduit is envisaged as per requirements of the para.4.4 SBR V.2.5-20-2001.

Commercial recording of gas consumption is performed on the designed gas recording assembly ans is developed by a separate project.

There is a gas utility meter installed on each boiler for each unit official recording of boiler's gas consumption.

There is a gas shut-off with electric drive on the boiler-house gas inlet for gas supply emergency cut-off to the boiler-house in automatic mode.

For the needs of steam boilers supply, heat supply network feeding, needs of hot water supply and boiler-house technological needs there is water supply provided from the water conditioning and purification system, namely:

1. Water for the steam boilers feed after softening installation with parameters

- water discharge - up to 40 m^3/hour;
- water pressure 1.2 - 3.5 kgf/cm^2;
- water temperature +15-20 ^{o}C;
- solid residual - not more than 70 mg/l;

- pH – 7.5;
- general hardness - not more than 0.6 mg-eqv/l;
- general alkalinity - not more than 1.0 mg-eqv/l;
- chlorides - not more than 1 mg/l;
- sulphates - not more than 1 mg/l;
- nitrates - not more than 1 mg/l;
- silicic acid - not more than 1.5 mg/l;
- iron, copper - n/a;
- dissolved oxygen - 7-14 mg/l, set by the water temperature;
- dissolved free carbon dioxide - not more than 5 mg/l.

2. Water of the recycling water supply for boilers emergency feed in case of reversed condensate absence or water softening installation repair.

- pH – 7.0;
- turbidity - 32.3 mg/l;
- general hardness - 0.27 mg-eqv/l;
- calcium - 0.22 mg-eqv/l;
- magnesium - 0.05 mg-eqv/l;
- general alkalinity - 2.44 mg-eqv/l;
- iron - 0.5 mg/l;
- manganese - 0.01 mg/l;
- nitrates - 7.0 mg/l;
- sulphates - 13.0 mg/l;
- chlorides - 24.5 mg/l;
- silicates related to SiO2 – 11.3 mg/l;
- ammonium - 103.5 mgO2/l;
- solid residual - 198 mg/l;
- electroconductivity - 320 mcS/cm.

3. Cold raw water for the HWS (hot water supply) and boiler-house needs

- pH – 6.9;
- turbidity - 0.7 mg/l;
- general hardness - 5.24 mg-eqv/l;
- calcium - 3.86 mg-eqv/l;
- magnesium - 1.38 mg-eqv/l;
- general alkalinity - 5.8 mg-eqv/l;
- iron - 0.07 mg/l;
- manganese - 0.01 mg/l;
- nitrates - 2.5 mg/l;
- sulphates - 16.3 mg/l;
- chlorides - 2.3 mg/l;
- silicates related to SiO2 – 8.5 mg/l;
- ammonium - 1.2 mgO2/l;
- solid residual - 311 mg/l;
- electroconductivity - 490 mcS/cm.

Projected automation system of the boiler-house provides for the boiler-house operation without operations staff' continuous control, boiler-house maintenance and operation control is performed occasionally as per the agreed schedule.

In the staff premises, servicing the boiler-house there is an alarm in case of emergencies occurring at the boiler-house.

Projected system of technological processes control provides for the boiler and auxiliary devices control.

The control system performs the following functions:

- In-process control of the technological processes progress and its appliances state;

- Technological parameters automatic adjustment in all operation modes of the appliances;

- Process signalling of parameters deviation from the rated value and of operation irregularity of certain units and devices;

- Technological appliances protection against damages in emergency cases;

- Arrangement of technological appliances control.

All control system is implemented on CMD&A traditional units, as well as on imported equipment of leading foreign manufacturers. Automatic control scope accepted in conformity with CNR (construction norms and rules) II-25-76 part II "Boiler units".

Heat control arrangement and devices selection performed in accordance with the following principles:

- Parameters, which observation is required for correct conduct of pre-set modes, is measured by gauges, showing:

- Parameters, which modification may lead to emergency situation, are controlled by gauges, making signals, and are shown on the supervisory console;

- Parameters, which recording is required for economic calculations or analysis of appliances operation, are controlled by gauges with its further saving, on customer's request it is possible to install printer with interface for parameters printing.

Main control and automation means are installed on CMD&A boards of the boiler-house.

Control of less critical parameters, as well as backup control is performed on site using local manometers and thermometers.

The following automatic adjustment systems are provided in the boiler-house:

- Outlet and inlet boiler water temperature adjustment as per the preset value;

- Hot water and heat transfer medium temperature adjustment on the preset level.

The project shall provide for process signalling system with alarm output on the supervisory console with the boiler-house alert reason fixation:

- Boiler and auxiliary appliances malfunction;

- Boiler-house power supply interruption;

- Boiler-house premises gas contamination alarm actuation;

- Fire alarm actuation (with decoding at the operator's site);

- On gas pressure loss before the boiler as to the preset value;

- On gas pressure rise before the boiler as to the preset value;

- On steam pressure rise or loss;

- On heat transfer medium pressure rise or loss after the district heater;

- On heat transfer medium temperature rise after the district heater.

Process protections of the boiler-house are designed to provide for the automated operations on the boiler stoppage with its switching on blocking to prevent accident development in case of emergencies.

Boiler operation safety system provides for gas supply cutoff to the burner in case of:

- Rise or loss of gas pressure on burners;

- Steam pressure rise after the boiler;

- Air pressure loss;

- Electromagnetic valves leakages;

- Burner's extinction;

- Rise and fall of the water level in boiler;

- Rise of gases pressure, coming out in the boiler furnace;

- Voltage loss

In case any of the listed above parameters deviates from the standard, sound-and-light alarm is activated in the boiler-house and on the operator's site console, gas supply tot he burner is stopped by closure of the electromagnetic drive cut-off valve.

Cold water supply for the boiler-house needs is envisaged from the local water supply system D100mm. Potable water in the boiler-house is used for everyday necessities, production demands and fire fighting needs.

Solvent cake storage. Building No. 17, 31.

Solvent cake storage with 8300 tonnes volume (on granulated soya solvent cake, volume density 0.65 t/m^3, compression ratio 6%) is designed for temporary storage (not more than 10-12 days) and dispatching of the solvent cake on the motor and railway transport.

Soya solvent cake one-time storage volume: 8300 tonnes;

Soya coat one-time storage volume: 430 tonnes.

The solvent cake storage production facilities include:

- The solvent cake storage, comprising six round capacities with flat bottom;
- The coat accumulative storage unit, comprising a round capacity with cone bottom;
- Solvent cake dispatching division to the automotive transport.
- Coat dispatching division to the automotive transport.
- Solvent cake dispatching division to the railway transport.
- Transport service and transfer units system is equipped with conveyors and bucket elevators with 3, 25 and 60 t/h efficiency for the granulated solvent cake and coat correspondingly, which enables capacities loading and unloading, as well as granulated solvent cake and peelings movement along prescribed itineraries.

Selection of the technological process main facilities

Selection of the main facilities, quantity and efficiency of the solvent cake storage loading and unloading processing lines are performed, basing on the following conditions:

Efficiency of the transport mechanisms of solvent cake capacities loading is accepted as 25 t/hour (as for soya solvent cake, as 0.65 t/m^3). Efficiency of the transport mechanisms of coat capacities loading is accepted as 3 t/hour (as for soya coat, as 0.65 t/m3).

For more rapid solvent cake storage as well as coat storage assembly unloading, as well as to reduce time of automotive and railway transport loading operations performance - efficiency of the transport mechanisms of the line is accepted as 60 t/hour.

The solvent cake storage loading line represents a series of chain conveyors, working in succession and situated outside on the overpass pos. 16a, 17a, 17e. They deliver soya solvent cake to the storage capacities.

Capacities unloading is made using chain conveyors with 60t/hour output, located under the capacities. Further the product is delivered to the elevator tower building No.18, located next to the solvent cake storage, from which further soya solvent cake is delivered to the automotive and railway transport loading line.

The process chart provides for the solvent cake possibility to be moved from one storage to another to exclude temperature rising and prevent eventual further product's spontaneous combustion.

Solvent cake receipt, allocation and storage

During the solvent cake receipt (NAOP 1.8.10-1.10-92):

- the product's external examination is held;

- temperature is measured, which should not exceed +35°C, in summer period it should not exceed ambient air temperature on more than +5°C,

- humidity is measures, which in course of soya beans processing, should not exceed 12%;

- solvent content is measured, which should not exceed 0.08%. Indices determination and quality control arrangement are performed by the production laboratory staff.

Only those solvent cake batches, which quality corresponds to the standards or engineering specifications, are subject to be allocated and stored. The solvent cake is stored in the solvent cake storage capacities as per the allocation layout, which is occasionally specified depending on the raw materials supply.

Solvent cake quality control arrangement in course of its storage.

As soon as the solvent cake is received and allocated, its storage quality systematic control is established.

The solvent cake storage quality control is made as per the following indices: colour and smell, temperature, humidity.

The temperature of the stored solvent cake is measured daily. The temperature control is performed by the enterprise's production staff. The solvent cake temperature in the mound is defined using monitors, connected to the thermometry system. The temperature is measured automatically using thermo-pendant, installed in the capacities and the readings are taken along all the mound height. In case the temperature rise is revealed in any solvent cake mound's area, the temperature is measured more carefully in all neighbouring areas, the solvent cake amount, enveloped by the spontaneous heating, is defined, its observation is enhanced and corresponding measures are taken in time.

The solvent cake being under heating should be immediately cooled by moving it into another storage area. For this purpose the solvent cake is passed through transportation mechanisms and pumped into a free capacity.

Conditions and admissible terms of the solvent cake safe storage.

The project envisaged temporary soya solvent cake allocation and storage for not more than 10-12 days.

When the solvent cake is loaded in at the mound's forming stage and in course of its storage the product's self-consolidation is taking place. As soon as self-consolidation is over, the solvent cake looses its flowability, its quality deteriorates. Thus, to ensure high quality and prevention of conditions, under which the solvent cake gets packed, there should be introduced a strict control of severe compliance with temporary or continuous storage terms, which depend on the self-consolidation period.

Processing lines description. Solvent cake storage capacities loading line.

Form the stock-preparation workshop the granulated soya solvent cake comes to the belt bucket elevator. The bucket elevator delivers soya solvent cake by natural flow to the chain horizontal conveyor, which in its turn distributes the product, using intermediate outlet gate, on one of two conveyors correspondingly. Conveyors load capacities for the soya solvent cake storage. Granulated soya solvent cake is stored in metal capacities with fat bottom, equipped with hydraulic discharge screw conveyor and thermometry system.

From the solvent cake storage capacities using hydraulic discharge screw conveyor the solvent cake gets through a horizontal drag conveyors system to the belt bucket elevator. Using bucket elevator the soya solvent cake through a two-way valve is getting to one of the directions: 1) in

chain conveyor, to perform soya solvent cake pumping into a free capacity; 2) by a horizontal drag conveyors system the granulated soya solvent cake is getting to the accumulative capacities of the solvent cake loading divisions into the automotive and railway transport. pos.20, 21.

From the accumulative capacity through manual and electric gate correspondingly, soya solvent cake is getting to the automotive transport.

From the accumulative capacity through manual and electric gate correspondingly, soya solvent cake is getting to the railway carriage. In order to keep record of the dispatched products quantity, carriages' loading is performed directly on the carriages scales.

Form the stock-preparation workshop the granulated soya coat comes to the belt bucket elevator. The bucket elevator delivers soya coat by natural flow to the capacity with cone bottom (hopper). From the storage capacity, soya coat through a bucket elevator by natural flow is loading to the accumulation capacity of the peeling cargo compartment to the automotive transport.

From the accumulative capacity through manual and electric gate correspondingly, soya coat is getting to the automotive transport.

In the solvent cake storage all equipment is performed in explosion-proof design, belt drives are covered with protective casings. Bucket elevators are equipped with explosion relieves. Transport appliances are maximum sealed to prevent dust formation.

Between constructions, which are not lied up technologically, there are standardized fire breaks made.

Cooling tower. Building No. 45.

In order to divert heat from the extraction workshop process equipment building No.27, the project envisages a rotational water turn, which includes:

- cooling towers building No.45. Cooling towers are installed at the 1.5m height. Special areas are provided for cooling towers maintenance. There is a basin under cooling towers to collect chilled water;

- centrifugal pumps, installed in the boiler-house premises building No.41;

- inter-workshops communications.

Reverse recycling water from the extraction workshop comes back to the modular ventilation cooling towers to be chilled. The project envisages reverse recycling water temperature control in collector and its pressure control at each cooling tower input point. In order to provide the production process with recycling water at the amount of 800 m^3/hour, the project envisages 2 cooling towers' installation with rated output 400 m^3/hour each with temperature ratio from 36 to 26 ^{0}C. Cooling towers are grouped to one cooling towers basin. In order to maintain required temperature mode of the recycling water in cold period of year, the project envisages a bypass piping, through which water is drained to the cooling towers basin directly.

The cooling towers basin design provides for:

- water-intake dibhole, from which water by two collectors is coming for centrifugal pumps suction pos. NV1/1-3;
- drainage dibhole, through which the basin is emptied to the sewerage system in course /before repairs time. Water from overflow funnels, installed in each basin to exclude its overflowing possibility, is also coming to a drainage collector.

In order to maintain corresponding recycling water quality, the technological chart envisages possibility of the cycle purging with partial water disposal, which loss is under control. Purging is performed from the reverse recycling water collector to the sewerage system.

The project envisages control of:

- recycling water temperature in the cooling towers basin;

- ambient air temperature;

- water level in basins with its adjustment using a valve, mounted on the rotational water turn feed piping with softened water from the water conditioning and purification plant of the boiler-house building No.41.

Softened water, supplied from the water conditioning and purification plant of the boiler-house building No.41, is used to balance water losses, related to the cycle's purge, evaporation and water losses by way of drops. The project envisages control of the softened water consumption and its quality.

From the cooling towers basins dibhole, the chilled water goes to the distribution suction collector of centrifugal pumps with efficiency 400 m^3/hour each. The pumps number is defined considering rotational water turn operation conditions with maximum loads (2 - operating; 1 - stand-by). Pumps pressure pipelines provide for return valves and direct recycling water pressure control. The project envisages frequency adjustment of pumps load and stand-by pump startup in case the operating one stops.

Direct recycling water from the pumps pressure is coming to the water distribution collector, from which it is distributed into two pipelines. In these pipelines the project envisages water temperature, pressure and quality control. At the inter-workshops communications outlet, the pipelines gather into a collector and direct recycling water, consumption and pH number of which are being controlled, is delivered to the extraction workshop building No.25.

The project envisages remote alarm of all electric equipment state: cooling towers fans and centrifugal pumps on the control panel. Operation of the rotational water turn cycle is controlled by required control and measuring gauges remotely from the control room or on site.

Engineering assurance

Designed utility connection laying is scheduled to be underground (water supply system, drainage, domestic and production sewerage system) and surface (process pipelines and electrical networks) along contemplated overpasses.

Water supply and sewerage

Water supply external networks.

Water supply of the contemplated enterprise is made from two current bore holes with 18 m^3/hour discharge each. From the bore holes, water is delivered to the purification plant using reverse osmosis. This plant is located in the boiler-house premises. After purification, prepared water is coming to the household and industrial consumers.

A pump plant is installed to the water conditioning and purification premises as a water supply station, which maintains required pressure and consumption at the enterprise's water supply network.

Water consumption for economic and potable and process requirements of water supply constitutes:

- economic and potable needs – 1.1 m^3/h; - 2.75 m^3/day.

- process requirements – 8.91 m³/h; - 213.84 m³/day.

Outside fire fighting is performed from the designed circular network of fire fighting water supply with 160 mm diameter plastic pipes, on which outside fire fighting hydrants are installed and inside fore fighting inlets are connected.

Minimum fire extinguishing water storage is kept in two tanks with total volume 4900 cub. m. Estimated time of fire extinguishing water storage renewal in the tanks - 15 days. Total water reserve in the tanks constitute 510 cub.m.

There is a fore fighting station provided as a water feeder of the outside and inside fire fighting, it has installed four buried pumps "Grundfos" (two main, two stand-by), located in the tanks. Each pump output is 230 m³/hour, pressure - 55 m.

Water consumption for the outside fire fighting constitutes 40 l/s;

*Internal water supply systems***.**

The project envisages a cold water dead-end supply system and circulation hot water system.

System's pipelines - are metal-reinforced plastic pipes PEX-AL-PEX and steel galvanized tubes. Pipelines laying is buried behind a counter ceiling and in the service premises partitions design, and is opened in the production premises constructions.

Operating temperature in the hot water supply system is not more than 90^0C. Isolation valves are mounted on instruments connectors. All inside pipelines are covered with thermal insulation made of polyethylene foam with б=9 mm thickness.

Hot water supply for economic and potable and process requirements is ensured due to installation of individual electric water heaters in each construction.

*Sewerage system external networks***.**

As per the customer's engineering specifications, waste waters in the scope: economic and utility sewage wastes –2.75 m³/day; process sewage wastes –214.08 m³/day; rainfall run-off – 340 m³/day, through a sewerage system network are drained to the waste treatment facilities of the Globyne meat-packing plant.

Economic and utility sewage wastes piping out is envisaged by gravitation to the pumping plants, and from the pumping plants along pressure manifolds to the take-over point to the forcing external areal network.

External sewerage networks are designed to be made from polypropylene and polyethylene pipes as per GOST 22689.2-89 with 50-250 mm diameter. Sewerage wells are performed from assembled ferroconcrete elements as per T.P. 902.04-22.84.

Rainfall run-off piping out from the construction area and from the solid road surface are collected along the rainwater catchments to the collectors with diameters from 200 mm to 400 mm and are piped out by gravitation to the storm rain collectors. Before drainage to the tank, waste waters are undergoing preliminary purification from mechanical admixtures and oil products in the sand trap and oil trap. From the tank rainfall run-off are gravitated to the sewerage system pumping plant, using which, along pressure manifolds, are pumped to the external areal collector.

Networks of storm drainage are designed from polyethylene and polyethylene pipes according to GOST 22689.2-89. Surface inlets are installed to the standard design T.P. 902-09-46.88.
All buildings of the enterprise are equipped with external corresponding drainage systems of storm water drainage. The systems are made of steel pipes 100 mm in diameter. Storm water is discharged to the blind area.

Domestic sewerage system.

In order to remove household and industrial waste in the premises of the buildings gravity sewerage systems are provided. The systems consist of pipelines 50-200 mm in diameters, which are laid in the floor construction and constructions of walls and partitions. Waste water discharged by gravity to the outdoor household sewage system 150 - 200 mm in diameter.

Networks of domestic sewerage systems are designed from polyethylene pipes according to GOST 22689.2-89. All pipes are laid with a bias towards the outlet.

Heat supply system.

The source of the heat supply of the enterprise is steam boiler station which is designed. The boiler station is located in a separate building.
In order to provide heat to heating systems and ventilation heating of the enterprise steam water heat point is provided.
As heat carriers the following was accepted:
- water design temperature of 90-70^0 C (for heating system and heating). Quality control of the heating system.
- water temperature of 60^0 C (for domestic hot water supply system).

Gas supply system.

Gas supply to the boiler station is conducted from designed gas pipeline of medium pressure 0.3 kgf/cm^2. Specifications issued for OJSC of gas supply and gasification “Poltavagas” as of 17.06.10 #5897/14.

Heating.

Industrial premises of stock-preparation workshops are heated with the help of hot air heating combined with a general exchange input system of ventilation. Installation of the regular heating system is also provided. As for the devices of the regular heating system in order to maintain the internal temperature of at least +5^{0}C hot-air heaters UGV (Juwent) are used. Aluminium radiators JET (Ragaini) are installed in serving spaces and a control room.

Industrial premises of extraction workshop are heated via heat emission from technological equipment and with the help of air heating combined with a general exchange input system of ventilation. Installation of the regular heating system is also provided. As for the devices of the regular heating system in order to maintain the internal temperature of at least +5^{0}C hot-air heaters UGV (Juwent) are used, explosion-proof design. Aluminium radiators JET (Ragaini) are installed in serving spaces and a control room.

As a regular heating system in the pump of oil daily tank the installation of electric wall-hung convectors Atlantic is provided.

The heating system of industrial laboratory is two-pipe with forced circulation of the heat carrier. Aluminium radiators JET (Ragaini) are used as heating units.

The heating system is designed from plastic pipes laid in the construction of walls and partitions. All pipes are covered with thermal insulation from polyethylene foam of 13 mm in thickness.

In the boiler station the heating system is provided for maintaining a temperature of 12^0C in the cold season, hydronic heating system via tidal unit heater is provided.

Ventilation.

In the building of the stock-preparation workshop the general exhaust ventilation with mechanical activation is provided for the 3-fold air exchange and air makeup with is removed by technological suction units. Main health hazards are heat excess from electric motors and the dust which technological aspirations failed to collect. Removal of air by general ventilation system is conducted from the upper zone with the help of roof fans. Intake air is delivered into the middle zone, for this purpose air handling units MC (ACM) are installed on three levels. In the warm season the intake air is cooled down to the specified temperature of + 28^0C, and in the cold period of the year the intake air is heated up to 10^0C. In the building a smoke exhaust system is provided. For this purpose smoke exhaust roof ventilators UKRV are installed, and on the walls, at around +12.000 wall mounted smoke exhaust fans FTDB are installed. Operating temperature of smoke exhaust fans is 600^0C.

In the building of the stock-preparation workshop the general exhaust ventilation with mechanical activation is provided for the 6-fold air exchange and air makeup with is removed by technological suction units. Main health hazards are heat excess from electric motors and vapors of hexane which technological aspirations failed to collect. Since vapors of hexane are heavier than air, the 2/3 of exhaust air is removed by general ventilation system from the lower zone, and 1/3 of exhaust air is removed from the upper zone with the help of roof fans. Intake air is delivered into the middle zone, for this purpose air handling units MC (ACM) with reserve fans are installed on the ground floor. In the warm season the intake air is cooled down to the specified temperature of + 28^0C, and in the cold period of the year the intake air is heated up to 10^0C. All ventilation equipment of the workshop is in explosion-proof design.

Main health hazards of the pump building of oil daily tanks are heat excess from electric motors. Standard air exchange is provided due to installation of natural ventilation. For this purpose on the top of a building extractor ventilator is installed, and on the doors supply grille is mounted.

In the premises of industrial laboratory combined extract-and-input system of ventilation with mechanical activation is installed. In order to provide standard air exchange and air makeup which are removed by technological local exhausts, behind the building of the laboratory installation of air handling unit MC (ACM) is provided. The unit is mounted on a separate base. Exhaust fans of the general ventilation systems and local exhausts are placed behind the suspended ceiling of the building. Fans are in explosion-proof design. In bathroom units a separate exhaust ventilation system is installed with the installation of tube axial fans behind the suspended ceiling. Distribution ducts are laid behind the suspended ceiling of the halls and connected to the distributors mounted into the suspended ceiling of the premises. When crossing the frame fillings of the A-category premises, back valves of explosion-proof design are installed and when crossing the frame fillings of the B-category premises fire dumpers are installed.
In order to provide the specified temperature in the summer season the intake air is cooled due to freon coolant of air handling unit and compressor condensing unit. In work rooms of the laboratory air conditioning systems are provided.

In the boiler room a supply and exhaust ventilation with natural activation is provided which is designed to compensate for heat emissions from equipment of the boiler room. The intake is conducted through the bars situated in the upper part of the boiler room. The exhaust is conducted through the deflector installed on the roof of the boiler room.

Relief. Ground leveling

The relief of the territory is flat with a slight slope to the north, north-easterly direction. The surface is graded with filled soil with a capacity of 0.3 -2.7 m. Placing fills for the area is conducted without engineering training on the top soil. Absolute marks of the surface vary from 94,7 to 96,80 m.

Soil humus is absent, therefore recultivation of agricultural lands is not provided by the project.

Ground leveling of the site is designed in accordance with the existing area relief, design elevations of existing buildings, structures and the diagram of internal and external motor passages. According to a general high-altitude relief solution of the whole territory, disposing of melt and rain water is conducted throughout the superficial method according to the planned surfaces from buildings, structures to the roads with subsequent release to the planned storm drainage and to treatment facilities in the southern part of the site.

General improvement and landscaping

The project provides for seeding undeveloped area with lawn grasses. Before landscaping soil humus is added: for lawns - 10 cm.

Two entrances as well as railway sidings are planned on the territory (designed by a specialized engineering company under a separate contract). Sidewalks and playgrounds near office buildings are designed from paving flags.

Territory cleanup is performed by workers of the complex. In a summer season watering of the territory is conducted with the help of watering taps. In winter, the passages and driveways are cleaned from snow and ice during the glaze storm – covered with sand. On the territory of the complex there are areas for quick breaks with installation of benches for rest and litter boxes.

1. **Waste of seed cleaning for production of soybean oil -waste code- 1541.2.9.05- production waste of food products and drinks (group 15)**

Plant waste from cleaning equipment of stock-preparation workshop (building #25) is accumulated in the refuse bin (building #29). From the refuse bin waste of plant origin, if necessary, unloaded into motor transport and sent to composting in order to use as organic fertilizer (under the contract with corresponding organization).

The amount of waste from cleaning equipment of stock-preparation workshop is 1115,1 t/ year (data of the company "Europa Crown").

2. Waste from washing and cleaning - waste code - 1542.2.6 - production waste of food products and drinks (group 15)

Flows from press room and areas of oil hydration of stock-preparation workshop for grease removal and barometric tank are delivered through sewerage network to the waste treatment facilities of Globynskyi meat packing plant.

The fat content in the waste water is 15 mg/m^3. Amount of purified water is 161,04 m^3/day 50727,6 m^3/year.

3. Waste from the operation of equipment for wastewater treatment, are not marked in another way - a mixture of lubricating substances and petroleum oils obtained from oil extraction from waste water -waste code - 9030.2.9.03, group 90

Waste water with traces of hexane from the equipment and ladder of extraction workshop comes to segregation into a gasoline interceptor (building #27.2). Isolated, due to the density difference, hexane from a separate part flows into the "dry" part of gasoline interceptor. From the "dry" part of the gasoline interceptor hexane with the help of a pump flows into the deep tank of miscella. Segregated water from the bottom of the gasoline interceptor by gravity drained through inspection well to the sewerage network.

The inspection well provides the analytical control of wastewater for contamination with oil and hexane. Composition of contamination:

- hexane – up to 10 ppm;
- suspended substances – up to 20 ppm;
- COD - 1000÷2000 ppm;
- BOD - 500÷1000 ppm;
- pH -6,8÷7,0 units.

The amount of discharged water is 52,8 m^3/day, 16 632 m^3/year (data of the company "Europa Crown").

Condensate of moisture from oil separator in the compressor room of stock-preparation workshop, the building #25.
Composition of contamination: water with traces of oil - up to 15 mg/m^3.
Amount of discharged water is 0,22 m^3/day, 69,3 m^3/year.

The total amount of waste, according to the specifications provided by the Customer, delivered via the sewerage network to the waste treatment facilities of Globynskyi meat packing plant is 16 632+69,3 = 16 701,3 m^3/year.

4. Cleaning materials which are damaged, used or contaminated - waste code -7730.3.1.06 - waste of packaging materials, adsorbents, cleaning and filter materials (group 77)

Rag is used as a cleaning material. The rate of waste rags for one worker – 0,02 t/year / ВНТП 09-92, Kyiv, to ОНТП 08-87, Moscow/. When the number of workers for maintenance of technological equipment - 88 people,

П rags = 1,76 t/year

5. Fluorescent lamps - waste code -7710.3.1.26 - waste products formed during their maintenance (group 77)

The number of waste fluorescent lamps used at the enterprise is 369 pcs. (according to the design data of the part “EO”).

6. Waste stabilized or solidified with the help of binding organic material – oily sand – waste code - 9010.2.3.02 – secondary waste from rendering services for collection, disposal and treatment of waste (group 90)

The sand is used for filling areas of spilled oil products by accident on the territory of the enterprise. Amount of the sand depends on random events and not stable, roughly estimated as 0,5 t/year. Oily sand is collected in a metal box with a lid tightly closed and stored on the territory of the area.

П oiled sand = 0,5 t/year.

7. Municipal waste (city) mixed, including garbage from bins (solid municipal waste) - waste code- 7720.3.1.01 - Waste from activities of institutions (group 77)

According to "Standards of municipal solid waste formation in the settlements of Ukraine", approved by the Ministry of Construction, Architecture and Housing and Communal Services of Ukraine as of 10.01.06 # 7, rate of solid domestic waste generation for administrative and public organizations - 75 kg/year per 1 workplace.

When the number of workplaces is 111 (13 of them - the staff of boiler room), amount of solid domestic waste is:

$П_{SDW}$ = 75 x 111/1000 = 8,325 t/year.

According to the Construction Norms and Rules 2.07.01-89 "Urban Planning. Planning and development of urban and rural settlements" standard of generated waste which is formed during the clean-up of the territory is 5 kg/m^2 per year. The area of the territory subject to cleaning is- 7900 m^2 (area of sidewalk coverage).

$П_{SDW}$ = 5 x 7900/1000 = 39,5 t/year.

Total amount of SDW formed during cleaning up of the territory is 47,825 t/year.

Solid domestic waste is collected in special containers on the site, and if necessary, removed to the places agreed under the agreement with City Municipal Services.

8. Oil and motor oil, spoiled or used – waste code - 6000.2.8.10- Waste connected with transport services (group 60)

Used technical oil which is separated in oil separator in the compressor room of stock-preparation workshop, the building # 25.

The amount of used oil is 0,0078 t/year. Oil is collected in a mobile container and transported for disposal to organization which has a corresponding contract with the Customer.

Possible waste and its approximate amount for a year are indicated in the in table below.

#	Waste code	Amount	Waste title	Hazard class	Treatment
1	1541.2.9.05	1115,1 t/year	Waste of seed cleaning for production of oil	3	Directed for composting for possibility to use as organic fertilizer
2	1542.2.6	50727,6 m^3/year	Waste from washing and cleaning (grease removal tank)	3	Through sewerage network to treatment facilities
3	9030.2.9.03	16 701,3 m^3/year	Waste from the operation of equipment for wastewater treatment, are not marked in another way (collected oil products)	3	Through sewerage network to treatment facilities
4	7730.3.1.06	1,76 t/year	Cleaning materials which are damaged, used or contaminated-waste code (waste of packaging materials, adsorbents, cleaning and filter materials)	3	Removal to the landfill
5	7710.3.1.26	369 psc.	Fluorescent lamps	1	Removal under the contract
6	9010.2.3.02	0,5 t/year	Waste stabilized or solidified with the help of binding organic material (oily sand)	3	Removal under the contract
7	7720.3.1.01	47,825 t/year	Municipal waste (city) mixed, including garbage from bins (solid municipal waste)	4	Removal to the landfill
8	6000.2.8.10	0,0078 t/year	Oil and motor oil, spoiled or used	3	Removal under the contract

Waste of 1 hazard class - used fluorescent lamps which are unbroken, not damaged, have no influence on the environment. Toxic effect on the human body and the air is possible only when used lamps are damaged.

Waste of 2 hazard class – absent.

Waste of 3 hazard class, which is in solid state, is quite stable compounds and in contact with soil or landfill does not decompose, the effect is absent.

Waste of 4 hazard class have no effect on the environment.

Settled dust as a result of technological operations is swept away and collected in special containers and must be removed.

To avoid soil contamination according to the project and technology of the production, the company is equipped with containers for collection of oily rags and daily waste, which are subject to further recycling by garbage trucks, special places to store used fluorescent lamps.

6. The main indicators of types of permanent influence on the environment.

When assessing the influence on the environment during operation of the designed complex the following impacts are involved:

- on atmospheric air;
- on water resources;
- land resources;
- anthropogenic environment;
- social environment;
- plant and animal life;
- acoustic influence.

Only those components and compartments of the environment are considered, which are affected by planned activities, as well as those, which present state do not meet the standard. Among the factors affecting the environment one must consider spatial, energy, chemical, physical, and others.

According to the Annex E ДБН А.2.2-1-2003 "The composition and content of the materials of environmental impact assessment during the design of the construction of enterprises, buildings and structures" conducting reloading works do not refer to objects which pose a high environmental hazard.

6.1. Influence on atmospheric air

To assess the impact of the object during its functioning the following was determined:

- technological procedures of pollution agents formation;
- the sources of harmful substances emissions into the atmosphere;
- estimated composition and volume (g/sec, t/year) of substances emitted into the atmosphere;
- calculation of the ground-level concentrations from emissions sources including background concentrations;
- performed analysis of atmospheric air condition.

Sources of atmospheric air pollution of designed soya processing complex are: technological equipment of production workshops, laboratory, boiler equipment, internal combustion engine of a vehicle. 39 sources of pollutants emission are expected on the designed project, four of which are fugitive. Annual emissions of pollutants amount to 263,68 t/year.

The total amount of emitted greenhouse gases (carbon dioxide, dinitrogen oxide, methane) is 33059,55 t/year.

According to the sanitary classification of enterprises and their sanitary protection zones “State Sanitary Regulations # 173 of 19.06.1996” the distance from plant products processing plants, including seeds of grains and oil plants is 100 m.

6.1.1. Reasons of pollutant emissions

During production of plant oil the dust of soya`s seeds are emitted (pollutant code – 11525), the dust of soya`s solvent cake (pollutant code – 11526), grain dust (pollutant code – 10417).

All types of dust belong to suspended substances (pollutant code – 2902).

Stock-preparation workshop, the building 25.

Source No.1 – Air emission from ventilator's pipe.

Parameters of the emission source: H =34,65 m; D =1,0 m, L =10 m^3/sec, T = 40^0C

*Position of the source No.1***:** *x = 49; y =60*

Polluting agents (hereafter pollutants - substances in the form of suspended solids of undifferentiated composition) are formed during drying of granulated solvent cake in the granule cooler.

According to the company "Europa Crown" dust concentration at the outlet of the aspiration system of the granule cooler is c = 100 mg/m^3.

Performance of the aspiration system is Q_{acn} = 36 000 m^3/year;

Annual emission of the pollutants is calculated according to the formula:

$Ep = (Q_{acn} * c * 7560 * 10^{-9}) * (1 - 0,95)$, t/year;

where, 0,95 - degree of purification of the cyclone.

7560 - time of device operation, h/year.

10^{-9}- conversion coefficient from *mg* into *tonnes*.

$Ep = (36\ 000 * 100 * 7\ 560 * 10^{-9}) * (1 - 0,95) = 1,36$ t/year;

Pollutants` emissions in *g/s* are calculated by the formula:

$Ec = (Q_{acn} * c * 10^{-3}) * (1 - 0,95)/3600$ g/s;

where, **10^{-3} -** conversion coefficient from *mg* into *g;*

3600 -conversion coefficient from *year* into *s;*

$Ec = (36\ 000 * 100 * 10^{-3}) * (1 - 0,95)/3600 = 0,05$ g/s;

Source No.2 – Air emission from ventilator's pipe.

Parameters of the emission source: H =34,65 m; D =0,5 m, L =3,05 m^3/sec, T = 20^0C

*Position of the source No.2***:** *x = 45; y =65*

Polluting agents (substances in the form of suspended solids of undifferentiated composition) are formed during drying of granulated cover in the granule cooler.

According to the company "Europa Crown" dust concentration at the outlet of the aspiration system of the granule cooler is c = 100 mg/m^3.

Performance of the aspiration system is Q_{acn} = 10 980 m^3/year;

Annual emission of the pollutants is calculated according to the formula:

$Ep = (Q_{acn} * c * 7\ 560 * 10^{-9}) * (1 - 0,95)$, t/year;

where, 0,95 - degree of purification of the cyclone.

7560 - time of device operation, h/year.
10^{-9}- conversion coefficient from *mg* into *tonnes*.

Ep ***=(10 980 * 100 * 7 560 * 1 0 $^{-9}$)* (1 -0,95) = 0,415 t/year;***

Pollutants` emissions in *g/s* are calculated by the formula:

Ec = (Q_{acn}* c * 10^{-3}) * (1 -0,95)/3600 g/s;

where, 10^{-3} - conversion coefficient from *mg* into *g;*

3600 -conversion coefficient from *year* into *s;*
Ec =(10 980 *100*10^{-3})* (1 -0,95)/3600=0,015 g/s;

Source No.3 – Air emission from ventilator's pipe.

Parameters of the emission source: H =34,65 m; D =1,0 m; L =9,44 m^3/sec, T = 20^0C

*Position of the source No.3***:** *x = 55; y =75*

Polluting agents (substances in the form of suspended solids of undifferentiated composition) are formed during breaking of the cover.

According to the company "Europa Crown" dust concentration at the outlet of the aspiration system of the granule cooler is c = 50 mg/m^3.

Performance of the aspiration system is 34 000 m^3/year.

Degree of filter cleaning of aspiration system = 0,95.

Calculation of pollutants emission is analogous to the source No.1:
Ep = (34 000 * 50 * 7 560 * 10^{-}9)* (1 -0,95) = 0,643 t/year;
Ec = (34 000 *50*10^{-3})* (1 -0,95)/3600=0,024 g/s;

Source No.4 – Air emission from ventilator's pipe.

Parameters of the emission source: H =34,65 m; D =1,0 m; L =9,44 m^3/sec, T = 20^0C

*Position of the source No.4***:** *x = 55; y =68*

Polluting agents (substances in the form of suspended solids of undifferentiated composition) are formed during breaking of the solvent cake.

According to the company "Europa Crown" dust concentration at the outlet of the aspiration system of the granule cooler is c = 50 mg/m^3.

Performance of the aspiration system is 34 000 m^3/year.

Degree of filter cleaning of aspiration system = 0,95.

Calculation of pollutants emission is analogous to the source No.1:
Ep = (34 000 * 50 * 7 560 * 10^{-}9)* (1 -0,95) = 0,643 t/year;
Ec = (34 000 *50*10^{-3})* (1 -0,95)/3600=0,024 g/s;

Source No.5 – Air emission from ventilator's pipe.

Parameters of the emission source: H =34,65 m; D =0,8 m; L =6,62 m^3/sec, T = 20^0C

*Position of the source No.5***:** *x = 58; y =78*

Polluting agents (substances in the form of suspended solids of undifferentiated composition) are formed during aspiration of stock-preparation division.

According to the company "Europa Crown" dust concentration at the outlet of the aspiration system of the granule cooler is c = 50 mg/m^3.

Performance of the aspiration system is 23 820 m^3/year.

Degree of filter cleaning of aspiration system = 0,95.

Calculation of pollutants emission is analogous to the source No.1:
Ep =(23 820 * 50 * 7 560 * 10^{-9})* (1 -0,95) = 0,45 t/year;
Ec =(23 820 *50*10^{-3})* (1 -0,95)/3600=0,0165 g/s;

Source No.6 – Air emission from ventilator's pipe.

Parameters of the emission source: H =34,65 m; D =0,6 m; L =3,55 m^3/sec, T = 20^0C

*Position of the source No.6***:** *x = 55; y =77*

Polluting agents (substances in the form of suspended solids of undifferentiated composition) are formed during aspiration of the conditioner.

According to the company "Europa Crown" dust concentration at the outlet of the aspiration of the conditioner is c = 75 mg/m^3.

Performance of the aspiration system is 12 780 m^3/year.

Degree of filter cleaning of aspiration system = 0,95.

Calculation of pollutants emission is analogous to the source No.1:
Ep =(12 7800 *75 * 7 560 * 10^{-9})* (1 -0,95) = 0,36 t/year;
Ec =(12 780 *75*10^{-3})* (1 -0,95)/3600=0,013 g/s;

Source No.7 – Air emission from ventilator's pipe.

Parameters of the emission source: H =34,65 m; D =0,45 m; L =1,97 m^3/sec, T = 20^0C

*Position of the source No.6***:** *x = 51; y =76*

Polluting agents (substances in the form of suspended solids of undifferentiated composition) are formed during aspiration of bins, elevators and conveyors.

According to the "Collected articles of emissions` indicators (specific discharge) of pollutants into the atmospheric air by different industries" "Ukrainian Scientific Center of Technical Ecology, the city of Donetsk, 2004 [v.II, table. X-97], the specific emissions of harmful substances into equipment environment which is aspirated are:

Average specific emission – 0,311 g/m^3;

Performance of the aspiration system is Q_{acn} = 7100 m^3/year;

Degree of purification of the cyclone = 0,95.

Annual emission of pollutants is calculated by the formula:
Ep = (7 100 * 0,311 * 7 560 * 10^{-6})* (1 -0,95) = 0,83 t/year;

Pollutants` emissions in *g/s* are calculated by the formula:

Ec =(7 100 *0,311)* (1 -0,95)/3600=0,031 g/s;
Source No. 8. Air emission during the loading of the garbage to the vehicle. Fugitive

Parameters of the emission source: H =4 m; D =0,3 m; L =0,294 m^3/sec, T = 20^0C

*Position of the source No.8***:** *x = 75; y =80*

Polluting agents (substances in the form of suspended solids of undifferentiated composition) are formed during the loading of the garbage to the vehicle.

The calculation is conducted according to the "Collection of methods of calculation of pollutants` content in the emissions from fugitive sources of air pollution, OJSC "UkrNTEK, the city of Donetsk, 1994"
Emissions during the loading of the garbage to the vehicle are calculated by the formula:

$$\Pi = \left(\frac{K_1 x K_2 x K_3 x K_4 x K_5 x K_7 x G x B}{3600} x 10^6 \right)$$

Where,

K_1 – weight percent of the dust fraction in the material [table 4.3.1, page 95], $K_1 = 0,03$;

K_2 – part of the dust which passes into the aerosol [table 4.3.1, page 95], $K_2 = 0,02$;

B – coefficient which includes the height of filling the material [table 4.3.7, page 97], $B = 0,4$;

G – amount of garbage, 1115,1 t/year;

K_3 – coefficient which includes local meteorological conditions of material storage [table 4.3.2, page 96], $K_3 = 1,0$;

K_4 - coefficient which includes protection level of loading node from external influence [table 4.3.3, page 96], $K_4 = 1,0$;

K_5 - coefficient which includes material moisture [table 4.3.4, page 96], $K_5 = 0,01$;

K_7 - coefficient which includes material size [table 4.3.5, page 96], $K_7 = 0,6$;

10^6 - conversion coefficient from *tonnes* into *g*.

We assume that the loading is conducted to a 5-ton vehicle, load time - 1 hour. Then, the emission is:
Π sec = 0,03 x 0,02 x 1,0 x 1,0 x 0,01 x 0,6 x 5 x 0,4 x 106 / 3600 = 0,002 g/sec
Π year = 0,03 x 0,02 x 1,0 x 1,0 x 0,01 x 0,6 x1115,1 x 0,4 = 0,0016 t/year

Extraction workshop, the building #27.

Source No.9 – Air emission from ventilator's pipe.

Parameters of the emission source: H =22,12 m; D =0,1 m; L =0,0225 m^3/sec, T = 20^0C

*Position of the source No.9***:** *x = 15; y = 115*

Pollutants` emission is conducted from the system of absorption and desorption solvent, after cleaning of hexane fumes by oil absorption, the air is discharged by the ventilator into the atmosphere. The air contains vapours of mineral oil, besides traces of hexane.

In similar enterprises the losses of oil absorption from the system of absorption and desorption are Vm = 0,1 m^3/month.

Losses of hexane from solvent recuperation system at the stage of absorption and desorption are: Ep = 81* (0,2*1,15/100)*3,84 *7560 /1000 =5,4 t/year

where, 81 (data of the company Europa Crown") – capacity of the ventilator, m^3/year;

0,2 (data of the company Europa Crown") – hexane content in the release of the ventilator from the system of solvent recuperation at the stage of absorption and desorption in parts of the lower concentration limit of flame occurrence (LCLF);

1,15 - LCLF of hexane % rev.;

3,84 – density of hexane vapour, kg/m^3;

Ec= 81 * (0,2*1,15/100)*3,84 *10^3/3600 = 0,199 g/s

Annual emission of the mineral oil:

Vm * 865 * 10,5* 10^{-3} = 0,1 * 865 * 10,5 *10^{-3} = 0,908 t/year

where, Vm – oil loss from the clarification system, m^3/month;

865 – density of absorption oil, kg/m^3;

10,5 – annual production time, months;

10^{-3} - conversion coefficient from *kg* into *tones*.

Emission of the mineral oil:

0,1 * 865 * 10^3 / (30 * 24 * 3 600) = 0,03337 g/s

where, 10^3 - conversion coefficient from *kg* into *g;*

3600 - conversion coefficient from *hours* into *s.*

30*24 – average duration of the month in hours.

Source No.10 – Discharge of air from the ventilator's pipe of general ventilation of extraction workshop.

Parameters of the emission source: H =22,12 m; D =0,63 m; L =6,389 m^3/sec, T = 20^0C

*Position of the source No.10***:** *x = 10; y =110*

Total losses of hexane consist of:

- losses with solvent cake, Xsolv., 250 ppm or 0,025% wt.;

- losses with extraction oil Xoil, 75 ppm or 0,0075% wt.;

- losses from solvent recuperation system at absorption and desorption stage, Xabs.;

- losses from the system of solvent cake drying and cooling in the toaster, Xtoas.;

- losses with flows, Xflow., 10 ppm or 0,001% wt.;

- losses from leaky equipment, Xleak.;

Hexane losses with solvent cake are:

Xsolv.=507,68 * (0,025 / 100) = 0,12692 t/day

where, 507,68 – amount of solvent cake, t/day

0,025/100 – weight percent of hexane in a solvent cake.

Losses with extraction oil are:

Xoil =122,82 * (0,0075/100) = 0,009212 t/day

where, 122,82 – amount of extraction oil, t/day;

0,0075/100 - weight percent of hexane in the extraction oil;

Losses from solvent recuperation system at absorption and desorption stage are:

Xabs.= 81 * (0,2*1,15/100)*3,84 * 24/1000 = 0,017169 t/day

where, 81 (data of the company “Europa Crown") – capacity of the ventilator, m^3/hour;

0,2 (data of the company “Europa Crown") - hexane content in the release of the ventilator from the system of solvent recuperation at the stage of absorption and desorption in parts of the lower concentration limit of flame occurrence (LCLF);

1,15 – LCLF of hexane % rev..;

3,84 – density of hexane vapour, kg/m^3

Losses from the system of solvent cake drying and cooling in the toaster are:

Xtoast. = 25 200 * (0,007/100)*1,293 * 24/1000 = 0,054741 т/day

where, 25 200 (data of the company Europa Crown”) – capacity of the ventilator, m^3/year;

0,007/100 (data of the company Europa Crown”) - weight percent of hexane in the air

released from the system of solvent cake drying and cooling in a toaster;

1,293 – air density, kg/m^3

Losses of hexane with flows are:

Xflow. = 2,2 * (0,001/100) * 24 = 0,000528 t/day

where, 2,2 (data of the company “Europa Crown”) – amount of flows, t/hour;

0,001/100 (according to the data of “Europa Crown”- 10 ppm) - weight percent of hexane in flows;

Then, losses of hexane from leaky equipment are:

Xleak.= Xgen. - Xsolv. - Xoil - Xabs. - Xtoas. - Xflow. = 0,392 - 0,12692 - 0,009212 - 0,017169 - 0,054741 - 0,000528 = 0,18343 t/day or 0,18343*315 = 57,78 t/year

where, 315- production time, days;

$$0{,}18343 * 10^6/(24*3600) = 2{,}12 \text{ g/s}$$

Source No.11. Air discharge from the pipe of the toaster cyclones

Parameters of the emission source: H =22,12 m; D =0,8 m; L =7 m^3/sec, T = 20^0C

*Position of the source No.11***:** *x = 35; y =130*

Polluting agents (substances in the form of suspended solids of undifferentiated composition, hexane) are formed during solvent cake drying in the toaster.

According to the data of “Europa Crown” losses of pollutants at the outlet of the aspiration system of the toaster are c = 100 mg/m^3.

- hexane, 70 ppm or 0,007% wt.;
- substances in the form of suspended solids of undifferentiated composition, 50 ppm or 0,005% wt.;

Performance of the aspiration system is Q_{acn} = 25 200 m^3/year;

Hexane:

Ep =(25 200 *1,298 * 0,007/100 * 7 560 * 10^{-3})* (1 -0,95) = 0,865 t/year;

Ec =(25 200 *1,298 * 0,007/100 * 10^3)* (1 -0,95)/3600=0,032 g/s;

Substances in the form of suspended solids of undifferentiated composition:

$$Ep =(25\ 200 *1,298 * 0,005/100 * 7\ 560 * 10^{-3})* (1 -0,95) = 0,618\ t/year;$$

$$Ec =(25\ 200 *1,298 * 0,005/100 * 10^{3})* (1 -0,95)/3600=0,023\ g/s;$$

where, 1,298 – air density, kg/m^3;
0,95 - degree of purification of the cyclone;
7560 – annual production time, hours

Production laboratory. The building No.40
Source No.12. Air emission from the exhaust hood of the laboratory No.1

Parameters of the emission source: H =15,5 m; D =0,2 m; L =0,097 m^3/sec, T = 20^0C

*Position of the source No.12***:** *x =-49; y =110*

Emission of polluting agents is conducted during operation of the exhaust hood.

Period of operation of the exhaust hood is 300 h/year
According to the "Collected articles of emissions` indicators (specific discharge) of pollutants into the atmospheric air by different industries" "Ukrainian Scientific Center of Technical Ecology, the city of Donetsk, 2004 [v.II, table. X-97], the specific emissions of harmful substances into the atmosphere from the exhaust hood of the laboratory are:

Sulfuric acid (pollutant code - 322)
$\Pi_{sec} = 1,39 \mathbf{x} 10^{-6}$ g/sec
$\Pi_{year} = 1,39 \mathbf{x} 10^{-6} \mathbf{x} 300 \mathbf{x} 3600 \mathbf{x} 10^{-6} = 1,5 \mathbf{x} 10^{-6}$ t/year;
Sodium hydroxide (pollutant code – 150)
$\Pi_{sec} = 1,94 \text{ x } 10^{-6}$ g/sec
$\Pi_{year} = 1,94 \mathbf{x} 10^{-6} \mathbf{x} 300 \mathbf{x} 3600 \mathbf{x} 10^{-6} = 2,1 \mathbf{x} 10^{-6}$ t/year
Ammonia (pollutant code – 303)
$\Pi_{sec} = 4,44 \text{x} 10^{-4}$ g/sec
$\Pi_{year} = 4,44 \mathbf{x} 10^{-4} \mathbf{x} 300 \mathbf{x} 3600 \mathbf{x} 10^{-6} = 0,0005$ t/year
Ethyl alcohol (pollutant code – 1061)
$\Pi_{sec} = 1,76 \text{ x} 10^{-4}$ g/sec
$\Pi_{year} = 1,76 \mathbf{x} 10^{-4} \mathbf{x} 300 \mathbf{x} 3600 \mathbf{x} 10^{-6} = 0,0002$ t/year
Hexane (pollutant code – 403)
$\Pi_{sec} = 0,0014$ g/sec
$\Pi_{year} = 0,0014 \mathbf{x} 300 \mathbf{x} 3600 \mathbf{x} 10^{-6} = 0,0015$ t/year

Source No.13. Air emission from the exhaust hood of the laboratory No.1

Parameters of the emission source: H =15,5 m; D =0,2 m; L =0,097 m^3/sec, T = 20^0C

*Position of the source No.13***:** *x =-48; y =112*

Emission of polluting agents is conducted during operation of the exhaust hood.

Period of operation of the exhaust hood is 300 h/year
According to the "Collected articles of emissions` indicators (specific discharge) of pollutants into the atmospheric air by different industries" "Ukrainian Scientific Center of Technical Ecology, the city of Donetsk, 2004 [v.II, table. X-97], the specific emissions of harmful substances into the atmosphere from the exhaust hood of the laboratory are:

Sulfuric acid (pollutant code - 322)
$\Pi_{sec} = 1,39 \mathbf{x} 10^{-6}$ g/sec
$\Pi_{year} = 1,39 \mathbf{x} 10^{-6} \mathbf{x} 300 \mathbf{x} 3600 \mathbf{x} 10^{-6} = 1,5 \mathbf{x} 10^{-6}$ t/year;
Sodium hydroxide (pollutant code – 150)
$\Pi_{sec} = 1,94 \text{ x } 10^{-6}$ g/sec

Π_{year} = 1,94 **x** 10^{-6} **x** 300 **x** 3600 **x** 10^{-6} = 2,1 **x** 10^{-6} t/year

Ammonia (pollutant code – 303)

Π_{sec} = 4,44x10^{-4} g/sec

Π_{year} = 4,44 **x** 10^{-4} **x** 300 **x** 3600 **x** 10^{-6} = 0,0005 t/year

Ethyl alcohol (pollutant code – 1061)

Π_{sec} = 1,76 x10^{-4} g/sec

Π_{year} = 1,76 **x** 10^{-4} **x** 300 **x** 3600 **x** 10^{-6} = 0,0002 t/year

Hexane (pollutant code – 403)

Π_{sec} = 0,0014 g/sec

Π_{year} = 0,0014 **x** 300 **x** 3600 **x** 10^{-6} = 0,0015 t/year

Solvent cake storage. Building17.

Emission source No. 14 – hopper deflector

Emission source parameters: H=15.5 m; D = 0.35 m; L = 0.03 m³/s, T = 20 °C

Coordinates of source No. 14: x = 20; y = 35

Source of contaminants emission – silo for cereals (item 17.1.1)

Emitted contaminants, – ***suspended particles (contaminant code-2902)***

Dust emission for silo according to "Collection of emission indicators (specific emission) of contaminants into the atmosphere by various industries," Ukrainian Scientific Center of Technical Ecology, Donetsk City, 2004 [vol.III, p.47 vol.XI-30] totals 0.009 g/s.

Number of working days when emissions from the silo are present - 315 days.

Thus, emission of suspended particles totals:

Suspended particles (contaminant code-2902)

$\Pi_{сек}$ = 0.009 g/s

$\Pi_{рік}$ = 0.009 x 3600 x 315 x 24 x 10^{-6} = 0.2449 t/year

Emission source No. 15 – hopper deflector

Emission source parameters: H=22 m; D = 0.35 m; L = 0.03 m³/s, T = 20 °C

Coordinates of source No. 15: x = 15; y = 50

Source of contaminants emission – silo for cereals (item 17.2.1)

Emitted contaminants, – ***suspended particles (contaminant code - 2902)***

Dust emission for silo according to "Collection of emission indicators (specific emission) of contaminants into the atmosphere by various industries," Ukrainian Scientific Center of Technical Ecology, Donetsk City, 2004 [vol.III, p.47 vol.XI-30] totals 0.009 g/s.

Number of working days when emissions from the silo are present - 315 days.

Thus, emission of suspended particles totals:

Suspended particles (contaminant code - 2902)

$\Pi_{сек}$ = 0.009 g/s

$\Pi_{рік}$ = 0.009 x 3600 x 315 x 24 x 10^{-6} = 0.2449 t/year

Emission source No. 16 – hopper deflector

Emission source parameters: H=22 m; D = 0.35 m; L = 0.03 m³/s, T = 20 °C

Coordinates of source No. 16: x = -10; y = 65

Source of contaminants emission – silo for cereals (item 17.3.1)

Emitted contaminants, – ***suspended particles (contaminant code-2902) (ZR-2902)***

Dust emission for silo according to "Collection of emission indicators (specific emission) of contaminants into the atmosphere by various industries," Ukrainian Scientific Center of Technical Ecology, Donetsk City, 2004 [vol.III, p.47 vol.XI-30] totals 0.009 g/s.

Number of working days when emissions from the silo are present - 315 days.

Thus, emission of suspended particles totals:

Suspended particles (contaminant code - 2902)

$\Pi_{сек}$ = 0.009 g/s

$\Pi_{рік}$ = 0.009 x 3600 x 315 x 24 x 10^{-6} = 0.2449 t/year

Emission source No. 17 – hopper deflector

Emission source parameters: H=22 m; D = 0.35 m; L = 0.03 m³/s, T = 20 °C

Coordinates of source No. 17: x = 8; y = 25

Source of contaminants emission – silo for cereals (item 17.4.1)

Emitted contaminants, – ***suspended particles (contaminant code - 2902)***

Dust emission for silo according to "Collection of emission indicators (specific emission) of contaminants into the atmosphere by various industries," Ukrainian Scientific Center of Technical Ecology, Donetsk City, 2004 [vol.III, p.47 vol.XI-30] totals 0.009 g/s.

Number of working days when emissions from the silo are present - 315 days.

Thus, emission of suspended particles totals:

Suspended particles (contaminant code - 2902)

$\Pi_{сек}$ = 0.009 g/s

$\Pi_{рік}$ = 0.009 x 3600 x 315 x 24 x 10^{-6} = 0.2449 t/year

Emission source No. 18 – hopper deflector

Emission source parameters: H=22 m; D = 0.35 m; L = 0.03 m³/s, T = 20 °C

Coordinates of source No. 18: x = -8; y = 40

Source of contaminants emission – silo for cereals (item 17.5.1)

Emitted contaminants, – ***suspended particles (contaminant code - 2902)***

Dust emission for silo according to "Collection of emission indicators (specific emission) of contaminants into the atmosphere by various industries," Ukrainian Scientific Center of Technical Ecology, Donetsk City, 2004 [vol.III, p.47 vol.XI-30] totals 0.009 g/s.

Number of working days when emissions from the silo are present - 315 days.

Thus, emission of suspended particles totals:

Suspended particles (contaminant code - 2902)

$\Pi_{сек}$ = 0.009 g/s

$\Pi_{рік}$ = 0.009 x 3600 x 315 x 24 x 10-6 = 0.2449 t/year

Emission source No. 19 – hopper deflector

Emission source parameters: H=22 m; D = 0.35 m; L = 0.03 m³/s, T = 20 °C

Coordinates of source No. 19: x =-20; y = 55

Source of contaminants emission – silo for cereals (item 17.6.1)

Emitted contaminants, – ***suspended particles (contaminant code-2902) (ZR-2902)***

Dust emission for silo according to "Collection of emission indicators (specific emission) of contaminants into the atmosphere by various industries," Ukrainian Scientific Center of Technical Ecology, Donetsk City, 2004 [vol.III, p.47 vol.XI-30] total 0.009 g/s.

Number of working days when emissions from the silo are present - 315 days.

Thus, emission of suspended particles totals:

Suspended particles (contaminant code - 2902)

$\Pi_{сек}$ = 0.009 g/s

$\Pi_{рік}$ = 0.009 x 3600 x 315 x 24 x 10^{-6} = 0.2449 t/year

Emission source No. 20 – loading of granulated husk. Uncontrolled.

Emission source parameters: H=4 m; D = 0.3 m; L = 0.294 m³/s, T = 20 °C

Coordinates of source No. 20: x =40; y = 40

Emission of contaminants (substances in the form of suspended solids particles undifferentiated by composition) occurs during loading of granulated husk to automobile transport. The estimation was performed according to "Collection of methods for estimation of contaminants content in emissions of uncontrolled air pollution sources, UkrNTEK JSC,
Donetsk City, 1994".

Estimation is similar to source number 8

We take that vehicles with loading capacity 5 ton are loaded, time of loading – 1 hour.
Quantity of granulated soy husk (according to process part) is 7 267.05 t/year
Then emission totals:
$\Pi_{сек}$ = 0.03 x 0.02 x 1.0 x 1.0 x 0.01 x 0.6 x 5 x 0.4 x 10^6 / 3600 = 0.002 g/s
$\Pi_{рік}$ = 0.03 x 0.02 x 1.0 x 1.0 x 0.01 x 0.6 x 7 267.05 x 0.4 = 0.0105 t/year

Emission source No. 21 – loading of granulated (non-granulated) solvent cake. Uncontrolled
Emission source parameters: H=4 m; D = 0.3 m; L = 0.294 m^3/s, T = 20 ^oC
Coordinates of source No. 21: x =25; y = -10

Emission of contaminants (substances in the form of suspended solids particles undifferentiated by composition) occurs during loading of granulated (non-granulated) solvent cake to the automobile transport.
We take that all granulated (non-granulated) solvent cake is loaded to vehicles with loading capacity 5 ton, time of loading – 1 hour.
Quantity of granulated soy solvent cake (according to the process part) totals 159 919.2 t/year
The estimation was performed according to "Collection of methods for estimation of contaminants content in emissions of uncontrolled air pollution sources, UkrNTEK JSC, Donetsk City, 1994".
Estimation is similar to source number 8
Then the emission totals:
$\Pi_{сек}$ = 0.03 x 0.02 x 1.0 x 1.0 x 0.01 x 0.6 x 5 x 0.4 x 10^6 / 3600 = 0.002 g/s
$\Pi_{рік}$ = 0.03 x 0.02 x 1.0 x 1.0 x 0.01 x 0.6 x 159 919.2 x 0.4 = 0.23 t/year

Automobile transport

Emission source No. 22 – uncontrolled, non-stationary

Emission source parameters: H = 2 m; Д = 0.05 m; L = 0.294 m^3/s, T = 40 ^oC
Coordinates of source No. 22: x = 25; y = 50
At the territory of the enterprise, exhaust gases are emitted from automobile transport of the raw materials supplier and the finished product consumer. Products of diesel fuel combustion are discharged into the atmosphere.

Emitted contaminants: *nitrogen dioxide (contaminant code–301), carbon monoxide (contaminant code–337), saturated hydrocarbons C_{12}-C_{19} (contaminant code–2754), sulfur dioxide (contaminant code–330), soot (contaminant code–328), benzopyrene (code ZR-703)*

Estimation of emission of harmful substances was performed according to "Collection of methods for estimation of contaminants content in emissions of uncontrolled air pollution sources, UkrNTEK JSC" (all references given during calculations below, concern this method).

KAMAZ truck (diesel) was taken as a conventional unit of the automobile transport for providing production with raw materials and transporting finished products. The calculations assumed that the car-lift truck for loading feedstuff into the automobile transport has fuel consumption characteristics similar to KAMAZ.

Loading capacity of KAMAZ is = 20 ton (with a trailer).

Simultaneously, two vehicles can stay at the territory of the enterprise:

- One is unloading raw materials to dump pit of the elevator;
- Another is unloading waste of vegetable and mineral origin or soy oil, solvent cake or soy husk.

Calculation of contaminants emissions from automobile transport is performed according to method [p.104].

Gross emission from automobile transport is calculated using the following formula:

$Xi = \kappa 1 * \kappa 2 * n * 10^6 / 3600$, g/s

where κ_1- coefficient of harmful substances emission during fuel combustion, ton/ton of fuel [item 4.3.13, p.104];

$\kappa_1 = 0.1$ for carbon monoxide;

$\kappa_1 = 0.03$ for hydrocarbons C_{12}-C_{19};

$\kappa_1 = 0.04$ for nitrogen dioxide;

$\kappa_1 = 0.0155$ for soot;

$\kappa_1 = 0.02$ for sulfur dioxide;

$\kappa_1 = 3.2*10\text{-}6$ for benzopyrene.

κ_2- fuel consumption by automobile transport ton/year [item 4.3.14, [p.104],for KAMAZ trucks (diesel)
$\kappa_2 = 0.013$ ton/year;

n – Number of simultaneously operating automobile transport units at the enterprise, units;

10^6 – conversion coefficient from g to *t*;

3600 - conversion coefficient from *hour* to *s*.

Then gross emission of harmful substances totals:

Carbon monoxide(contaminant code-337)

$X_1 = 0.1 * 0.013*2*106 / 3600 = 0.72$ g/s;

Saturated hydrocarbons C_{12}-C_{19} (contaminant code-2754)

$X_2 = 0.03 * 0.013*2*106 / 3600 = 0.217$ g/s;

Nitrogen dioxide (contaminant code-301)

$X_3 = 0.04 * 0.013*2*106 / 3600 = 0.289$ g/s;

Soot (contaminant code-328)

$X_4 = 0.0155 * 0.013*2*106 / 3600 = 0.212$ g/s;

Sulfur dioxide (contaminant code-330)

$X_5 = 0.02 * 0.013*2*106 / 3600 = 0.144$ g/s;

Benzopyrene (contaminant code-703)

$X_6 = 3.2*10^{-6} * 0.013*2*106 / 3600 = 2.3*10^{-5}$ g/s.

Annual gross emissions are estimated based on annual productivity of the enterprise and time during which a conventional automobile transport unit stays at the territory of the plant with running engine.

Duration of unloading raw materials by the automobile transport at dump pits of the grain depot.

According to the material balance (data of Corporatyvni Zernovi Systemy Private Enterprise) quantity of grain accepted by the depot totals:

Soy seeds 246 000 t/year;

Only 80% of all grain comes to the enterprise by automobile transport

Quantity of grain, which comes by automobile transport:

246 000 80 / 100 = 196 800 t/year.

Total time of staying of the automobile transport for unloading raw materials:

$$T_{total} = \frac{196800 \times T \times 2}{z \times 60} = \frac{196800 \times 4 \times 2}{20 \times 60} = 1\,312 \text{ hour/year}$$

where: T is time for driving in (out) of the territory, T = 4 min;

2 – coefficient which takes into account driving of the automobile transport in an out;

z – loading capacity of KAMAZ, z = 20 ton (with trailer);

60 – conversion coefficient from *min* to *year.*

Duration of staying of automobile transport during loading of soy husk and waste of plant and mineral origin from the treatment department to the grain depot of the Korporatyvni Zernovi Systemy private enterprise.
Annual time of loading waste to automobile transport:

$$T_{total} = \frac{(1115.1 + 13510.35) + 9864.4 \times 4 \times 2}{20 \times 60} = 163.3 \text{ hour/year}$$

where : 1 115.2 + 13 510.35 is the total volume of waste and soy husk respectively (according to the material balance of the process part section), t/year;

9846.4 is the total quantity of waste (according to data of Korporatyvni Zernovi Systemy private enterprise respectively), t/year;

Duration of staying the automobile transport during loading of soy oil and solvent cake:

50% of all soy oil and solvent cake is loaded to automobile transport.

Quantity of soy oil and solvent cake, loaded to automobile transport, totals:

(38 688.3+159 919.2)*50/100=99 303.75 t/year.

where:38 688.3+159 919.2 is the total quantity of waste and soy husk respectively (according to material balance of the process part section), t/year;

Annual time of loading automobile transport:

$$T_{total} = \frac{99303.75 \times 4 \times 2}{20 \times 60} = 662 \text{ hour/year}$$

Total time of staying of one unit of working conventional unit of automobile transport on the

territory of the enterprise: T_{total} =1 312 + 163.3 + 662 = 2 137.3 hour/year.

Then annual gross emission of harmful substances from automobile transport:

Carbon monoxide (contaminant code-337)
X1= 0.2* 0.013 * 2 137.3 = 2.778 t/year

Saturated hydrocarbons C_{12}-C_{19} (contaminant code-2754)

X2= 0.03* 0.013* 2 137.3 = 0.833 t/year;

Nitrogen dioxide (contaminant code-301) (ZR-301)

X3= 0.04* 0.013* 2 137.3 = 1.11 t/year;

Soot (contaminant code-328)

X4= 0.0155* 0.013* 2 137.3 = 0.43 t/year;

Sulfur dioxide (contaminant code-330)

X5= 0.02* 0.013*2 137.3=0.55 t/year;

Benzopyrene (contaminant code-703)

X6 = 3.2*10-6* 0.013 * 2 137.3 = 8.9*10-5 t/year.

Boiler plant, building 41.
Emission source No. 38 – smoke flue of the boiler plant.
Emission source parameters: H=30 m; D = 0.8 m; L = 3.33 м³/s, T = 130 °C
Coordinates of source No. 22: x =-40; y = 75
Source of contaminants emission – boiler furnace.

Fuel – natural gas

Density of natural gas – 0.723 kg/nm³

Hourly consumption of gas per one boiler – 1 107 nm³/hour 0.723 kg/nm³ = 800.361 kg/hour.

Annual consumption of gas per one boiler– 800.361*7560/1000 = 6050.73 t/year

Emitted harmful substances: ***carbon monoxide (contaminant code-337), nitrogen dioxide (contaminant code-301), metallic mercury (contaminant code-183)***

Emitted greenhouse gases: *carbon dioxide, dinitrogen oxide, methane* ***(contaminant code -410)***

Estimation of emission of contaminants was performed according to "Collection of emission indicators (specific emission) of contaminants into the atmosphere by various industries," volume 1, Donetsk City 2004.

$$E_j = \sum_i E_{ji} = 10^{-6} \sum_i k_{ji} * B_i * (Q^r)_i, \quad (1)$$

where E_j - gross or annual emission of *j* contaminant during burning of *i* fuel for period P, t;

k_{ji} - indicator of emission of *j* contaminant for *i* fuel, g/GJ;

B_i - consumption of *i* fuel during period P, t;

$$B_i = Q_v * \rho$$

ρ – density of natural gas under normal condition, kg/nm³, ρ = 0.723 kg/nm³

$(Q^r)_i$ – lower working energy value of *i* fuel, MJ/kg.

Volumetrical lower working energy value for natural gas – 31.8 MJ/m³,

According to GOST 5542-87, thus, mass lower working energy value totals:
$Q^r = 31.8/0.723 = 43.983$ MJ/kg

Estimation of nitrogen oxides emission:

Indicator of nitrogen oxides k_{NO_x}, g/GJ, taking into account emission reduction measures, equals to

$$k_{NO_x} = (k_{NO_x})_0 * f_н * (1-\eta_I) * (1- \eta_н * \beta)$$

where $(k_{NO_x})_0$ – indicator of nitrogen oxides emission not taking into account emission reduction measures, for units with heating capacity < 300 MW $(k_{NO_x})_0$ = 100 g/GJ [table E.8,].

$f_н$ - level of nitrogen oxides emission reduction during working at low load;

$$f_н = (Q_ф / Q_н)^z$$

As this unit's heating power corresponds to total hear consumption, level of nitrogen oxides emission reduction during working at low load equals to $f_н = 1$.

η_I – effectiveness of primary emission reduction measures;

$\eta_н$ – effectiveness of secondary emission reduction measures;

β – load ratio of the nitrogen purification unit;

As the production lacks facility for purification of flue gases from nitrogen oxides and sulfur, $\eta_I = \beta = \eta_н = 0$

$$k_{NO_x} = 100 * 1 = 100 \text{ g/GJ}$$

Nitrogen dioxide (contaminant code-301)

$\Pi_c = 10^{-6} * 100 * 43.983 * 800.361 * 1000 / 3600 = 0.97$ g/s

$\Pi_p = 10^{-6} * 100 * 43.983 * 6050.73 = 26.613$ t/year

where 1000/3600 is the conversion coefficient from *kg/hour* to *g/s*.

Estimation of carbon monoxide emission:

Indicator of carbon monoxide emission k_{co}, g/GJ (determined according to table E.19)

$k_{co} = 250$.

Carbon monoxide (contaminant code-337):

$\Pi_c = 10^{-6} * 250 * 43.983 * 800.361 * 1000 / 3600 = 2.44$ g/s $\Pi_p = 10^{-6} * 250 * 43.983 * 6050.73 = 66.53$ t/year Estimation of mercury emission:

Indicator of mercury emission k_{Hg}, g/GJ (determined according to table E.17)

$k_{Hg} = 0.0001$

Metallic mercury (contaminant code-183):

$\Pi_c = 10^{-6} * 0.0001 * 43.983 * 800.361 * 1000 / 3600 = 9.7*10^{-7}$ g/s

$\Pi_p = 10^{-6} * 0.0001 * 43.983 * 6050.73 = 2.6*10^{-5}$ t/year

Estimation of **greenhouse gases** emission was performed according to "Collection of emission indicators (specific emission) of contaminants into the atmosphere by various industries", volume1, Donetsk City, 2004

Carbon dioxide

1. Determination of *carbon dioxide* emission indicator:

$k_{CO_2} = 3.67 \quad k_C \quad E_C$ g/GJ, where:

k_c – indicator of carbon emission, g/GJ (taken according to table E.20), k_c =15 300

ε_c – level of oxidization of fuel carbon, ε_c= 0.995

Natural gas:

$k_{CO_2} = 3.67 \quad 15300 \quad 0.995 = 55870.245$

Carbon dioxide:

Пр = 10^{-6} * 55870.245 * 43.983 * 6050.73 = 14868.7 t/year

Dinitrogen oxide

Indicator of dinitrogen oxide emission k_{N_2O}, g/GJ (determined according to table E.21), k_{N_2O} =0.1

Dinitrogen oxide:

Пр = 10^{-6} * 0.2 * 43.983 * 6050.73 = 0.026 t/year

Methane

Indicator of methane emission k_{CH_4}, g/GJ (determined according to table E.22), k_{CH_4}= 1.

$П_c$=10^{-6} * 1.0* 43.983 * 800.361 * 1000 / 3600 = 0.0097 g/s

$П_p$=10^{-6} * 1.0 * 43.983 * 6050.73 = 0.266 t/year

Emission source No. 39 – smoke flue of the boiler plant.
Emission source parameters: H=30 m; D = 0.8 m; L = 3.33 м³/s, T = 20 °C
Coordinates of source No. 22: x =-30; y = 78
Emissions from source No.39 are similar to emission from source No.38.

Grain depot, building No.9.1-9.6, 10-16.
This object, designed by Korporatyvni Zernovi Systemy private enterprise, is not a part of soybean processing complex. However, emission sources of the grain depot, which is part of Hlobyno recycling plant, are taken into account when assessing the impact on the atmosphere.

Sources No.23-37.

See estimation and description of emission sources in 1005/01, performed by Korporatyvni Zernovi Systemy Private Enterprise.

See properties of emission sources in Table 4

6.1.2 List of emission of contaminants to the atmosphere

In determining the level of air pollution maximum one-time concentrations of harmful substances in the air of populated areas were taken according to the list "Maximum acceptable concentration (MAC) and Safe for Orientation Levels of Exposure (SOLE) of contaminants in the air of populated areas", Ecology Ministry of Ukraine, Kyiv, 1998

According to the resolution No. 18 dated 04.06.2010 "On approval of values of hygienic concentration of chemicals in the air of populated areas", the maximum acceptable concentration (MAC) of nitrogen dioxide is 0.2 mg/m^3, hazard class 3.

Maximum on-time maximum acceptable concentration (MACm.o.) of suspended substances is taken as 0.5 mg/m^3.

The list of contaminants, emitted by the enterprise (excluding emissions from automobile transport), is given in Table 3.

Table 3
List of contaminants

п/п	**Contaminant code**	**Contaminant**	**MACm.o. SOLE mg/m^3**	**Hazard class**	**Emission power, t/year**
1	150	Sodium hydroxide	0.01	2	0.000004
2	183	Metallic mercury	0.003	1	0.000058
3	301	Nitrogen dioxide	0.2	3	55.926
4	303	Ammonia	0.2	4	0.001
5	322	Sulfuric acid	0.3	2	0.000003
6	337	Carbon monoxide	5	4	134.75
7	403	Hexane	60	4	63.798
8	410	Methane	50	4	0.589
9	1061	Ethanol	5	4	0.0004
10	2735	Mineral lubricant	0.05	3	0.9083
11	2902	Suspended substances	0.5	4	7.71012
Total:					**263.68 t/year**

Total quantity of emitted greenhouse gases (carbon dioxide, dinitrogen oxide, methane), equals **33059.55 t/year**.

6.1.3 Parameters of contaminants emission sources into the atmosphere

Data on emission of contaminants from production facilities of the enterprise is given in Table 4 "Parameters of contaminant emission into the atmosphere for calculation of spreading":

Parameters of contaminant emission sources

Table 4

Contaminant emission sources	Emission sources					Parameters of gas-air mixture		Coordinates X/y	Contaminant code	Contaminant name	Hazardous substance emissions	
Name of department, section	No. source	Name	Quant	Height, m	Diameter, m	volume m^3/s	Temperature				g/s	t/year
Treatment department. Building No.25												
Contaminant emission source – granule cooler item 56042	1	Fan chimney	1	34.65	1.0	10	40	49/60	2902	Suspended substances	0.05	1.36
Contaminant emission source – granule cooler item 25029	2	Fan chimney	1	34.65	0.5	3.05	40	45/65	2902	Suspended substances	0.015	0.415
Contaminant emission source – husk crusher item 25003.01	3	Fan chimney	1	34.65	1	9.44	40	55/75	2902	Suspended substances	0.024	0.643
Contaminant emission source – solvent cake crusher item 56013.01	4	Fan chimney	1	34.65	1	9.44	20	55/68	2902	Suspended substances	0.024	0.643
Contaminant emission source - treatment section equipment	5	Fan chimney	1	34.65	0.8	6.62	20	58/78	2902	Suspended substances	0.0165	0.45
Contaminant emission source – air conditioner, item 24003	6	Fan chimney	1	34.65	0.6	3.55	20	55/77	2902	Suspended substances	0.013	0.36
Contaminant emission source – treatment section equipment	7	Fan chimney	1	34.65	0.45	1.97	20	51/76	2902	Suspended substances	0.031	0.83
Contaminant emission source – loading of waste into automobile transport	8	Uncontrolled	1	4	0.3	0.294	20	75/80	2902	Suspended substances	0.002	0.0016
Extraction department. Building No.27												
Contaminant emission source – solvent absorption and desorption system	9	Fan chimney	1	22.12	0.2	0.0225	20	15/115	403	Hexane	0.299	5.4
									2735	Mineral lubricant	0.0334	0.9083
Contaminant emission source – process equipment in the production facility (losses of solvent	10	Fan chimney	1	22.12	0.63	6.389	20	10/110	403	Hexane	2.22	57.78

Contaminant emission sources	Emission sources					Parameters of gas-air mixture		Coordinates X/y	Contaminant code	Contaminant name	Hazardous substance emissions	
Name of department, section	No. source	Name	Quant	Height, m	Diameter, m	volume m^3/s	Temperature				g/s	t/year
due to leaks in the process equipment)												
Contaminant emission source – toaster cyclones item 52013	11	Cyclone chimney	1	22.12	0.8	7	20	35/130	2902	Suspended substances	0.032	0.865
										Hexane	0.023	0.618
Production laboratory. Building No.40												
Contaminant emission source fume hood No. 1 in the laboratory premises	12	Fume hood chimney	1	4	0.2	0.097	20	-86/18	322	Sulfuric acid	$1.39\ 10^{-6}$	$1.5\ 10^{-6}$
									150	Sodium hydroxide	$1.94\ 10^{-6}$	$2.2\ 10^{-6}$
									303	Ammonia	$4.44\ 10^{-4}$	0.0005
									1061	Ethanol	$1.76\ 10^{-4}$	0.0002
									403	Hexane	0.0014	0.0015
Contaminant emission source – fume hood No. 2 in the laboratory premises	13	Fume hood chimney	1	4	0.2	0.097	20	-85/15	322	Sulfuric acid	$1.39\ 10^{-6}$	$1.5\ 10^{-6}$
									150	Sodium hydroxide	$1.94\ 10^{-6}$	$2.2\ 10^{-6}$
									303	Ammonia	$4.44\ 10^{-4}$	0.0005
									1061	Ethanol	$1.76\ 10^{-4}$	0.0002
									403	Hexane	0.0014	0.0015
Solvent cake storage Building No. 17												
Contaminant emission source – silo for storing cereals item 17.1.1	14	Hopper deflector	1	15.5	0.35	0.03	20	20/35	2902	Suspended substances	0.009	0.2449
Contaminant emission source – silo for storing cereals item 17.2.1	15	Hopper deflector	1	15.5	0.35	0.03	20	15/50	2902	Suspended substances	0.009	0.2449
Contaminant emission source – silo for storing cereals item 17.3.1	16	Hopper deflector	1	15.5	0.35	0.03	20	-10/65	2902	Suspended substances	0.009	0.2449
Contaminant emission source – silo for storing cereals item 17.4.1	17	Hopper deflector	1	15.5	0.35	0.03	20	8/25	2902	Suspended substances	0.009	0.2449

Contaminant emission sources	Emission sources					Parameters of gas-air mixture		Coordinates X/y	Contaminant code	Contaminant name	Hazardous substance emissions	
Name of department, section	No. source	Name	Quant	Height M	Diameter, m	volume m^3/s	Temperature				g/s	t/year
Contaminant emission source – silo for storing cereals item 17.5.1	18	Hopper deflector	1	15.5	0.35	0.03	20	-8/40	2902	Suspended substances	0.009	0.2449
Contaminant emission source – silo for storing cereals item 17.6.1	19	Hopper deflector	1	15.5	0.35	0.03	20	-20/55	2902	Suspended substances	0.009	0.2449
Contaminant emission source - loading of granulated husk to automobile transport	20	Uncontrolled	1	4	0.3	0.294	20	40/40	2902	Suspended substances	0.002	0.0105
Contaminant emission source – loading of granulated (non-granulated) solvent cake to automobile transport	21	Uncontrolled	1	4	0.3	0.297	20	25/-10	2902	Suspended substances	0.002	0.23
Automobile transport												
Contaminant emission source – automobile transport of the raw materials supplier and the finished product consumer	22	Uncontrolled, non-stationary	1	2.0	0.05	0.294	40	25/50	337	Carbon monoxide	0.72	2.778
									2754	Saturated hydrocarbons	0.217	0.833
									301	Nitrogen dioxide	0.289	1.21
									330	Sulfur dioxide	0.244	0.55
									328	Soot	0.212	0.43
									703	Benzopyrene	$2.3*10^{-5}$	$8.9*10^{-5}$
Grain depot, Building 9.1-9.6.20-16												
Contaminant emission source - drum separator MKZM 9510 item 5.1.4	23	Exhaust chimney	1	33	0.2	0.34	20	120/40	2902	Suspended substances	0.047	0.0616
Contaminant emission source – Air-sieve separator TAS 204A-4item 5.2.3	24	Exhaust chimney	1	28	0.71	4.8	20	121/39	2902	Suspended substances	0.2401	0.363

Contaminant emission sources	Emission sources					Parameters of gas-air mixture		Coordinates X/y	Contaminant code	Contaminant name	Hazardous substance emissions	
Name of department, section	No. source	Name	Quant	Height M	Diameter, m	volume m^3/s	Temperature				g/s	t/year
Contaminant emission source – dump pit of the automobile transport	25	Exhaust chimney	1	23	0.5	2.58	20	122/38	2902	Suspended substances	0.0003	0.0013
Contaminant emission source – round tank with cone bottom (hopper) item 3.1.1	26	Hopper deflector	1	21	0.87	0.060	20	155/22	2902	Suspended substances	0.0018	0.0036
Contaminant emission source - round tank with cone bottom (hopper) item 4.1.1	27	Hopper deflector	1	21	0.87	0.06	20	125/35	2902	Suspended substances	0.0003	0.0006
Contaminant emission source - round tank with cone bottom (hopper) item 4.2.1	28	Hopper deflector	1	21	0.87	0.06	20	135/40	2902	Suspended substances	0.0003	0.0006
Contaminant emission source – grain dryer SBC 25 LE item7.1	29	Fan chimney	3	30	1.25	0.22	40	105/38	301	Nitrogen dioxide	0.35	2.7
									337	Carbon monoxide	0.22	1.69
									183	Metallic mercury	$7.7*10^{-7}$	$6*10^{-6}$
									410	Methane	0.007	0.057
									11812	Carbon dioxide	-	3321.5
									11815	Dinitrogen oxide	-	0.0057
Contaminant emission source - round tank with cone bottom (hopper) item 8.1.1	30	Hopper deflector	1	21	0.85	0.04	20	100/30	2902	Suspended substances	0.0001	0.0003
Contaminant emission source – silo for storing cereals CB 24-20 item 9.1.1	31	Hopper deflector	1	30	1.3	0.04	20	85/25	2902	Suspended substances	0.00005	0.00007
Contaminant emission source- silo for storing cereals CB 24-20 item 9.2.1	32	Hopper deflector	1	30	1.3	0.04	20	70/60	2902	Suspended substances	0.00005	0.00007

Contaminant emission sources	Emission sources					Parameters of gas-air mixture		Coordinates X/y	Contaminant code	Contaminant name	Hazardous substance emissions	
Name of department, section	No. source	Name	Quant	Height M	Diameter, m	volume m^3/s	Temperature				g/s	t/year
Contaminant emission source-silo for storing cereals CB 24-20 item 9.3.1	33	Hopper deflector	1	30	1.3	0.04	20	45/-10	2902	Suspended substances	0.00005	0.00007
Contaminant emission source-silo for storing cereals CB 24-20 item 9.4.1	34	Hopper deflector	1	30	1.3	0.04	20	25/-22	2902	Suspended substances	0.00005	0.00007
Contaminant emission source - silo for storing cereals CB 24-20 item 9.5.1	35	Hopper deflector	1	30	1.3	0.04	20	8/-40	2902	Suspended substances	0.00005	0.00007
Contaminant emission source-silo for storing cereals CB 24-20 item 9.6.1	36	Hopper deflector	1	30	1.3	0.04	20	20/-53	2902	Suspended substances	0.00005	0.00007
Contaminant emission source - round tank with cone bottom (hopper) item12.1.1	37	Hopper deflector	1	21	0.85	0.07	20	85/70	2902	Suspended substances	0.0001	0.0012
Contaminant emission source – natural gas boiler	38	Smoke flue	1	30.0	0.8	3.33	130	-40/75	301	Nitrogen dioxide	0.97	26.613
									337	Carbon monoxide	2.44	66.53
									183	Metallic mercury	$9.7*10^{-7}$	$2.6*10^{-5}$
									410	Methane	0.0097	0.266
									11812	Carbon dioxide	-	14868.7
									11815	Dinitrogen oxide	-	0.026
Contaminant emission source – natural gas boiler	39	Smoke flue	1	30	0.8	3.33	130	-30/78	301	Nitrogen dioxide	0.97	26.613
									337	Carbon monoxide	2.44	66.53
									183	Metallic mercury	$9.7*10^{-7}$	$2.6*10^{-5}$
									410	Methane	0.0097	0.266
									11812	Carbon dioxide	-	14868.7
									11815	Dinitrogen oxide	-	0.026

6.1.4 Determination of maximum surface concentration of contaminants

The hazard level of air pollution is characterized by the biggest estimated value of concentration for respective adverse weather conditions, including dangerous wind speed.

To determine the level of air pollution EOL PLUS software was used, which was agreed with the Ministry of Environmental and Nuclear Safety of Ukraine.

According to item 5.21. ОНД – 86 (OND-86), estimation of surface concentrations is performed only for hazardous substances, for which:

$$\frac{M}{MAC} > \Phi$$

where M, g/s – total emission from all sources of the enterprise, which corresponds to the most adverse of determined emission conditions,

MAC (SOLE), mg/m^3 - maximum one-time acceptable concentration;

$\Phi = 0.1$ at $H \le 10$ m

$\Phi = 0.01*H$ at $H > 10$ m

where H, m – weighted average height of the emission source at the enterprise.

$$H = \frac{5*M_{(0\text{-}10)} + 15*M_{(11\text{-}20)} + 25*M_{(21\ 30)} + 35*M_{(31\ 40)}}{M_j}, \text{ m [ОНД – 86 (OND-86), p.40]}$$

M = M(0-10) j +M(11-20) j +M(21-30) j +...

where M (0-10), M (11-20) ….. – total volume of emission or sources of the enterprise within height intervals up to 10 m and from 11 to 20 m and so on;

Weighted average height of sources for:

- nitrogen dioxide:

M = 0.289 + 0.35 + 0.97+0.97 = 2.579 g/s

$$H = 5 * 0.289 + \frac{25 * (0.35 + 0.97 + 0.97)}{2.579} = 22.75 \text{ m}; \quad \Phi = 0.23$$

- carbon monoxide:

M = 0.72+0.22+ 2.44 + 2.44 = 5.82 g/s

$$H = 5 * 0.72 + \frac{25 * (0.22 + 2.44 + 2.44)}{5.82} = 22.52 \text{ m}; \quad \Phi = 0.23$$

- hexane:

M = 0.0014+0.0014+ 0.299+2.22+0.032= 2.354 g/s

$$H = 5 * (0.0014 + 0.0014) + \frac{25 * (0.299 + 2.22 + 0.032)}{2.354} = 24.9 \text{ m}; \quad \Phi = 0.25$$

- suspended substances:

M = 0.002*3+0.009*6+0.32+0.2401+0.003*3+0.0018+0.0001*2+0.00005*6+0.05+0.015+0.024+ 0.024+0.0165+0.013+0.031+0.047 = 0.8519 g/s

Emission for heights:

From 0 to 10 : M=0.002*3=0.006 g/s

From 11 to 20 : M=0.009*6=0.054 g/s

From 21 to 30 : M=0.32+0.2401+0.003*3+0.0018+0.0001*2+0.00005*6=0.5714 g/s

From 31 to 40 : M=0.05+0.015+0.024+ 0.024+0.0165+0.013+0.031+0.047= 0.2205 g/s

$$H = \frac{5 * (0.006) + 15 * (0.054) + 25 * (0.5714) + 35 * (0.2205)}{0.8519} = 26.81 \text{ m}; \ \Phi = 0.27$$

Determination of expediency of estimation surface concentration of contaminants are summarized in Table 5.

Table 5

No. of source	Weighted average height of the source H, m	Substance	MAC (SOLE) mg/m^3	Emission source intensity M, g/s	$\frac{M}{MAC}$	Φ	Expedience of estimation
12.23	4	Sodium hydroxide	(0.01)	$3.88*10^{-6}$	$3.88*10^{-4}$	0.2	**No**
29.38.39	30	Metallic mercury	0.0003	$2.71*10^{-6}$	0.009	0.3	**No**
22.29.38, 39	22.75	Nitrogen dioxide	0.2	2.579	12.9	0.23	**Yes**
12.23	4	Ammonia	0.2	$8.88*10^{-4}$	0.0044	0.2	**No**
12.23	4	Sulfuric acid	0.3	$2.78*10^{-6}$	$9.2*10^{-6}$	0.4	**No**
22	2	Sulfur dioxide	0.5	0.244	0.288	0.1	**Yes**
22.29.38, 39	22.52	Carbon monoxide	5	5.82	1.264	0.23	**Yes**
9-13	24.9	Hexane	60	2.354	0.04	0.25	**No**
29.38.39	30	Methane	50	0.0264	0.0005	0.3	**No**
12.23	4	Ethanol	5	$3.52*10^{-4}$	0.00007	0.1	**No**
9	22.22	Mineral lubricant	(0.05)	0.0334	0.668	0.22	**Yes**
22	2	Saturated hydrocarbons	1	0.217	0.217	0.1	**Yes**
1-8.21.24-21.23-28.30-37	26.81	Suspended substances	0.5	0.8519	1.7	0.27	**Yes**
22	2	Soot	0.25	0.212	0.74	0.1	**Yes**
22	2	Benzapyrene	0.0001	$2.3*10^{-5}$	0.23	0.1	**Yes**

For sodium hydroxide, metallic mercury, ammonia, hexane, methane, ethanol M/MAC < Φ, therefore estimation for them was not performed.

For sulfuric acid M/MAC < Φ, however it forms a biological summation group No.28 with sulfur dioxide, therefore estimation for it was not performed.

Size of estimation rectangle was taken 2000 x 2000 m with 50 m increment.

Background concentrations were taking into account during estimation of dispersion of contaminants in the surface layer of the atmosphere.
Background concentrations of such contaminants as nitrogen dioxide, carbon monoxide, sulfur dioxide, and suspended substances was determined based on the information from the letter of the State Environment Protection Administration in Poltava region No. 1338/04-11 date 03.04.2012 (see Appendix).

Background concentrations for the rest of contaminants are taken as 0.4 Смах.

For estimation, a control point Кт10 with coordinates X=-10; У=600 was taken.

Analysis of surface concentration estimation, performed during development of section "Assessment of Environmental Impact" shows that for all hazardous substances, maximum surface concentrations of emission from the designed facility, considering background concentrations, do not exceed the MAC of the air of a settlement and are total no more than **0.78 of MAC**:

Nitrogen dioxide – 0.54 MAC $_{settlement}$; Sulfuric acid – 0.4
MAC $_{settlement}$;
Soot – 0.52 MAC $_{settlement}$;
Sulfur dioxide - 0.25 MAC $_{settlement}$;
Carbon monoxide - 0.34 MAC $_{settlement}$;
Benzopyrene – 0.44 MAC $_{settlement}$;
Mineral lubricant - 0.44 MAC $_{settlement}$;
Saturated hydrocarbons – 0.43 MAC $_{settlement}$;
Suspended substances - 0.44 MAC $_{settlement}$; Summation group
28 - 0.64 MAC $_{settlement}$;
Summation group 31 - 0.78 MAC $_{settlement}$.
In addition to that, estimation of maximum surface concentration was performed in control points, selected at the boundary of the standard sanitary protection zone (SPZ) – 100m.

The following are coordinates of the control points:

No. of control point	Coordinates of Кт, m	
	X	У
Кт1	40	230
Кт2	120	190
Кт3	210	85
Кт4	170	-60
Кт5	-40	-150
Кт6	-120	-55
Кт7	20	-125
Кт8	-145	85
Кт9	-100	200

Analysis of surface concentrations at given points showed that for all hazardous substances maximum surface concentrations, taking into account background concentrations, do not exceed 0.9 MAC $_{settlement}$;
Impact on air within the MAC for the air of settlements. Therefore, emissions of hazardous substances can be established as the maximum acceptable.
Maps of contaminants dispersion in the air are shown in the figures in the appendix.

6.1.5 Determination of SPZ size

Sanitary protection zone (SPZ) is established according to the sanitary classification of enterprises listed in **State sanitary rules No. 173 dated 19.06.1996., DBN-360-92 p.7-55 / "Planning and development of urban and rural settlements"** / and is confirmed by estimation.
According to the sanitary classification of enterprises and sizes of sanitary protection zones for them "State sanitary rules No. 173 dated 19.06.1996", the distance for enterprises processing crops products, including grain and oil plants, **is 100 m**
The existing complex is located in the industrial area of Hlobyno city. The nearest residential development is located 470 m from potential sources of emissions.

6.2 Impact on water resources

Water supply of the designed enterprise is performed by two existing wells with an output of 18 m^3/hour each. From wells, water flows to the reverse osmosis water treatment facility.

This facility is located in the boiler building.

After purification, treated water flows to domestic and industrial consumers.

The water pumping station, installed in the water treatment building, serves as a water station, and provides required pressure and flow rate in the water supply system of the enterprise.
Water consumption for industrial, drinking and technological needs consists of the following:

- Industrial and drinking needs– 1.1 m^3/hour; - 2.75 m^3/day;
- Technological needs – 8.91 m^3/hour; - 213.84 m^3/day.

Water meter units are designed to account volume of consumed water.
According to the specifications provided by the customer, waste waters total: industrial and domestic waste water -2.75 m^3/day; technological waste water -214.08 m^3/day; rainwater - 340 m^3/day, which are supplied to Hlobyno meat processing plant by the sewer system.

Industrial and domestic waste water is planned to be disposed by gravity flow to pumping stations, and from there is sent through pressure collectors to the point of the tie-in into the pressure networks outside the site.

Rain water is disposed from the building area and paved roads through collectors with diameters from 200 mm to 400 mm, and by gravity flow it is disposed to a rainwater tank. Before entering the tank, waste waters undergo preliminary purification from mechanical admixtures and petrochemical products in the sand trap and oil trap. From rainwater tank, by gravity flow, water comes to the sewer pumping station, which pumps it through the pressure collector to the collector outside the site.

The production area is covered by solid asphalt, which prevents penetration (leakage, filtration) of rainwater from the surface to underlying horizons. Therefore there is no negative impact on the ground water.
There is no impact on the ground water and the surface water.

6.3 Impact on land resources

The relief of the territory is sloped with light grade to the north and north-east. The surface is formed by filled soil with thickness from 0.3 to 2.7 m. Filling of the site was performed without engineering preparations to soil and vegetation layer. Absolute surface markings vary from 94.7 to 96.80 m

There is no plant layer of the soil, therefore the project does not provide recultivation of agricultural lands.

Operation of the facility will not result in adverse impact on the soil, because domestic and industrial waste water is sent through the sewer network to the water treatment plant of Hlobyno meat processing plant, and municipal solid waste is collected in closed containers on the special concreted site and disposed of in a landfill.

Slopes of the area, which does not exceed the maximum acceptable levels, is the main measure to protect the soil from erosion and washing out of the plant layer.

Planning of the site provides complete disposal of rainwater, creates conditions, which prevent stagnation of the rainwater on the surface of paved driveways, sidewalks and squares.

There is no impact on soil and land resources during operation of the object.

6.4 Impact on geological environment

There is no impact on the geological environment during construction and operation of the object. Taking into account planned activities, no negative endogenous and exogenous processes and tectonic, seismic, geodynamic, landslide, mud, karst changes of the stress state and properties of the rocks, deformation of the earth's surface, etc. are expected.

There is no impact on the geological environment.

6.5 Acoustic impact

This section provides assessment of expected acoustic impact on the environment during operation of the complex on the basis of acoustic calculation of required noise reduction at control points and defining the boundaries of the sanitary protection zone by noise factor.

Evaluation of acoustic noise impact on the noise conditions of the surrounding area during operation of the complex, according to the requirements of SNiP II-12-77/1/ was performed on the basis of acoustic calculations and comparing their results with acceptable levels of noise in the standard document "State sanitary rules of planning and development of settlements, dated 19.06 .96 No. 173 "/2/ and" Sanitary norms of acceptable noise in premises of residential and public buildings on the territory of residential development: SN No. 3077-84 "/3/.

The main sources of noise that may have an adverse effect on the surrounding area are the following:

- fans of general exchange ventilation and aspiration systems;
- equipment of boilers;
- process equipment;
- vehicles during moving in and out of the territory
- internal cargo transportation

The initial data for the acoustic calculations according to the requirements of SNiP II-12-77/1/ is the noise characteristics of noise sources (level of sound power, Lp, dB) identified by passport data and directories / 4 / in case of their absence, by experimental data of similar sources or estimated values / 5, 6 /.

Noise characteristics of fans of general exchange ventilation and aspiration systems, which are taken for acoustic estimations, are given in Table 6.

Noise characteristics of fans

Table 6

Equipment	Octave band centre frequencies (Hz)							
	63	125	250	500	1000	2000	4000	8000
	Levels of noise acoustic power, Lp, dB							
Multicyclone of the aspiration system	72	76	83	82	81	76	69	57
Fan of supply ventilation system	66	68	72	76	75	75	72	61

Noise characteristics of steam boilers as the similar equipment are given in Table 7.

Noise characteristics of heating equipment

Table 7

Equipment	Octave band centre frequencies (Hz)							
	63	125	250	500	1000	2000	4000	8000
	Average values of acoustic pressure of noise, **L m**, dB							
Steam boiler	66.9	56.2	50.2	46.7	52.2	39.7	39.7	35.7

Noise properties of the automobile transport during moving in and out of the territory, internal site transportation are given in Table 8.

Noise characteristics of automobile transport

Table 8

Noise source	Octave band centre frequencies (Hz)							
	63	125	250	500	1000	2000	4000	8000
	Levels of noise acoustic power, Lp, dB							
Automobile transport (working engine)	66	70	65	58	54	50	46	40

Noise characteristics of main process equipment and standardized indicators of noise level for permanent working places, according to GOST 12.1.003 – 83 and state sanitary norms DSN 3.3.6.037-99, are given in tables 9 and 10.

Noise characteristics of the process equipment

Table 9

Working place Equipment name	Sound levels an equivalent sound levels, dBA
Building No. 25. Treatment department	
Compressor unit, item 37012.01.02. Working place is non-permanent	67
Europa Crown equipment . Working place is non-permanent.	80
Building No. 27. Extraction department	
Europa Crown equipment . Working place is non-permanent.	80

Standardized indicators of noise level for permanent working places

Table 10

Noise level indicators	Levels of acoustic pressure, dB, in octave band centre frequencies, Hz.								
	31.5	63	125	250	500	1000	2000	4000	8000
Standardized indicators for permanent working places according to GOST 12.1.003 - 83	107	95	87	82	78	75	73	71	69

Acoustic calculation of required noise reduction in control points was performed to check compliance with noise regime in the surrounding area.

Required reduction of noise levels at the control point, **Lreq**, dB, is determined according to requirements of section 4 of SNiP II-12-77/1/:

а) for one source it is calculated using formula (13)

ΔLreq = L - Lдоп (1),

б) for several sources it is calculated using formula (14)

ΔLreq = Li - Lдоп + 10lgn (2),

Where L, Li are levels of noise, dB, create by an individual source at the control point, defined using formulas (7) or (9) - (65) (11) (7) according to requirements of SNiP II-12-77/1/;

Lдоп are permissible noise levels, dB, at the control points according to the "State Sanitary rules of planning and development of settlements dated 19.06.96 No. 173 "(annex.16)/2/ and" Sanitary norms of acceptable noise in premises of residential and public buildings and in the territory of residential development: SN No. 3077-84 "(table 1 item.9)/3/;

n - total number of noise sources taken into account, according to items 5.4 and 5.5 of SNiP II-12-77/1 /.

Acceptable noise levels (**Lдоп**, dB) are taken regardless of the operation mode of the enterprise, provided by the project.

Operation mode of the enterprise (continuous, 24/7).

Acceptable noise levels (**Lдоп**, dB), taken for assessment of noise regime in the surrounding territory, are given in Table 11.

Acceptable noise levels

Table 11

Territory purpose	Octave band centre frequencies (Hz)							
	63	125	250	500	1000	2000	4000	8000
	Acceptable noise levels, **Lдоп**, dB							
Territories adjacent to residential buildings./2, 3/								
Day hours: day	75	66	59	54	50	47	45	43
(from 23^{00} to 7^{00})	LAaccept = 55dBA							
Day hours: night	67	57	49	44	40	37	35	33
(from 7^{00} to 23^{00})	LAaccept = 45dBA							

Correction for tone nature of noise SN No.3077-84 table.2/3/, dB								
	-5	-5	-5	-5	-5	-5	-5	-5

According to requirements of SNiP II-12-77/1/ control points (KT) are selected at the shortest distance from noise sources, where their impact is the most typical.

The project provides the following measures to protect against noise:

- Vibration isolation of air ducts fastening to suspensions (bracket) and places where air ducts pass through the enclosing structures (walls, floors) of the building;
- Selection of optimal air velocity in air ducts;
- Using of installed equipment taking into account its maximum efficiency;
- Installation of fans on vibration resistance supports;
- Placing fans in individual rooms (ventilation chambers);
- Connecting fans with the structural elements of systems by flexible inserts;
- Installation of aerodynamic noise silencers in supply ventilation system an aspiration on the sides of pumping and suction.

During acoustic calculations of required noise reduction in KT, the superposition principle sources of noise sources and correction for tone character of the noise fans were take into account.

During acoustic calculations, efficiency of measures for protection from noise, provided by the project., reduction of noise cause by structural elements of systems were taken according to data /1, 7, 8/.

Calculation of required noise reduction in control points was performed in a tabular form and given in tables.

The calculations identified the expected levels of sound pressure in octave bands and sound level with sound frequency correction (A) in KT.

Analysis of acoustical calculations results shows that measures for protection against noise, provided by the project, ensure compliance with regulatory document "Effective state sanitary rules of planning and development of settlements", dated 19.06.96 No. 173/2/ and "Sanitary norms of acceptable noise in premises of residential and public buildings and in the territory of residential development SN No. 3077-84 "/3/ in KT at the shortest distance from noise sources.

Sound levels by correction (A) in KT are the following: in Кт1 - 13 - 32 dBA, Кт2 - 28dBA, which does exceed acceptable noise levels and meets requirements of /2 / and /3/.

Calculating required noise reduction in control points

Name of noise source (ШШ) - multicyclone aspiration

Direction factor ШШ - Ф = 1

Space angle of noise emission Ω = 4

Direction of noise distribution: pressurization side

Value	Reference to formula	Octave band centre frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
Lp, dB		72	76	83	82	81	76	69	57
ΔLp гл, dB		-2	-5	-18	-25	-20	-15	-12	-11
ΔLрпов,dB		0	0	0	0	0	0	0	0
ΔLротк до, dB		-8	-4	-1	0	0	0	0	0
Lp пр, dB	9 /1/	62	67	64	57	61	61	57	46
10lgФ, dB		0	0	0	0	0	0	0	0
10lgΩ, dB		-11	-11	-11	-11	-11	-11	-11	-11
ΔLp нап,dB		-10	-10	-10	-10	-10	-10	-10	-10
15lgr, dB		-22.2	-22.2	-22.2	-22.2	-22.2	-22.2	-22.2	-22.2
L KT, dB	7 /1/	18.8	23.8	20.8	13.8	17.8	17.8	13.8	2.8
Lдоп., dB		-67	-57	-49	-44	-40	-37	-35	-33
ΔdB		5	5	5	5	5	5	5	5
ΔLreq ,dB	1	0	0	0	0	0	0	0	0

Estimation of sound level by correction (A) in KT

F, Hz	63	125	250	500	1000	2000	4000	8000
LKT, dB	18.8	23.8	20.8	13.8	17.8	17.8	13.8	2.8
Δ(A), dB	-26.2	-16.2	-8.6	-3.2	0	1.2	1.0	-1.2
(L-Δ), dB	0	7.7	12.2	10.6	17.8	19	14.8	1.7
LA, dBA	23.2							
LAдоп, dBA	-45							
ΔdBA	5							
ΔLA тр., dBA	0							

Estimation of required noise reduction in control points

Name of noise level (ІШ): fan of the supply ventilation system

Direction factor ІШ - Ф = 1

Space angle of noise emission Ω= 2

Direction of noise distribution: suction side

Value	Reference to formula	Octave band centre frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
Lp, dB		66	68	72	76	75	75	72	61
ΔLp гл, dB		-2	-5	-18	-25	-20	-15	-12	-11
ΔLрпов,dB		0	0	0	0	0	0	0	0
ΔLротк до, dB		-8	-4	-1	0	0	0	0	0
Lp пр, dB	9 /1/	56	59	53	51	55	60	60	50
10lgФ, dB		0	0	0	0	0	0	0	0
10lgΩ, dB		-8	-8	-8	-8	-8	-8	-8	-8
ΔLp нап,dB		-10	-10	-10	-10	-10	-10	-10	-10
15lgr, dB		-15	-15	-15	-15	-15	-15	-15	-15
L KT, dB	7 /1/	23	26	20	18	22	27	27	17
Lдоп., dB		-67	-57	-49	-44	-40	-37	-35	-33
ΔdΔB		5	5	5	5	5	5	5	5
ΔLreq ,dB	1	0	0	0	0	0	0	0	0

Estimation of sound level by correction (A) in KT

F, Hz	63	125	250	500	1000	2000	4000	8000
LKT, dB	23	26	20	18	22	27	27	17
Δ(A), dB	-26.2	-16.2	-8.6	-3.2	0	1.2	1.0	-1.2
(L- Δ), dB	0	9.9	11.4	14.8	22	28.2	28	15.9
LA, dBA	31.9							
LAдоп, dBA	-45							
ΔdBA	5							
ΔLA тр., dBA	0							

Estimation of required noise reduction in control points

Name of noise source (ІШ) – boiler and process equipment

Direction factor ІШ - Ф = 1

Space angle of noise emission Ω= 4

Direction of noise distribution: smoke flue

Value	Reference to formula	Octave band centre frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
Lm, dB		66.9	56.2	50.2	46.7	52.2	39.7	39.7	35.7
ΔLрпов,dB		0	0	0	-1	-5	-7	-5	-3
ΔLротк до, dB		-13	-8	-4	-1	0	0	0	0
Lp пр, dB	9 /1/	53.9	48.2	46.2	44.7	47.2	32.7	34.7	32.7
10lgФ, dB		0	0	0	0	0	0	0	0
10lg Ω dB		-11	-11	-11	-11	-11	-11	-11	-11
ΔLp нап,dB		-10	-10	-10	-10	-10	-10	-10	-10
15lgr, dB		-15	-15	-15	-15	-15	-15	-15	-15
ΔL KT, dB	7 /1	17.9	12.2	10.2	8.7	11.2	0	0	0

Lдоп., dB		-67	-57	-49	-44	-40	-37	-35	-33
ΔdB		0	0	0	0	0	0	0	0
ΔLreq ,dB	1	0	0	0	0	0	0	0	0

Estimation of sound level by correction (A) in KT

F, Hz	63	125	250	500	1000	2000	4000	8000
LKT, dB	17.9	12.2	10.2	8.7	11.2	0	0	0
Δ(A), dB	-26.2	-16.2	-8.6	-3.2	0	1.2	1.0	-1.2
(L- Δ), dB	0	0	1.6	5.5	11.2	1.2	1	0
LA, dBA	12.9							
LAдоп, dBA	-45							
ΔdBA	0							
ΔLAтр, dBA	0							

Estimation of required noise reduction in control points

Name of noise source (ІШ) – automobile transport during moving in and out, during internal site transportation (working of engine)

Direction factor ІШ - Ф = 1

Space angle of noise emission Ω= 4

Value	Reference to formula	Octave band centre frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
Lp, dB		66	70	65	58	54	50	46	40
10lgФ, dB		0	0	0	0	0	0	0	0
10lg Ω , dB		-11	-11	-11	-11	-11	-11	-11	-11
ΔLp нап,dB		-10	-10	-10	-10	-10	-10	-10	-10
15lgr(Кт3), dB		-13.2	-13.2	-13.2	-13.2	-13.2	-13.2	-13.2	-13.2
L Кт3, dB	7 /1/	31.9	35.9	30.9	23.9	19.9	15.9	11.9	5.9
Lдоп., dB		-75	-66	-59	-54	-50	-47	-45	-43
ΔdB		0	0	0	0	0	0	0	0
ΔLreq(Кт3), dB	1	0	0	0	0	0	0	0	0

Estimation of sound level by correction (A) in KT

F, Hz	63	125	250	500	1000	2000	4000	8000
LKT, dB	31.9	35.9	30.9	23.9	19.9	15.9	11.9	5.9
Δ(A), dB	-26.2	-16.2	-8.6	-3.2	0	1.2	1.0	-1.2
(L- Δ), dB	5.7	19.8	22.3	20.7	19.9	17.2	12.9	4.8
LA, dBA	27.5							
LAдоп, dBA	-55							
ΔdBA	0							
ΔLAтр., dBA	0							

In order to verify and specify noise regime in the surrounding area, the acoustic calculation was performed for determining the distance (of boundaries of sanitary protection zone by noise factor) **R гр**, m, at which noise level do not exceed the acceptable values according to "State sanitary rules of planning and development of settlements dated 19.06.96, No. 173 "(Annex 16 item 2) /2/ and" Sanitary norms of acceptable noise in premises of residential and public buildings and in the territory of residential development: SN No. 3077-84 "(table 1. Item 9) (Table 1.p.9) /3/, using formulas (7) of SNiP II-12-77 /1/ under the condition that the noise level in the territory is **Lтер**, dB, which equals **Lдоп**, dB, which means

Lтер = Lдоп **(3),**

R гр, m, is determined using the following formula:

$$R_{гр} = 10^{1/15\,(L_{пр} - L_{доп} + 10\lg Ф - (P_{а\,г})/1000 - 10\lg\Omega)} \quad (4),$$

where: **Lp** пр - noise characteristic of the noise source or levels of sound power of the noise source, which went through the ducts or enclosing structures, which are determined using formulas (9) and (65), dB by

βa- noise fading in air, dB/km;

Φ - direction factor of the noise source;

Ω- space angle of emission.

Acoustic calculations of determining distance (of the sanitary protection zone by noise factor), at which noise levels do not exceed the acceptable values, for ventilation system fans was performed without taking into account the correction for tone character of fan noise, because standard requirements are complied in with at control points (see note to Table 1 /3/).
During conducting acoustic calculation, the principle of superposition and the effect of direction of noise sources.
Acoustic estimation of sanitary protection zone by noise factor was performed in the form of tables and is given in tables.
Analysis of results of acoustic calculation of sanitary protection zone boundaries of the designed facility by noise factor showed that it is not beyond the projection of the internal passages of automobile transport, projection of the territory of intended area and does not overlap the adjacent territory.
Sanitary protection zone of the designed facility by noise factor can be taken within the territory of the planned site and the sanitary protection zone by other harmful factors.

Estimation of sanitary protection zone by noise factor

Name of emission source (ІШ): multicyclone of the aspiration system
Direction factor ІШ - Φ = 1
Space angle of noise emission Ω= 4
Direction of noise distribution: pressurization side
Direction of noise distribution: N, S, E, W

Value	Reference to formula	Octave band centre frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
Lp, dB		72	76	83	82	81	76	69	57
ΔLp гл, dB		-2	-5	-18	-25	-20	-15	-12	-11
ΔLpпов,dB		0	0	0	0	0	0	0	0
ΔLpотк до, dB		-8	-4	-1	0	0	0	0	0
Lp пр, dB	9 /1/	62	67	64	57	61	61	57	46
10lgΦ, dB		0	0	0	0	0	0	0	0
10lg Ω, dB		-11	-11	-11	-11	-11	-11	-11	-11
ΔLp нап,dB		-10	-10	-10	-10	-10	-10	-10	-10
L доп.н, dB		-67	-57	-49	-44	-40	-37	-35	-33
ΔdB		0	0	0	0	0	0	0	0
15lgr, dB	7 /1/	-26	-11	-6	-8	0	3	1	-8
R гр., m	4	0	0	0	0	0	1.6	1.2	0

R гр= 1.6m

Estimation of sanitary protection zone by noise factor

Name of noise source (ІШ): fan of supply ventilation system
Direction factor ІШ - Φ = 1
Space angle of noise emission Ω= 2
Direction of noise distribution: Suction side
Direction of noise distribution: N, E, W

Value	Reference to formula	Octave band centre frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
Lp, dB		66	68	72	76	75	75	72	61
ΔLp гл, dB		-2	-5	-18	-25	-20	-15	-12	-11
ΔLpпов,dB		0	0	0	0	0	0	0	0

Value	Reference to formula	Octave band centre frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
ΔLротк до, dB		-8	-4	-1	0	0	0	0	0
Lp пр, dB	9 /1/	56	59	53	51	55	60	60	50
10lgΦ, dB		0	0	0	0	0	0	0	0
10lg Ω, dB		-8	-8	-8	-8	-8	-8	-8	-8
ΔLp нап,dB		-10	-10	-10	-10	-10	-10	-10	-10
L доп.н, dB		-67	-57	-49	-44	-40	-37	-35	-33
ΔdB		0	0	0	0	0	0	0	0
15lgr, dB	7 /1/	-29	-16	-14	-11	-3	5	7	-1
R гр.,m	4	0	0	0	0	0	2.2	2.9	0

R гр= 2.2m

Estimation of sanitary protection zone by noise factor

Name of noise source (ІШ) – boiler and process equipment

Direction factor ІШ - Φ = 1

Space angle of noise emission Ω= 4

Direction of noise distribution: smoke flue

Direction of noise distribution: W, S, E, W

Value	Reference to formula	Octave band centre frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
Lm, dB		66.9	56.2	50.2	46.7	52.2	39.7	39.7	35.7
ΔLpпов,dB		0	0	0	-1	-5	-7	-5	-3
ΔLротк до, dB		-13	-8	-4	-1	0	0	0	0
Lp пр, dB	9 /1/	53.9	48.2	46.2	44.7	47.2	32.7	34.7	32.7
10lgΦ, dB		0	0	0	0	0	0	0	0
10lg Ω, dB		-11	-11	-11	-11	-11	-11	-11	-11
ΔLp нап,dB		-10	-10	-10	-10	-10	-10	-10	-10
L доп.дн, dB		-67	-57	-49	-44	-40	-37	-35	-33
ΔdB		0	0	0	0	0	0	0	0
15lgr, dB	7 /1/	-34.2	-29.8	-23.8	-20.3	-13.8	-25.3	-21.3	-21.3
R гр., m	4	0	0	0	0	0	0	0	0

R гр= 0

Estimation of sanitary protection zone by noise factor

Name of noise source (ІШ) – automobile transport during moving in an out, and internal site transportation (working engine)

Direction factor ІШ - Φ = 1

Space angle of noise emission Ω= 4

Direction of noise distribution: N, S, E, W

Value	Reference to formula	Octave band centre frequencies (Hz)							
		63	125	250	500	1000	2000	4000	8000
Lp, dB		66	70	65	58	54	50	46	40
10lgΦ, dB		0	0	0	0	0	0	0	0
10lg Ω, dB		-11	-11	-11	-11	-11	-11	-11	-11
ΔLp нап,dB		-10	-10	-10	-10	-10	-10	-10	-10
L доп.дн, dB		-75	-66	-59	-54	-50	-47	-45	-43
ΔdB		0	0	0	0	0	0	0	0
15lgr, dB	7 /1/	-30	-17	-15	-17	-17	-18	-20	-24
R гр., m	4	0	0	0	0	0	0	0	0

R гр= 0

Conclusion

Performed acoustic calculations show that measures, provided by the project for protection from noise, ensure compliance with standard requirements for noise factor in the surrounding area.
Performed acoustic calculations showed that noise generated during operation of the designed facility comply with effective regulatory documents / 2, 3 / both for night and day time and total 32 dBA in control points Кт1-13 and 28 dBA in Кт2.
Sanitary protection zone of the object by the noise factor can be taken in projections of the planned area and sanitary protection zones by other harmful factors.
Thus, production activities, provided by the project, will not result in negative acoustic effects on the environment and social conditions of people.
Since the effectiveness of measures for protection against noise depends essentially on their technical implementation, it is necessary to control level of noise in the surrounding area, generated during mounting works, and tests of equipment .

References

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6. GOST 12.1.028-80 Occupational safety standards system. Noise. Determination of noise characteristics of noise sources. Survey method.

Main Standards Committee of the USSR, Moscow 1980

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6.6 Impact on social environment

Contaminants, generated during operation of the process equipment, will be negative factors of impact on social environment.

Calculations of diffusion of contaminants in the atmosphere showed that operation of the enterprise will ensure compliance with standard levels of contaminant emission to the atmosphere.

New production facility is completely automated and mechanized, which indicates an improvement in working conditions of staff and the high degree of operational safety of the explosive and hazardous production.

The project provides measures required by the rules and norms of safety, and labor protection, compliance with which ensures normal and safe operation of soybean processing complex.

Commissioning of soybean processing complex of Hlobyno Processing Plant LLC (Hlobyno-Meat Processing Plant LLC) will provide expansion of the market for selling agricultural products, development of fodder base for livestock, and create additional jobs in the region.

In general, the impact of the complex on social environment can be assessed as positive.

6.7 Impact on technological environment

This object affects technological environment and is likely to be affected by nearby technological objects.

In the impact area of the planned activity, there are no samples of architecture, history and culture.

The negative impact on the technological environment may be a result of a possible accident. However, a set of measures for prevention of emergencies was prepared at each project stage, as well as ways and means of quick elimination of accident consequences.

Measures to ensure the operational reliability and preserving surrounding technological environment objects are described in this documents. They are aimed at protection of the facility, which in turn ensures the preservation of the technological environment.

Thus, the impact of technological processes on technological environment at the enterprise can be assessed as acceptable.

6.8 Impact on flora and fauna

The technological process is performed in the industrially developed area, therefore no negative impact on flora and fauna will be detected.
There are natural preserves objects and territories, prospective for preserves (reserved for this purpose). There are no migration routes of animals and birds in the area of the constructed facility.
The project provides that area free of building will be sown with grass.
Before green planting, the plant soil is added: 10 cm of soil under lawns.

6.9 Risk assessment of planned activity's impact on the environment

Risk assessment of planned activity's impact on the environment was performed for objects listed in Annex F, DBN A.2.2-1-2003, and includes the following:

- Risk assessment of the impact of the planned activity on public health;

- Risk assessment of impact of the planned activity on society.

Risk assessment of planned activity's impact on the environment was performed according to amendment 1 to DBN A.2.2-1-2003.

Risk assessment of planned activity's impact on public health

Risk assessment of impact of air pollution on public health is performed based on estimation of development of carcinogenic and carcinogenic effects.

The risk of carcinogenic effects is determined by calculating hazard index (HI):

$$HI = \sum HQ_i \qquad \text{(H.1)}$$

Where HQi are hazard coefficients of individual substances, which are determined according to the following formula:

$$HQ_i = \frac{C_i}{R_f * C_i} \qquad \text{(H.2)}$$

Where C_i is the estimate average annual concentration of *i* substance, mg/m ^{3};

$R_f * C_i$ is the reference (safe) concentration of *i* substance, mg/m ^{3}.

Assessment of non- carcinogenic risk is performed according to addition H, table H .1 (Amendment 1 to DBN A. 2.2.1-2003.)

Table 12 Criteria of non-carcinogenic risk

Risk characteristics	***Hazard factor (HQ)***
Very low risk if harmful effects	**<1**
Maximum value of accepted risk	**1**
Probability of development of harmful effects is increasing proportionally to increase in HQ	**>1**

Due to the fact that the influential factors in determining the estimated average concentration of *i* substance on the boundary of residential development on the designed facility are

- Calculation of surface concentrations on the boundary of residential development, direction and wind speed relative to the facility;
- Duration of contaminant emission from the designed facility during a year,

Software complex Еол+ (EOL+) v5.21 was used for determination of surface concentrations on the boundary of the residential development, in fraction of MAC

Settled territory of Hlobyno city is the near residential territory to this facility.
For hazardous substances, for which indicators of surface concentrations do not exceed background values, estimations were not given.
Estimation of risk of development of non-carcinogenic effects are given in Table 13
Table 13

Non-carcinogenic substance	Surface concentration, Ci, proportion of MAC	Background concentration, Ci, proportion of MAC	Reference concentration, Rf*Ci, mg/m ^{3}	Average annual concentration, Ci, mg/m ^{3}	Risk factor, Hqi
Nitrogen dioxide	0.54	0.15	0.04	0.072	1.8
Soot	0.52	0.4	0.15	0.018	0.12
Sulfur dioxide	0.25	0.2	0.08	0.025	0.31
Carbon monoxide	0.34	0.3	3	0.2	0.06
Mineral lubricant	0.44	0.4	0.05	0.002	0.04
Saturated hydrocarbons	0.43	0.4	1	0.03	0.03
Suspended substances	0.44	0.4	0.05	0.02	0.2
Risk index					**2.56**

Index danger of the designed facility is 2.56, which is greater than one, the limit value of the taken risk level.
Calculation of the risk of development of individual carcinogenic effects (ICR,) from substances, which have carcinogenic effects during combustion of fuel in internal combustion engines was not performed in this report, because Ukraine has no approved calculation methods for determining emissions of carcinogens, including benzopyrene. Because of that assessment of carcinogenic risks of impact of planned activity of the designed facility on human health was not performed.
Non-carcinogenic risk to public health from the influence of nitrogen dioxide in the air cannot be considered acceptable, harmful effects may appear. Non-carcinogenic risks to public health from the influence of other substances are extremely small and can be considered acceptable.

All hazardous substances, which are released into the atmosphere from emissions sources, have no carcinogenic effects on human health. Therefore, the level of carcinogenic risk is zero.

Assessment of social risk of the planned activity
Social risk if the planned activity is defined as the risk for a group of people, which may be affected by implementation of the business facility, taking into account peculiarities of natural and man-made system.
The value of social risk (Rs) for assessment is determined by the following formula:

$$R_s = CR_a * V_u * \frac{N}{T} * (1 - N_p) \quad \text{—} \quad \text{(I.1)}$$

where Rs is the social risk , person/year;
CRa is carcinogenic risk of the combined effect of several carcinogenic substances which

contaminate the atmosphere, specified by Annex G or is taken *CRa* = 1*10^{-6}, dimensionless;

We take CRa = 1*10^{-6}

Vu is vulnerability of the area from the effects of air pollution, which is determined by the ratio of the area under the facility of the economic activity (5.75 hectares) to the object of the facility with the sanitary protection zone (10.65 ha), proportion;

Vu = 5.75/10.65 = 0.54

N is the number of residents, which is determined a)by data of the urban district in the settlement, where the facility is located, if any; b) by data of the whole settlement, if it has no urban districts, or if the project has city development value; c) by data of settlements in the sphere of influence of the designed object, if it is locate beyond their boundaries, persons;

N= 12 801 person (Quantity of Hlobyno residents, according to the census of 2001);

T is the average life expectancy (determined for this region or taken as 70 years), persons/year;

We take T= 70 years;

NP is the coefficient, determined using the formula (I.2) for construction of the new facility, and using formula (I.3 for reconstruction of the facility, in case number of working places remain the same *Np* = 0.)

$$N_p = \frac{\Delta N_p}{N} \qquad \text{(I.2)}$$

$$N_p = \frac{\Delta N_p}{N_{rm}} \qquad \text{(I.3)}$$

where N_p is the number of additional working place (in case of reduction with minus sign);

N_p =111 persons

N is the number of people, taken in formula (I.1);

N_{rm} - previous quantity of working places.

Np=ΔNp/N=111/12801=0.0086

Then estimated value of social risk *(Rs)* is determined using the following formula (I.1):

$$R_s = 1*10^{-6} * 0.54 * \frac{12801}{70} * (1 - 0.0086) = 0.000098 \text{person/year}$$

Results of estimation of social impact of the planned activity are given in Table 14.

Table 14 Estimation of social impact assessment

Name	Designator	Measur. unit	Indicator
Carcinogenic risk of the combined effect of several carcinogenic contaminants in the atmosphere	CRa	-	1*10^{-6}
Area, allocated for the business facility	Fоб	Hectare	5.75
Area of the facility with the sanitary protection zone	Fоб	Hectare	9.94
Vulnerability of the territory to effects of air pollution	Vu	Proportion	0.55
Area of estimated site of surface concentrations	FC	Sq. km	4

Name	Designator	Measur. unit	Indicator
Population (Hlobyno city) located in the area of impact of the designed facility, which is located outside its borders	N	person	12801
Average life expectancy (determined for this region or taken as 70 years)	T	year	70
Coefficient, determined using formula (I.3) for reconstruction of the facility, on condition that number of working places remains the same	Np	person	0.0076
Social risk of planned activity	Rs	pers/year	**0.000098**

Then level of social risk during lifetime of this facility is 0.000098 (person/year), which is less than $10^{-4} \div 10^{-6}$, (according to Annex I), which is conditionally acceptable for the planned activity.

Table 15. Classification of social risk levels

Risk level	*Risk value*
Unacceptable for professional workforce and population	**$>10^{-3}$**
Acceptable for professional workforce and unacceptable for population	**10^{-3} - 10^{-4}**
Conditionally acceptable	**10^{-4} - 10^{-6}**
Acceptable	**$< 10^{-6}$**

Risk assessment of the impact of the planned activity on components of the environment

Indicators of technological risk (risk of impact of the facility or its planned activity on the environment) are determined in two stages. At the first stage , the risk of impact of the business facility on the environment components is determined using the formula (1), which establishes a projected level of technological risk during design. At the second stage, the indicator of risk of impact of each specific contaminant to respective components of the environment is determined using the formula (1). Risks at the first and second stages are determined for objects in which such risks can be really present.

$$R_{kj}=A*e^{B-e^{D_{kj}}} \quad (1)$$

Where R_{kj} is risk of k stage by j component of the environment; A and B are constants (A=4.99·10^{-6}, B=-7.557); D_{kj} is the value, determined according to k stage of risk estimation by j component, which is calculated using the formula (2).

$$D_{kj}=-e^{I_{kj}-1} \quad (2),$$

where I_{kj} is the contamination index by j component of the environment (atmosphere, hydrosphere and soil) for k stage of risk estimation, dimensionless, is determined by Table 16.

Table 16. Determination of contamination index of environment components

Component of the environment	First stage (k=1)		Second stage (k=2)	
	Initial data	Estimated dependence Ikj	Initial data	Estimated dependence Ikj
Atmosphere (j=1)	OE – Order of exceeding standards, dimensionless	0.25 *OE*	IC_i – Indicator of contamination by *i* substance in the atmosphere, %;	0.0025 IC_i
Hydrosphere (j=2)	IWC– Index of water contamination by indicators, dimensionless	0.2 *IWC*	IWC_i – Index of water contamination by *i* indicator of hydrosphere pollution, dimensionless	0.2 IWC_i
Soil (j=3)	Zc – Cumulative indicator of soil contamination, dimensionless	0.016 *Zc*	Kc_i – Coefficient of concentration of *i* chemical substance, which contaminates soil, dimensionless	0.016 Kc_i

Assessment of risk level is performed according to Table 17.

Table 17. Classification of risk levels of environmental impact of the planned activity

Risk level	Risk value
Non-acceptable	$>10^{-6}$
Acceptable	10^{-6} - 10^{-8}
Unconditionally acceptable	$< 10^{-8}$

At the first stage, on the basis of the received value, a decision is made on acceptability of the planned activity by this component of the environment, its improvement (for example, improvement of wastewater treatment systems, etc.), or rejection of the project.

At the second stage, on the basis of the received values, a decision is made on acceptability of the planned activity by each specific substance (indicator) of the respective component of the environment.

Determination of the impact is performed for the atmosphere, j=1

Nitrogen oxides (NOx):

Jkj=0.54 MAC

Dkj= - $2.71^{(0.25*0.54)-1}$= - 0.42105

R= $4.99*10^{-6}*2.71^{-7.557*2.71^{-0.42105}}$ =$3.49*10^{-8}$

As the estimated risk factor R=10^{-8} <$3.49*10^{-8}$<10^{-6}- according to Table 2, the level of risk to the environment is characterized as acceptable.

Carbon monoxide (CO):

Jkj=0.34 MAC

Dkj= - $2.71^{(0.25*0.34)-1}$= - 0.4005

R= $4.99*10-6*2.71^{-7.557*2.71^{-0.4005}}$ =$3.25*10^{-8}$

As the estimated risk factor R= 10^{-8} <$3.25*10^{-8}$<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Soot:
Jkj=0.52 MAC
Dkj= - $2.71^{(0.25*0.52)-1}$= - 0.41895

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.41895}}$ =3.46*10-8
As the estimated risk factor R= 10^{-8} <3.46*10^{-8}<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Sulfur dioxide (SO_2):
Jkj=0.25 MAC
Dkj= - $2.71^{(0.25*0.25)-1}$= - 0.39161

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.39161}}$ =3.01*10^{-8}
As the estimated risk factor R= 10^{-8} <3.01*10^{-8}<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Hydrocarbons (C^{12}-C^{19}):
Jkj=0.43 MAC
Dkj= - $2.71^{(0.25*0.43)-1}$= - 0.40963

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.40963}}$ =3.3*10^{-8}
As the estimated risk factor R=3.3*10^{-8}<10^{-6}-10^{-8} according to Table 2, the level of risk to the environment is characterized as acceptable.

Benzopyrene:
Jkj=0.44 MAC
Dkj= - $2.71^{(0.25*0.44)-1}$= - 0.41066

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.41066}}$ =3.32*10^{-8}
As the estimated risk factor R= 10^{-8} <3.32*10^{-8}<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Sulfuric acid :
Jkj=0.4 MAC
Dkj= - $2.71^{(0.25*0.4)-1}$= - 0.40657

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.40657}}$ =3.25*10^{-8}
As the estimated risk factor R= 10^{-8} <3.25*10^{-8}<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.
Suspended substances:
Jkj=0.44 MAC
Dkj= - $2.71^{(0.25*0.44)-1}$= - 0.41066

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.41066}}$ =3.32*10^{-8}
As the estimated risk factor R= 10^{-8} <3.32*10^{-8}<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.
Petroleum mineral lubricant:
Jkj=0.44 MAC
Dkj= - $2.71^{(0.25*0.44)-1}$= - 0.41066

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.41066}}$ =3.32*10^{-8}
As the estimated risk factor R= 10^{-8} <3.32*10^{-8}<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Sodium hydroxide :

Jkj=0.4 MAC

Dkj= - $2.71^{(0.25*0.4)-1}$= - 0.40657

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.40657}}$ =$3.25*10^{-8}$

As the estimated risk factor R= 10^{-8} <$3.25*10^{-8}$<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Metallic mercury :

Jkj=0.4 MAC

Dkj= - $2.71^{(0.25*0.4)-1}$= - 0.40657

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.40657}}$ =$3.25*10^{-8}$

As the estimated risk factor R= 10^{-8} <$3.25*10^{-8}$<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Methane :

Jkj=0.4 MAC

Dkj= - $2.71^{(0.25*0.4)-1}$= - 0.40657

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.40657}}$ =$3.25*10^{-8}$

As the estimated risk factor R= 10^{-8} <$3.25*10^{-8}$<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Hexane :

Jkj=0.4 MAC

Dkj= - $2.71^{(0.25*0.4)-1}$= - 0.40657

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.40657}}$ =$3.25*10^{-8}$

As the estimated risk factor R= 10^{-8} <$3.25*10^{-8}$<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Ammonia:

Jkj=0.4 MAC

Dkj= - $2.71^{(0.25*0.4)-1}$= - 0.40657

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.40657}}$ =$3.25*10^{-8}$

As the estimated risk factor R= 10^{-8} <$3.25*10^{-8}$<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Ethanol :

Jkj=0.4 MAC

Dkj= - $2.71^{(0.25*0.4)-1}$= - 0.40657

R= 4.99*10-6*$2.71^{-7.557*2.71^{-0.40657}}$ =$3.25*10^{-8}$

As the estimated risk factor R= 10^{-8} <$3.25*10^{-8}$<10^{-6} according to Table 2, the level of risk to the environment is characterized as acceptable.

Due to the abovementioned, the conclusion may be made that the designed facility has insignificant impact on the environment. Measures, listed in section 11, will ensure reliable and long-term operation of the designed facility and lower impact on the atmosphere. Analysis of the impact on the designed facility on the environment, natural and artificial components of surrounding territory showed that impact of the facility should be rated as local and acceptable.

7.Impact on the environment during construction

The project provides construction of new and reconstruction of existing buildings and structures:
Building No. 25 – Treatment department;
Building No.25.1 – Grain elevator tower (for supplying soybeans from the daily bunker to production);
Building No.25.2 – Automobile transport waste loading station;
Building No.25.3 – Receiver park;
Building No.25.4 – Chiller platform;
Building No. 25.5 – Pallet of the buffer tank;
Building No.26 – Process rack No.1;
Building No.27 – Extraction department;
Building No. 27.1 – Return petrol storage;
Building No. 27.2 – Petrol trap;
Building No. 27.3 – Tank car loading and receiving rack;
Building No. 30 – Solvent cake and husk transfer point ПУШЛ 3.7х3.7+5 (PUSHL 3.7x3.7+5);
Building No. 31 – Husk storage station;
Building No. 32 –Transport husk loading section;
Building No. 33 – Oil feed tanks;
Building No. 34 – Pumping station of oil feed tanks;
Building No. 35 – Tank car loading station;
Building No. 36 – Railway tank car loading station;
Building No. 37 – Process rack No.2;
Building No. 38 – Process rack No.3;
Building No. 39 – Process rack No.4;
Building No. 40 – Production laboratory;
Building No. 41 – Boiler plant;
Building No. 42 – 42 Electric control room. Operator room;
Building No. 43.1 – 43.1 Transformer substation;
Building No. 43.2 – 43.1 Transformer substation;
Building No. 44.1.2 – Wells (2) (existing);
Building No. 45 – Tower cooler;
Building No. 46 – Railway car weighting station;
Building No. 47 – Rainwater tank;
Building No. 48 – Check point;
Building No. 51 – Fire reserve water tank;
Building No. 52 – Workshop (reconstruction);
Building No. 53 – Waste site;
Building No. 54.1.2 – Generator;
Building No. 55 – Site for private cars;
Building No. 56.1.2 – Recreation site;
Building No. 57 – Fire pumps control station.

During the preparation period, the following activities must be performed:

- Develop and approve the projects of activities;
- Obtain certificates and test all hoisting machines and devices;
- Create a geodesic layout base for the construction;
- Clear the area of the construction site;
- Dismantle buildings and structures in the area of construction;
- Dismantle concrete and asphalt surfaces;
- Perform priority tasks on planning the territory for providing temporary drains of surface water;
- Construct permanent internal roads;
- Arrange storage sites, temporary buildings and structures;
- Transfer existing and install new networks (if necessary).

During the main period, the following activities must be performed:

- Establish foundations;
- Mount metal structures;
- Install manufacturing equipment;
- Perform landscaping.

Construction is performed by independent streams, which are divided into specialized activities:

- Earth works;
- Driving piles under grillage of buildings and structures;
- Manufacture of reinforcing and embedded parts for structures of the underground phase;
- Performance of formworks;
- Concreting of monolithic foundations and grills,
- Mounting of prefabricated structures of the underground phase;
- Mounting of metal structures

Works on construction of conveyor gallery, ramps, utility networks must be executed simultaneously with the construction of main buildings and structures.

When choosing optimal technical solutions, it is necessary to consider the current state of the construction area, hydrogeological and climatic characteristics of the area, the need to create an organized recreation zone in this area.

The project provides for construction of one process construction site directly next to the constructed facility. On this site warehouses, welfare rooms for works and sites for assembling pre-manufactured concrete structures are located.

After completion of construction, existing surfaces and green planting, damaged by the construction, will be restored.

Sources of contamination of the environment during construction

Table 18

Works	Equipment	Emitted hazardous substances
Territory planning, filling and back-filling of gravel, sand and limestone	Engines of construction machines	Carbon monoxide Nitrogen dioxide Sulfur dioxide Soot Saturated hydrocarbons Benzopyrene
Territory planning, filling and back-filling of soil, gravel, sand and limestone	Filling and excavation	Nonorganic dust
Welding works	Welding stations	Manganese and its compounds Iron oxide Silicon compounds Fluoride compounds Calcines
Painting works	Air-brushes	Solvents Waste containers

1. Emissions during loading of cargo

Estimations were done according to the "Collection of methods for calculating content of contaminants in emission of uncontrolled source " UkrNTEK, Donetsk City. All references refer to this method.

The maximum one-time amount of dust released into the atmosphere during loading of soil by excavator to dump trucks is calculated using the following formula:

$G_3 = P_1 * P_2 * P_3 * P_4 * P_5 * P_6 * g$ ton

where P_1 - weight part of dust fraction in the material [Table 4.3.1, p.95] P_1 = 0.03;
P_2- fraction of dust, which turns to aerosol [Table 4.3.1, p.95]; P_2=0.02
P_3- coefficient, which takes into account speed of wind [Table 4.3.2, p.96]; P_3=1.7
P_4- coefficient, which takes into account moisture of the material [Table 4.3.4, p.96]; P_4=0.01
P_5-- coefficient, which takes into account fineness of the material [Table 4.3.5, p.96]; P_5=0.2
P_6- coefficient, which takes into account local weather conditions [Table 4.3.3, p.96]; P_6=1
g - volume of soil, processed by the excavator, 30 000 m^3 (density 1.94-1.97 t/m^3); 58200 t during construction period.

Nonorganic dust(contaminant code- 2908)

Π_{ton} = 0.03*0.02*1.7*0.01*0.2*1*58 200 = 0.218 t

2. Filling of sand

Q = k1* k2* k3* k4* k5* k7*G*B [p.97], g/s

Where k1- weight part of dust fraction in the material [Table 4.3.1, p.95]; k1=0.05
k2- fraction of dust, which turns to aerosol [Table 4.3.1, p.95]; k2=0.03
k3- coefficient, which takes into account local weather conditions [Table 4.3.2, p.96]; k3=1.7
k4- coefficient, which takes into account local conditions [Table 4.3.3, p.96]; k4=1
k5 - coefficient, which takes into account moisture of the material [Table 4.3.4, p.96]; k5=0.01 k7 - coefficient, which takes into account fineness of the material [Table 4.3.5, p.96]; k7=1
B - coefficient, which takes into account height of filling of the material [Table 4.3.7,p.97]; B=0.7

G – productivity by material, ton; G=1751.33 m^3 (density 2.6 t/m^3); 4553.5 tons during construction period.

Nonorganic dust with content of SiO_2 >70% (contaminant code-2907)

Π_{ton} = 0.05*0.03*1.7*1*0.01*1*0.7*4553.5 = 0.081 t

3. Filling of gravel

Calculation is similar to the previous item.

Nonorganic dust with content of SiO2 from 20 to70% (contaminant code-2908)

Π_{ton} = 0.04*0.02*1.7*1*0.01*0.5*0.7*4553.5 = 0.086 t

Where 18062.2 is productivity by gravel.

4. Welding and painting works

Electric welding using AC current

Estimation of contaminant emission from electric welding is performed according to "Collection of emission indicators (specific emission) of contaminants into the atmosphere by various industries," volume No.1".
Estimation of emission of contaminants into the atmosphere is performed using the following formula:

$$П = M * q * 10^{-6}, t$$

where M is the mass of consumed electrodes, kg. The project provides using 11.914 t (11 914 kg) of electrodes of Э42А (E42A) grade.

q – specific emission of contaminants during electric welding, g/kg:

- Iron oxide (Fe_2O_3) – 8.57 g/kg;
- Manganese oxide (MnO_2) – 1.0 g/kg;
- Chromium oxide (Cr_2O_3) - 1.43 g/kg;
- Fluorides poorly/well soluble – 0.75 / 1.5 g/kg;
- Hydrogen fluoride (HF) – 0.001 g/kg;

10-6 – conversion coefficient from g to ton.

Therefore, total emission of contaminants during welding works:

- I**ron oxide** (Fe_2O_3): 8.57 * 11 914 * 10^{-6} = 0.202 t;
- **Manganese oxide** (MnO_2): 1.0 * 11 914 * 10^{-6}= 0.011 t;
- **Chromium oxide** (Cr_2O_3): 1.43 * 11 914 * 10^{-6} = 0.017 t;
- **Fluorides poorly/well soluble:** 0.75 * 11 914 * 10^{-6} = 0.0089 t;
- **Fluorides well soluble**: 1.5 * 11 914 * 10^{-6} = 0.017 t;
- **Hydrogen fluoride (HF)**: 0.001 * 11 914 * 10^{-6} = 1.2 * 10^{-5} t

Waste produces during welding

In the process of welding, stubs of welding electrodes, slime from burning and dispersion of metal are generated.
During welding works, 11.914 t (11 914 kg) of grade E42A electrodes will be used. Diameters of electrodes: 2, 4, 5, 6 mm.
The standard of waste generation (in the form of stubs), according to construction regulations RDS 82-202-96, using welding electrodes E42A, is 7% of the electrode consumption (at rod length of 450 mm and diameter of the rod more than 3 mm).

Nstub = 11.914 * 0.07 = 0.834 t.

The standard of welding slime generation for all types of electrodes is 11% of electrode consumption (less emission to the atmosphere).
According to the abovementioned calculations, total emissions to the atmosphere during welding is 0.834 t.

N∑slime = 11.914 * 0.21 – 0.834 =0.47654 t.
Therefore, quantity of waste generated during welding, totals:
Nwelding = 0.834 + 0.47654 = 1.31 t.
General contractor must conclude an agreement with a specialized company on disposal of waste, generated during welding, for further recycling.
Used metal containers, including shallow containers
During construction and repair works, paint-and-lacquer materials will be used, including:

- water-based paint – 3.276 t;
- enamel XB-124 (KhV-124) – 3.812 t;
- primer ГФ 021 (HF 021)– 35.728 t;

Waste generation is calculated using the following formula:

$$N = \frac{Q}{v} * m,$$

where Q is the consumption of paint-and-lacquer materials, t; Q = 3.276 + 3.812+35.728= 42.716 t
v – capacity of metal paint containers, t. v = 0.01 t;
m – weight of 1 metal container, t. m = 0.0012 t.
Ncont = (42.716 /0.01) * 0.0012 = 5.226 t.
Paint works
During construction works, the following paint-and-lacquer materials are used:

- enamel XB-124 (KhV-124) – 3.812 t;

- primer ГФ 021 (HF 021)– 35.728 t;

Paint-and-lacquer materials are applied using air-brushes. Average productivity of an air brush is 2 kg/hour.

Estimation of contaminant emission during application of paint-and-lacquer materials is performed according to "Collection of methods for calculating emissions of contaminants into the atmosphere by various enterprises". L. Gidrometeoizdat. 1986.

Enamel XB-124 (KhV-124)

Mass of substances in the form of aerosol in paint-and-lacquer materials, which are emitted during application on surfaces:

$П_{ок.а.} = M_{n.c.} * Sa/100 * 10^{-3}$,

where $П_{ок.а.}$ is mass of substances in the form of aerosol in paint, t;

$M_{n.c.}$ is the nonvolatile content of paint-and-lacquer materials, used for coating, kg.

Enamel XB-124 (KhV-124) contains 45% of nonvolatile content and 55% of volatile matter, solvent.

Accordingly, mass of the nonvolatile content of paint-and-lacquer materials totals:

$M_{n.c.} = 3.812 * 0.45 = 1.7154$ kg

Sa is the fraction of paint, which is emitted as aerosol, %, according to "Collection of methods", During pneumatic spaying Sa = 30%.

$П_{ок.а.} = 1.7154 * 30/100 = 0.5146$ t.

Primer ГФ 021 (HF 021)

Primer ГФ 021 (HF 021)contains 72% of nonvolatile content and 28% of volatile matter, oil varnish.

Accordingly, mass of the nonvolatile content of paint-and-lacquer materials totals:

$M_{n.c.} = 35.728 * 0.72 = 25.724$ kg

Mass of substances in the form of aerosol in paint-and-lacquer materials, which are emitted during application on surfaces:

$П_{ок.а.} = 25.724 * 30/100 = 7.72$ t.

Total mass of substances in the form of aerosol in paint-and-lacquer materials, which are emitted during application on surfaces:

0.5146 + 7.72 = 8.2346 t.

Solvents

Solvent (White spirit) is discharged during application and drying of enamel XB-124 (KHV-124). All solvent is emitted to the atmosphere.

Quantity of solvent, discharged during application and drying of enamel XB-124 (KHV-124), is determined by concentration of volatile matter, 55%:

$M_{y.c.} = 3.812 * 0.55 = 2.097$ t

5. Automobile transport and specialty vehicles

Use of automobile transport and specialty vehicles is planned for transportation of construction materials and performing construction works

Calculation of contaminants emission from combustion of fossil fuels (petrol, diesel fuel) were performed according to "Collection of methods for calculating content of contaminants in emissions of uncontrolled sources of atmosphere contamination". UKRNTEK JSC, Donetsk City.

According to Table 4.3.13 of this Collection, indicative emissions of contaminants per 1 ton of fuel burnt in internal combustion engines, total:

Diesel fuel

- carbon monoxide – 0.2 t/t;
- hydrocarbons – 0.03 t/t;
- nitrogen dioxide – 0.04 t/t;
- soot – 0.0155 t/t;
- sulfur dioxide - 0.02 t/t;
- benzopyrene - $0.32*10^{-6}$ t/t

Petrol

- carbon monoxide – 0.6 t/t;
- hydrocarbons – 0.2 t/t;
- nitrogen dioxide – 0.04 t/t;
- soot – $0.58*10^{-3}$ t/t;

- sulfur dioxide - 0.002 t/t;
- lead – $0.3*10^{-3}$ kg/t;
- benzopyrene - $0.23*10^{-6}$ t/t

Diesel fuel consumption by the automobile transport and specialty vehicles during construction totals 76 tons. Accordingly, emission of contaminants during burning of diesel fuel totals:
- carbon monoxide – 0.2 * 76 = 7.6 t;
- hydrocarbons – 0.03 * 76 = 2.28 t;
- nitrogen dioxide – 0.04 * 76 = 3.04 t;
- soot – 0.0155 * 76 = 1.278 t;
- sulfur dioxide - 0.02 * 76 = 1.52 t;
- benzopyrene - $0.32*10^{-6} * 76 = 2.4*10^{-4}$ t,

Petrol consumption by the automobile transport and specialty vehicles during construction totals 21 ton. Accordingly, emission of contaminants during burning of petrol totals:
- carbon monoxide – 0.6 * 21 = 12.6 t;
- hydrocarbons – 0.2 * 21 = 2.2 t;
- nitrogen dioxide – 0.04 * 21 = 0.84 t;
- soot – $0.58 * 10^{-3} * 21 = 0.012$ t
- sulfur dioxide - 0.002 * 21 = 0.042 t;
- lead – $0.3 * 10^{-3} * 21 = 0.0063$ t
- benzopyrene - $0.23 * 10^{-6} * 21 = 4.8 * 10^{-6}$ t

Total emission of contaminants into the atmosphere from automobile transport an specialty vehicles:
- **carbon monoxide** – 7.6 + 12.6= 20.2 t;
- **hydrocarbons** – 2.28 + 2.2 = 4.38 t;
- **nitrogen dioxide** – 3.04 + 0.84 = 3.88 t;
- **soot** – 1.278 + 0.012 = 1.9 t;
- **sulfur dioxide** – 1.52 + 0.042 = 1.562 t;
- **lead** - 0.0063 t,
- **benzopyrene** – $2.4*10^{-4} + 4.8 * 10^{-6} = 2.45 * 10^{-4}$ t.

7.1. Waste during construction and mounting works

Installation of storage hoppers for construction waste with further disposal.

Waste, generated at the construction phase:

- Construction waste. Disposed of at the landfill.
- Waste from electrodes is stored in the container and is disposed as metal scrap.
- Domestic waste is stored in the waste container and is disposed of at the landfill.
- Waste lubricant of construction vehicles is poured into sealed containers and transported for processing.

Waste generated at the works stage:

Construction waste. During construction, the amount of construction waste will total approximately 150 tons (hazard class IV). Waste is disposed of at the landfill.

Waste from the electrodes is stored in the container. Quantity of waste is 1.31 ton (hazard class IV). Waste is disposed of as metal scrap.

Used metal containers, including shallow, are stored in the container. Quantity of waste is 5.226 ton (hazard class IV). Waste is sent for metal scrap.

Domestic waste is stored in the waste container and is disposed of at the landfill. Workforce need is specified based on budgeted labor intensity and average estimated production per worker, it is 250 people. Quantity of waste will be approximately 20 tons (hazard class IV). Waste is disposed of at the landfill.

7.2. Measures for environmental protection

The main sources of air pollution during preparatory and construction works are: construction machinery (bulldozers, excavators, dump trucks, cranes and other vehicles) arriving and leaving the construction site, welding works. Those sources are uncontrolled and contaminants cannot be captured.

The construction site should be kept clean. Construction waste and garbage must be removed daily from the work sites and from the construction area to the landfill.

If heating bitumen or mastic is necessary, it should be performed in special devices. It is prohibited to start fires for heating bitumen or mastic, which lead to the emission of smoke and fumes into the air. Wheels of cars, which leave the territory of the construction site, must be cleaned and the dirt should be washed off.

In order to reduce the impact on the environment during the construction period, the construction project must provide the following activities:

1. Construction materials and products must be stored in designated sites. Burying of defective prefabricated elements on the construction site is prohibited .
2. During layout works, the soil layer, suitable for further use, must be stored. Upon completion of construction works, this soil must be used for vertical planning and arranging of the site.
3. Growing trees and shrubs, which do not prevent construction, must be preserved during construction on the site. It is prohibited to fill the soil on crowns and trunks of trees.
4. During winding-up of construction works, all construction waste from the site must be disposed of at the landfill.
5. The arrangement plan provides complete restoration of areas, disturbed during construction.

8.Monitoring

Monitoring is the system of observation, collection, processing, storing and analyzing of data on the status of water bodies, soil and air, forecasting its changes and development of scientifically justified recommendations for making corresponding decisions.

Monitoring of the atmosphere

Departmental control over emissions from the equipment must be performed according to permit for discharging contaminants into the air, which will be obtained at the stage of facility commissioning, according to the Order of the Ministry of Environmental Protection of Ukraine No.108 dated 09.03.06 "On approval of regulations on general requirements for documents, justifying volumes of emissions of contaminants into the air, for obtaining permits for discharging contaminants by stationary sources for enterprises, institutions, organizations and individuals - entrepreneurs".

Monitoring of soil

During operation of this facility, there is no impact on soil, because domestic and industrial waste waters are discharged into the internal site sewer system, and solid domestic waste is stored in closed containers at the special concreted site and is disposed of at the landfill.

Monitoring of impact on soil is not needed.

The analysis showed that the technological solutions were developed according to effective rules and regulations on environmental protection and sanitation. The proposed technical and layout solutions are focused on utilizing best Ukrainian an international practices, ensuring reliability and safety of system operation, minimal emissions of contaminants into the environment.

This facility complies with all standards and requirements of Laws of Ukraine "On air protection", "On environmental protection", "On ensuring sanitary and epidemiological welfare of the population," Land Code of Ukraine and State sanitary rules No.173 dated 19.06.1996, state construction norms DBN-360-92-55 item 7-55 /"Planning and development of urban and rural settlements" /, GSP-96 "Planning and development of settlements", **it does no negative effect on the environment.**

According to item 4 of DBN A 2.2-1-2003 "Structure and content of materials for assessment of environmental impacts during design and construction of enterprises, buildings and structures," works performed in the framework of this project, and facility's activity **do not pose environmental hazard**.

9.Accidents

Solvent, used in the extraction process, is flammable liquid mixture, which forms explosive mixture with air. Soy beans, oil, solvent cake and husk, waste soybeans are combustible materials.

Measures for ensuring fire safety:

- Protection of structural elements from destruction during fire is provided by using standard prefabricate reinforced concrete and metal structures with the required fire-resistance rating (fire resistance degree IIIa). Construction structures of the soybean processing complex comply with requirements of "Fire safety rules of Ukraine" and construction norms and regulations;
- Access ways with width 4.5 and 6.0 m with asphalt surface are provided for all buildings and structures;
- Water tanks with fire reserve of water are provided on the territory of the enterprise. For external fire extinguishing, the ring fire and domestic water supply system with fire hydrants is provided;
- The project of automatic fire extinguishing, automatic fire alarms and fire notification provides the following fire prevention measures:
    - According to effective norms and regulations, production buildings are equipped with automatic fire extinguishing and fire alarm systems;
    - Signal from the receive and control device of the fire extinguishing system is installed into the attendant's post and the centralized observation station of fire guards;
    - Production buildings of the enterprise have direct telephone lines to the fire department;
    - Installation of manual fire alarms on the production area;
    - System of alerting the personnel about the fire;
    - Internal fire water pipes with hydrants;
    - Automatic shutdown of ventilation system when the fire alarm goes off;
- Evacuation of people in case of fire is provided according to requirements of DBN V.1.1-7-2002 "Fire safety of construction objects" through doors and gates, where pedestrian and transport road lead, and through the stair ladders leading directly outside;
- Platforms and pathways are fenced and provide unhindered movement and safety of personnel, evacuation of people in case of fire in minimal time;
- In case of fire, smoke is removed by opening windows and transoms.
- Electrical equipment and lighting comply with requirements of electrical equipment installation;
- Preventive measures against spilling flammable liquids outside the premises are provided (ramps). Feeding tanks are installed in the appropriate tray to limit spill in case of emergency. The site for a car tank during loading is flanged to limit spill in case of emergency.
- Sampling of soybeans and oil by mechanized devices is performed only in allowed places and in quantity, provided by the regulations. Unused residues of samples are stored in the specially equipped site and must be disposed of in timely manner;
- Technological equipment is grounded. Lightning and static electricity protection is provided;
- Places of filling flammable materials have the free fall height not more than 0.5 m;
- To prevent the accumulation of combustible dust, elevators, conveyors, hoppers, and separators are equipped with aspiration systems with dust removal;
- Aspiration systems are synchronized with launching devices of the process equipment;
- It is prohibited to remove dust from hard to reach places by blowing it out with compressed air;
- Devices have no internal ignition sources (sparks, overheating, etc.). Elevator buckets are made of materials that do not generate sparks. To prevent dust generation during unloading hoppers and silos, mechanisms that ensure a uniform supply of combustible materials and exclude possibility of their dispersion, are used. Places of filling are closed;

- "Breathing pipelines" of tanks and vessels with oil are equipped with firewalls;

- Smoking on the production territory is prohibited, except specially equipped places.

The following organization and technical measures to prevent fires are provided at the enterprise:

- Timely scheduled maintenance of the equipment;

- Control over compliance with the technological mode and functionality of equipment and utility systems;

- Periodic monitoring of dust content in the air of the working area;

- Timely regular cleaning of premises and the territory to exclude accumulation of combustible waste on the territory of the plant.

Potential hazards, associated with fires, can be controlled and the risk can be reduced to the minimum through the use of modern technology and rigorous compliance with process regulations.

Measures to exclude the possible occurrence of accidents and their negative consequences:

- Devices and service lines must be equipped with necessary shutting-off valves and control and measuring devices, installed in locations convenient for maintenance;

- Light and sound alarms warning deviations of specified parameters of equipment working modes from standard values, are installed in places of permanent presence of service personnel;

- Production processes are carried out using equipment made of corrosion-resistant materials;

- Cabinets with control and measurement equipment, electrical equipment, technical equipment and pipes are subject to grounding;

- Protection of equipment and pipelines from static electricity, primary and secondary effects of lightings;

- Feed oil tanks are installed in the appropriate trays to limit the spill in case of an accident. The site of loading tank cars is flanged to limit spill in case of emergency;

- Reservoir equipment with flammable liquids (oil) is equipped with "breathing" pipelines and a firewall;

- Equipment with circulating hexane is under slight vacuum;

- In case of emergency depressurization of equipment and pipelines with hexane, they are emptied to the emergency (backup) tank;

- All accident spills in extraction section with mark 0.00 are discharged to petrol trap though the trap sewage with further discharging water to the sewer system an returning of solvent and miscella to miscella tank;

- Automatic gas analysis of pre-explosive concentrations of hexane in the air of working zones of the extraction department in building 27 is performed using gas analyzers with a centralized operator workstation, local alarm and the automatic start of the emergency ventilation when concentrations of hexane vapors exceed 10% of the lower concentration limit of explosion hazard (LCLE), and the department is shut down if concentration of hexane vapor exceed 50% of LCLE;

- Devices and pipelines with solvent may be purged with nitrogen and water vapor steaming before feeding hexane into them, with control of oxygen level in purging gases, which must not exceed 7% by volume, and before repairs of the equipment and pipes with control of hexane in purging gases, which must not exceed 0.0575% by volume. (5% of LCLE);

- Periodic sanitary control of content of hexane vapor in the air of working areas of the extraction department , which must not exceed 300 mg/m3 (MAC);

- Pumps for transporting flammable and combustible liquids may be remotely shut down from a safe place;

- Pipe diameters are designed to provide acceptable speed for transportation through pipelines of hexane with specific volumetric electrical resistance 1 1015 Ohm * m, soy oil with a specific volumetric electrical resistance 1.8 * 109 Ohm*m, not more than 1 m/s;

- Feed rate of bulk products by gravity flow transport pipe during mechanized loading to automobile transport or railway cars does not exceed 2 m/s;
- Placing equipment from bulk materials taking into account maximum shortening routes of transportation of dust forming material;
- All operations of transferring bulk materials are mechanized;
- An automatic shutdown of process equipment is provided if specified process parameters are exceeded by more than 10% and in case of emergency state of the process equipment (for example, clogged elevators);

Emergency emissions (burst release) of massive amount of dust to the atmosphere can lead to exceeding MAC of contaminants in the atmosphere of the residential zone. However, the adopted design and technical solutions exclude burst releases.

This complex is not a facility, accident on which may lead to any significant impact on the environment. In case of failure of individual units of process line elements (tear of the conveying belt, etc.) possible spills of product are localized within the closed conveyor gallery. In case of malfunction of any element of the system, the whole production line is stopped.

Suspended substances in the air and inside the buildings are explosive in suspended state, and dust that settled on the structures and equipment is inflammable. Given this, the project takes into account requirements regarding explosion and fire prevention, and technological equipment is explosive an fire resistant. Fire and explosions may be caused by factors which are unrelated to the technology process. To prevent such fires and explosions, it is necessary to implement measures, provided by this project.

10. Measures to ensure the standard state of the environment and ecological safety

The following measures are provided to protect the atmosphere and reduce the impact of emissions of hazardous substances:
- The aspiration system, supply ventilation system with mechanical and natural air induction were designed in the production premises. The project provides aspiration system, consisting of cyclones or filters, fans and rotary locks for aspiration of Europa Crown equipment. Dusty air from process equipment flows to cyclones or filters. Dust from cyclones return to the process through rotary locks. Purified air after cyclones and filters is discharged into the atmosphere by fans.
- The system of lubricant absorption reduces content of solvent vapor in emissions to the air from the extraction department of the plant. After the vapor condenser, non-condensated vapor flows through the solvent vapor absorber, which captures traces of hexane in counterflow with cold mineral lubricating oil cascade. After that, oil is heated in the mineral oil heater and releases hexane vapor in the solvent vapor desorber, hot mineral oil from the desorber is cooled in the combined chiller/ heat exchanger and fed into the absorber. Hexane vapor, released in the desorber, flows to the condenser, where hexane vapor condensates. Solvent condensate is returned to the process.

- Smoke flue with height of 30 m was installed in the boiler plant, which ensures minimum surface concentrations of hazardous substances.

According to the specifications provided by the customer, waste water, process waste water and rainwater are fed to the treatment facilities of Hlobyno meat processing plant by the sewer system network.

The company implemented organized waste disposal under the contract with specialized organizations.

11.Integrated assessment of impact of the facility operation on the environment, characteristics of residual effects

No.	Indicator	Measurement unit	Indicator value
1	Total (gross) quantity of contaminants, emitted by the designed object to the atmosphere, including:	t/year	**263.68 t/year**
	Sodium hydroxide	t/year	0.000004
	Metallic mercury	t/year	0.000058
	Nitrogen dioxide	t/year	55.926
	Ammonia	t/year	0.001
	Sulfuric acid	t/year	0.000003
	Carbon monoxide	t/year	134.75
	Hexane	t/year	63.798
	Methane	t/year	0.589
	Ethanol	t/year	0.0004
	Mineral lubricant	t/year	0.9083
	Suspended substances	t/year	7.71012
	Quantity of greenhouse gases (carbon dioxide, dinitrogen oxide, methane)	t/year	33059.55
2	Water volume, required for operation of the designed facility, including:	m^3/hour	**10.01**
	For household needs	m^3/hour	1.2
	For process needs	m^3/hour	8.91
3	Name of used water source		According to specifications
4	Volume of waste water, discharged by the designed facility, including:	m^3/day	214.06
	- to water bodies	m^3/day	None
	- to city sewer system	m^3/day	According to specifications
5	Chemical composition of waste waters of the designed facility:		
	- waste water from petrol trap of the extraction department (building No.27.2): Water with traces of: 1) hexane 2) suspended substances 3) chemical oxygen demand 4) biochemical oxygen demand 5) pH	 Ppm Ppm Ppm Ppm	 Below 10 below 20 1000÷2000 500÷1000 6.8÷7.0
	- Waste water from grease trap and barometric tank of the treatment department, building No.25: Water with traces of oil	 mg/m^3	 Below 15
	- condensate from lubricant separator in the compressor room of the treatment department, building No.25: Water with traces of lubricant	 mg/m^3	 Below 15

Potential waste and their approximate annual quantity

No.	Waste code	Quantity	Waste type	Hazard class	Disposal
1	1541.2.9.05	1115.2 t/year	Waste of seed scouring for oil production	3	To the composting to be used as an organic fertilizer
2	1542.2.6	50727.6 m3/year	Waste from washing and scouring (grease trap waste)	3	Through the sewer system to water purification plant
3	9030.2.9.03	16 701.3 m3/year	Waste from sewerage water purification plant, not designated by other means (collected petrochemical products)	3	Through the sewer system to water purification plant
4	7730.3.1.06	1.76 t/year	Waste, used or soiled wiping materials – waste code (waste packaging materials, absorbents, wiping and filtering materials)	3	Disposal at the landfill
5	7710.3.1.26	369 units	Fluorescent lamps	1	Disposal according to the agreement
6	9010.2.3.02	0.5 t/year	Stabilized or solidified waste with bonding agent (oil contaminated sand)	3	Disposal according to the agreement
7	7720.3.1.01	47.825 t/year	Mixed municipal solid waste, including waste from trash bins	4	Disposal at the landfill
8	6000.2.8.10	0.0078 t/year	Waste or used engine oils and lubricants	3	Disposal according to the agreement

Waste of hazard class 1, waste fluorescent lamps. Intact lamps have no impact on the environment. Poisonous effect on the human body and the atmosphere is only possible when waste lamps are damaged.

Waste of hazard class 2 is absent.

Waste of hazard class 3, which is in solid state, is represented by rather stable compounds, which do not decompose when exposed to soil or landfill, there is no impact on the environment.

Waste of hazard class 4 have no impact of the environment.

Dust settled as a result of technological operations, is swept and collected in special containers, and is subject to removal

To avoid soil contamination according to the project and production technology, the enterprise is equipped with tanks for collecting oiled rags and household waste, which is subject to further disposal by garbage trucks, and special places for storage of used fluorescent lamps.

Assessment of impact of the planned activity on the environment is considered during construction works.

Impact on the environment depending on its duration is temporary or permanent.

Temporary nature of the impact is connected with construction works. During the construction period, alienation of the site for permanent or temporary use are main factors of the impact on the environment. Such alienation is accompanied by violation of the established natural balance, after removal and storing of the soil layer.
During the construction process, the impact on the environment will be performed by contamination of the air by dust and fuel combustion products, generated by working construction machinery, vehicles and the like. In addition to that, soil and vegetation are contaminated by fuel and lubricants, individual sections of terrestrial biomes are destroyed due to transport activity, storing of various construction materials and equipment. Disturbance factors grow due to noise, generated during construction works.
Effects of these activities on the environment are as following:

- Mechanical destruction of soil and plant layer within the works site;
- Contamination of surface soil by waste petrochemical products from working transport and construction machinery and industrial and household waste;

To reduce the impact on the environment during construction works, environmental protection measures are performed in order to restore the ecological balance.
Nature restoration works are deemed completed if the following are absent:

- Areas with not restored vegetation;
- Places, contaminated with oil, fuel and lubricants, construction and household waste.

Impact on air during construction and mounting works:

During construction works, the estimated volume of emission of contaminants totals **32.37 t.**

Impact on the atmosphere during construction works may be assessed as acceptable, as the effect is temporary.
Based on the given assessments of impact on the environmental during construction of the facility, it can be concluded that this effect is acceptable and no environmental risks of the planned activity are observed.

Permanent impact on the environment.
In assessing the impact on the environment during operation of the facility, the following types of impact are considered:

- Impact on the atmosphere;
- Impact on water resources;
- Impact on land resources;
- Acoustic impact;
- Impact on the social environment;
- Risk assessment of the planned activity;
- Impact on the man-made environment;
- Impact on the geological environment;
- Impact on flora and fauna.

Impact on the atmosphere

Sources of air contamination of the designed soybean processing complex are the following: process equipment of production shops, laboratories, boiler equipment, combustion engines of the automobile transport. At the designed facility, 39 sources of contaminants are planned, four of which are uncontrolled. Annual contaminant emissions will total 263.68 t/year.

Generally, emission of 11 components of hazardous substances is planned:

Sodium hydroxide	0.000004	t/year
Metallic mercury	0.000058	t/year
Nitrogen dioxide	55.926	t/year
Ammonia	0.001	t/year
Sulfuric acid	0.000003	t/year
Carbon monoxide	134.75	t/year
Hexane	63.798	t/year
Methane	0.589	t/year
Ethanol	0.0004	t/year
Mineral lubricant	0.9083	t/year
Suspended substances	7.71012	t/year

The overall amount of emitted greenhouse gases (carbon dioxide, dinitrogen oxide, methane) totals 33059.55 t/year.

According to the sanitary classification of enterprises and sizes of sanitary protection zones for "State Sanitary Rules No.173 dated 19.06.1996", distance from the agricultural products processing plants, including processing of cereals and oil cultures, must be 100 m.

Analysis of calculation of surface concentration, performed during preparation of section "Assessment of environmental impact" shows that maximum surface concentrations of emissions of the designed facility by all contaminants, taking into account their background concentrations, do not exceed MAC in the air of the settlement and totals not more than **0.78 MAC:**

Nitrogen dioxide – 0.54 MAC $_{settlement}$;
Sulfuric acid – 0.4 MAC $_{settlement}$;
Soot – 0.52 MAC $_{settlement}$;
Sulfur dioxide - 0.25 MAC $_{settlement}$;
Carbon monoxide - 0.34 MAC $_{settlement}$;
Benzopyrene – 0.44 MAC $_{settlement}$;
Mineral lubricant - 0.44 MAC $_{settlement}$;
Saturated hydrocarbons – 0.43 MAC $_{settlement}$;
Suspended substances - 0.44 MAC $_{settlement}$;
Summation group 28 - 0.64 MAC $_{settlement}$;
Summation group 31 - 0.78 MAC $_{settlement}$.

Additionally, estimations of maximum surface concentrations were performed in control points, selected on the boundary of the regulatory SPZ (100 m).

Analysis of estimation of surface concentrations at specified points showed that for all hazardous substances, maximum surface concentrations, taking into including background concentrations, do not exceed 0,9 MAC $_{settlement}$;

Impact on the atmosphere is insignificant, within MAC in the air of settled areas. Therefore, emissions of all hazardous substances can be set as the maximum acceptable.

Impact on water resources

Water is supplied to the designed enterprise from two existing wells with flow rate 18 m^3/hour each. From wells, water is fed to the reverse osmosis water treatment plant. This plant is located in the boiler house. After purification, treated water is supplied to domestic and industrial consumers. Water pumping station is installed in the water treatment facility, which maintains the required pressure and flow rate in the water supply system of the enterprise.

Water consumption for drinking and technological needs is the following: 1.1m^3/hour for industrial and drinking needs, 2.75 m^3/day for technological needs.
Water meter units are designed to account volume of consumed water.
According to the specifications provided by the customer, waste water total: industrial and domestic waste water - 2.75 m^3/day; technological waste water - 214.08 m^3/day; rainwater - 340 m^3/day, which are supplied to the water purification facility of Hlobyno meat processing plant by the sewer system.

Industrial and domestic waste water is planned to be disposed by gravity flow to pumping stations, and from there through pressure collectors to the point of the tie-in into the pressure networks outside the site.

Rain water flows from the construction area and paved roads through drainage systems to collectors, and by gravity flow they are disposed to a rainwater tank. Before entering the tank, waste waters undergo preliminary purification from mechanical admixtures and petrochemical products in the sand trap and oil trap. From rainwater tank, by gravity flow water flows to the sewer pumping station, which pumps it through the pressure collector to the collector outside the site.

The production area is covered by solid asphalt, which prevents penetration (leakage, filtration) of rainwater from the surface to underlying horizons. Therefore there is no negative impact on ground waters.
There is no impact on ground water and surface water

Impact on land resources

The relief of the territory is sloped with light grade to the north and north-east. The surface is formed by filled soil with thickness from 0.3 to 2.7 m. Filling of the site was performed without engineering preparation, to soil and vegetation layer. Absolute surface markings vary from 94.7 to 96.80 m.
There is no plant layer of the soil, therefore the project does not provide reclaiming of agricultural lands.
Operation of the facility will not result in adverse impact on the soil, because domestic and industrial waste water are sent through the sewer network to the water treatment plant of Hlobyno meat processing plant, and municipal solid waste is collected in closed containers on the special concreted site and disposed of in a landfill.

Slopes of the area, which does not exceed the maximum acceptable levels, is the main measure to protect the soil from erosion and washing out of the plant layer.

Planning of the site provides complete disposal of rainwater, creates conditions, which prevent stagnation of the rainwater on the surface of paved driveways, sidewalks and squares.

There is no impact on soil and land resources during operation of the facility.

Impact on the geological environment

There is no impact on the geological environment during construction and operation of the object. Taking into account planned activities, no negative endogenous and exogenous processes and tectonic, seismic, geodynamic, landslide, mud, karst changes of the stress state and properties of the rocks, deformation of the earth's surface, etc. are expected.

There is not impact on the geological environment.

Acoustic impact

Performed acoustic calculations show that measures, provided by the project for protection from noise, ensure compliance with standard requirements for noise factor in the surrounding area.

Performed acoustic calculations showed that noise, generated during operation of the designed facility, comply with effective regulatory documents /2, 3/ both for night and day time and total 32 dBA in control points Кт1-13 and 28 dBA in Кт2.

Sanitary protection zone of the object by the noise factor can be taken in projections of the planned area and sanitary protection zones by other harmful factors.

Thus, production activities, provided by the project, will not result in negative acoustic effects on the environment and social conditions of people.

Since the effectiveness of measures for protection against noise depends essentially on their technical implementation, it is necessary to control the level of noise in the surrounding area, generated during mounting works, and tests of equipment.

Impact on the social environment

Contaminants, generated during operation of the process equipment, will be the negative factors of impact on social environment.

Calculations of diffusion of contaminants in the atmosphere showed that operation of the enterprise will ensure compliance with standard levels of contaminant emission to the atmosphere.

New production facility is completely automated and mechanized, which indicates an improvement in working conditions of staff and high degree of operational safety of the explosive hazardous production.

The project provides measures required by the rules and norms of safety and labor protection, compliance with which ensures normal and safe operation of soybean processing complex.

Commissioning of the soybean processing complex of Hlobyno Processing Plant LLC will provide expansion of the market for selling agricultural products, development of fodder base for livestock, and create additional jobs in the region.

In general, the impact of the complex on social environment can be assessed as positive.

Risk assessment of the planned activity

Within the framework of the project, the risk assessment of the impact of planned activity on human health was assessed (hazard index is 2.56, there is risk of carcinogenic effects) The likelihood of adverse effects is increased proportionally to increase of Hq (limit value of acceptable risk); calculation of social risk of the planned activity was performed (social risk: 0.000098, level of social risk is assessed as conditionally acceptable).

Impact on the technological environment

This object affects technological environment and is likely to be affected by nearby technological objects.

In the impact area of the planned activity, there are no samples of architecture, history and culture.
The negative impact on the technological environment may caused by a possible accident. However, a set of measures for prevention of emergencies was prepared at each project stage, as well as ways and means of quick elimination of accident consequences.
Measures to ensure the operational reliability and preserving surrounding technological environment objects are described in this documents. They are aimed at protection of the facility, which in turn ensures the preservation of the technological environment.
Thus, the impact of technological processes on technological environment at the enterprise can be assessed as acceptable.

Impact on flora and fauna

The technological process is performed in the industrially developed area, therefore no negative impact on flora and fauna will be detected.
There are natural preserves objects and territories, prospective for preserves (reserved for this purpose). There are migration routes of animals and birds in the area of the constructed facility.
The project provides that area free of construction will be sown with grass.
Before green planting, the plant soil is added: 10 cm of soil under lawns.
There is no impact on flora and fauna.

The facility meets all standards and requirements of the Laws of Ukraine "On air protection" and "On environmental protection" and will not adversely impact the environment.

12. List of used literature

GOST 17.2.3.02-78. Nature protection. Atmosphere. Regulations for establishing permissible emissions of noxious pollutants from industrial enterprises.

DBN A.2.2.-1-2003. Structure and content of Environmental Impact Assessment (EIA) documents during design and construction of enterprises, buildings and structures. Main provisions of design.

OND-86. State hydrometeorology commission. Methods for calculating concentrations of hazardous substances in atmosphere in emissions of enterprises.

Collection of regulatory, legal and methodological documents for inspection of air protection measures. M. Hidrometeoizdat 1986, 319 p.

Instructions on normalization of emissions/discharges/contaminants into the atmosphere and water bodies. State committee on nature protection. M. 1989.

RD 0237631.012-89. Quantitative characteristics of harmful substances, emitted during operation of the main technological equipment at enterprises in the industry. Odessa, SPKI, 1990.

"Collection of methods for calculating content of contaminants in emission from uncontrolled sources of atmosphere pollution". Ukrainian scientific center of technical ecology, Donetsk City 1994.

N.F.Tyschenko. Atmosphere protection. Calculating harmful substances and their diffusion in the air. Moscow, Khimiya, 1991

"Collection of emission indicators (specific emission) of contaminants into the atmosphere by various enterprises". Ukrainian Scientific Center of Technical Ecology, Donetsk City, 2004

13.Annexes

Coat of Arms of Ukraine

Ministry of Emergency Situations of Ukraine
Poltava Region Hydrometeorology Center
1, Zihina Str., Poltava City, 36000 Tel/Fax 7-42-60

09.04.2012 No. 32-03-23.107
Ref. No. _____ dated _____

Short climatic review of individual meteorological indicators of climate concerning development of ecology documents for emission of contaminants to the atmosphere under the project of construction of Hlobyno soybean processing facility of Hlobyno Processing Plant LLC, Hlobyno city, Hlobyno district of Poltava region.

Hlobyno city is located in the south-eastern part of Poltava region.
Climate is moderately continental, insufficiently humid, warm, and favorable for development of industry and agriculture.
Meteorological characteristics and coefficients, which define conditions of spreading contaminants in the atmosphere:

1. Coefficient, which depends on atmosphere stratification, A=205

2. Coefficient of area terrain, equals 1

3 Average monthly and annual air temperature (C)

January	-6.3	April	8.9	July	20.1	October	7.7
February	-5.1	May	15.6	August	19.3	November	1.8
March	0.0	June	18.6	September	14.3	December	-2.8

Average annual temperature 7.7 °C

4. Absolute minimum air temperature for many year period of observations was +36 °C

5. Absolute maximum air temperature for many year period of observations was -39 °C

6. Average maximum air temperature of the hottest month of the year (July) is +26.1 °C

7. Average minimum air temperature of the coldest month of the year (January) is -9.5 °C

8. Average monthly and annual relative air humidity (%)
a) January – 85 % b) July – 69% c) Annual – 77%

9. Average monthly and annual partial pressure of water vapor (mBar)
a) January – 3.8 mBar) July – 16.2 mBar c) Annual – 9.0 mBar

10. During summer month western and north-western winds prevail, and during cold part of the year, eastern and south-eastern winds prevail.

Frequency of wind directions and calms:

	N	N-E	E	S-E	S	S-W	W	N-W	Calm
January	8	13	13	15	10	17	14	10	3
February	10	12	14	18	8	14	11	13	3
March	10	14	14	14	11	13	11	13	5
April	11	12	16	15	11	12	11	12	6
May	14	15	16	12	8	12	11	12	7
June	17	14	11	9	8	12	12	17	10
July	18	12	9	5	6	12	18	20	10
August	16	14	10	6	8	12	16	18	10
September	13	12	9	8	13	16	16	13	10
October	10	12	14	12	10	15	15	12	10
November	6	10	21	20	11	13	10	9	4
December	7	11	15	20	11	17	11	8	4
Annual	12	12	13	13	10	14	13	13	7

11. Average monthly and annual wind speed (m/s)

January	5.0	April	4.7	July	3.3	October	3.8
February	5.2	May	4.1	August	3.2	November	4.7
March 5.1	June	3.4	September	4.7	December	4.7	

Annual 4.2 m/s

12 Frequency of cases when wind speed exceeds 16 m/s is 5%. At average per year, the most frequent are winds with speeds less than 5 m/s, which total 74%.

13 By level of rainfall, Hlobyno district is the insufficient wet area. Average annual rainfall is 511 mm, taking into account corrections for moistening the measuring device.
Out of this, 326 mm of rainfall come during the warm period of the year (from April to October, which is 64%, and 185 mm comes during cold period of the year, or 36% of the annual rainfall)

14 At average, snow cover appears on 19 November and disappears on 28 March.

15. Average number of foggy days per year: 46 days

This climatic characteristic was issued for development of the ecology documents concerning emission of contaminants into the atmosphere under the project of construction of Hlobyno soybean processing facility of Hlobyno Processing Plant LLC, Hlobyno city, Karla Marksa str., 203, Hlobyno district, Poltava Region.
Agencies of the state hydrometeorological service do not provide observation of pollution of the atmosphere with hazardous admixtures in Hlobyno city.

The climatic characteristic was issued for the period of prepared ecological documents for this business object.

Head of the Poltava Region
Hydrometeorology Center */signed/* V.S. Bohomatsera

Official seal: Ministry of Emergency Situations of Ukraine, Poltava Region Hydrometeorology Center, ID code 22531005

Prepared by Sotyr H.N.

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Ministry for Environmental Protection of Ukraine
State Administration
For environmental protection in Poltava Region

1, Zihina Str., Poltava City, 36000 E-mail /illegible/ Tel/Fax (05321) 56-95-08

No. 1338/04-11 dated 03.08.2012 Reply to 9 dated 29.03.2012	Attention of: director of Hlobyno processing plant Pitsyk O.P. Poltava Region, Hlobyno city, Karla Marksa Str.,203

Concerning provision of information

During development of documents justifying quantity of emissions for obtaining permits for emission of contaminants to the atmosphere from stationary sources on the territory in the sphere of influence of objects on the territory of Poltava Region, according to item 4.8 of the "Procedure of determination of background concentrations of contaminants in the atmosphere", approved by the order of the Economy and natural resources of Ukraine on 30.07.2001 No. 286, for cities (with the number of residents up to 250 thous. people) and other settlements, where regular observations of air contamination are not performed, in case of absence of significant industrial emission sources, values of background concentrations for main common contaminants are taken, which are given in the table of this Procedure. For other contaminants (if it is impossible to determine background concentrations by the method of estimation) it is allowed to calculate their values by multiplying coefficient 0.4 with values of maximum one-time acceptable concentrations of the respective substances.

Values of background concentration, based on observation results at stationary posts in cities, are determined and established by hydrometeorology agencies.

Population (thous, people)	Contaminants:							
	/illegible/		Nitrogen dioxide		Carbon monoxide		Sulfur dioxide	
	mg/m3	Fraction of MAC	mg/m3	Fraction of MAC	mg/m3	Fraction of MAC	mg/m3	Fraction of MAC
125-250	0.2	0.4	0.03	0.35	0.5	0.3	0.1	0.2
50-125	0.1	0.2	0.015	0.17	0.8	0.15	0.05	0.1
<50	0.05	0.1	0.008	0.09	0.4	0.08	0.02	0.04

Values of background concentration by data of under plume measurements in cities are determined and established by regional (city) sanitary and epidemiological stations

Head /signature/ I.A.Piddubnyy

Ref No. 2 dated 11.04.12

Issue of Zorya Pridneproviya local newspaper, dated 21 July 2012, where the statement of intent to construct soybean processing plant is published:

13.1Estimation of diffusion of hazardous substances in the atmosphere during operation of the facility

Estimation was performed on 25.01.2013, 11:32 using Еол-Плюс (Eol-plus) software, version 5.23.

TABLE 1. Description of weather conditions and georeference

City code	City name	Average air temperature		Boundary speed, m/s	Regional atmospheric stratification factor	Angle between the north direction and OX axis, degrees.	City area, sq.km	Required concentration in point (proportion of MAC)
		Of the hottest month,°C	Of the coldest month,° C					
1	Hlobyno	20.1	-6.3	4.2	205	-45		1

TABLE 2. Description of industrial sites (georeference)

City code	Industrial site code	Name of industrial site	Affixment to the main coordinate system		
			X start, m	Y end, m	Angle of rotation, degrees
1	1	Processing complex	4353400	5464200	0

TABLE 3. Description of contamination emission sources

City code	Industrial site code	Source code	Source name	Model code or angle between OX axis and the length of area source	Relief coefficient	Coordinates of point source, start o linear source or center of the area source		Coordinates of en of linear source, or length and width of area source or point source with rectangular mouth		Source height, m	Diameter of point source of type 2 area source, or speed of steam-gas-air mixture output (Wo) for linear source, (0 for type 1 area source)	Consumption of steam-gas-air mixture, (0 for type 1 area source)	Temperature of steam-gas-air mixture (° C)	Hazard class
						X1, м	Y1, м	X2, м	Y2, м					
1	1	1	Fan chimney	444	1	49	60			34.65	1	10	40	4
1	1	2	Fan chimney	444	1	45	65			34.65	0.5	3.05	40	4
1	1	3	Fan chimney	444	1	55	75			34.65	1	9.44	40	4
1	1	4	Fan chimney	444	1	55	68			34.65	1	9.44	40	4
1	1	5	Fan chimney	444	1	58	78			34.65	0.8	6.62	20	4
1	1	6	Fan chimney	444	1	55	77			34.65	0.6	3.55	20	4
1	1	7	Fan chimney	444	1	51	76			34.65	0.45	1.97	20	4
1	1	8	Fan chimney	444	1	75	80			4	0.3	0.294	20	4
1	1	9	Fan chimney	444	1	15	115			22.12	0.1	0.0225	20	4
1	1	11	Exhaust chimney	444	1	35	130			22.12	0.8	7	20	4
1	1	12	Fan chimney	444	1	-86	18			4	0.2	0.097	20	4
1	1	13	Fan chimney	444	1	-85	15			4	0.2	0.097	20	4
1	1	14	Hopper deflector	444	1	20	35			15.5	0.35	0.03	20	4
1	1	15	Hopper deflector	444	1	15	50			15.5	0.35	0.03	20	4
1	1	16	Hopper deflector	444	1	-10	65			15.5	0.35	0.03	20	4
1	1	17	Hopper deflector	444	1	8	25			15.5	0.35	0.03	20	4
1	1	18	Hopper deflector	444	1	-8	40			15.5	0.35	0.03	20	4
1	1	19	Hopper deflector	444	1	-20	55			15.5	0.35	0.03	20	4
1	1	20	Loading of husk	444	1	40	40			4	0.3	0.294	20	4

1	1	21	Loading of solvent cake	444	1	25	-10			4	0.3	0.294	20	4
1	1	22	Automobile transport	50	1	25	50	240	220	2	0.05	0.294	40	4
1	1	23	Discharge chimney	444	1	120	40			33	0.2	0.34	20	4
1	1	24	Discharge chimney	444	1	121	39			28	0.71	4.8	20	4
1	1	25	Discharge chimney	444	1	122	38			23	0.5	2.58	20	4
1	1	26	Hopper deflector	444	1	115	22			21	0.87	0.06	20	4
1	1	27	Hopper deflector	444	1	125	35			21	0.87	0.06	20	4
1	1	28	Hopper deflector	444	1	135	40			21	0.87	0.06	20	4
1	1	29	Fan chimney	444	1	105	38			30	1.25	0.22	40	4
1	1	30	Hopper deflector	444	1	100	30			21	0.85	0.04	20	4
1	1	31	Hopper deflector	444	1	85	25			30	1.3	0.04	20	4
1	1	32	Hopper deflector	444	1	70	60			30	1.3	0.04	20	4
1	1	33	Hopper deflector	444	1	45	-10			30	1.3	0.04	20	4
1	1	34	Hopper deflector	444	1	25	-22			30	1.3	0.04	20	4
1	1	35	Hopper deflector	444	1	8	-40			30	1.3	0.04	20	4
1	1	36	Hopper deflector	444	1	20	-53			30	1.3	0.04	20	4
1	1	37	Hopper deflector	444	1	85	70			21	0.85	0.07	20	4
1	1	38	Smoke flue	444	1	-40	75			30	0.8	3.33	130	4
1	1	39	Smoke flue	444	1	-30	78			30	0.8	3.33	130	4

TABLE 4. Source emission content characteristics

City code	Industrial site code	Source code	Substance code	Total emission t/year	Substance normalized setting out coefficient	Maximum emission (g/s) at the following wind speed									
						0.5 m/s	1 m/s	2 m/s	4 m/s	6 m/s	8 m/s	10 m/s	12 m/s	14 m/s	16 m/s
1	1	1	2902	1.36	1	0.05									
1	1	2	2902	0.415	1	0.015									
1	1	3	2902	0.643	1	0.024									
1	1	4	2902	0.643	1	0.024									
1	1	5	2902	0.45	1	0.0165									
1	1	6	2902	0.36	1	0.013									
1	1	7	2902	0.83	1	0.031									
1	1	8	2902	0.0016	1	0.002									
1	1	9	2735	0.9083	1	0.0334									
1	1	11	2902	0.865	1	0.032									
1	1	12	322	1.5E-6	1	1.39E-6									
1	1	13	322	1.5E-6	1	1.39E-6									
1	1	14	2902	0.2449	1	0.009									
1	1	15	2902	0.2449	1	0.009									
1	1	16	2902	0.2449	1	0.009									
1	1	17	2902	0.2449	1	0.009									
1	1	18	2902	0.2449	1	0.009									
1	1	19	2902	0.2449	1	0.009									
1	1	20	2902	0.0105	1	0.002									

1	1	21	2902	0.23	1	0.002										
1	1	22	301	1.11	1	0.289										
1	1	22	328	0.43	1	0.112										
1	1	22	330	0.55	1	0.144										
1	1	22	337	2.778	1	0.72										
1	1	22	703	8.9E-5	1	2.3E-5										
1	1	22	2754	0.833	1	0.217										
1	1	23	2902	0.0616	1	0.047										
1	1	24	2902	0.363	1	0.2401										
1	1	25	2902	0.0013	1	0.0003										
1	1	26	2902	0.0036	1	0.0018										
1	1	27	2902	0.0006	1	0.0003										
1	1	28	2902	0.0006	1	0.0003										
1	1	29	301	2.7	1	0.35										
1	1	29	337	1.69	1	0.22										
1	1	30	2902	0.0003	1	0.0001										
1	1	31	2902	7E-5	1	5E-5										
1	1	32	2902	7E-5	1	5E-5										
1	1	33	2902	7E-5	1	5E-5										
1	1	34	2902	7E-5	1	5E-5										
1	1	35	2902	7E-5	1	5E-5										
1	1	36	2902	7E-5	1	5E-5										
1	1	37	2902	0.0012	1	0.0001										
1	1	38	301	26.613	1	0.97										
1	1	38	337	66.53	1	2.44										
1	1	39	301	26.613	1	0.97										
1	1	39	337	66.53	1	2.44										

TABLE 5. Description of hazardous substances

Substance code	Name of substances	MAC	Normalized setting out coefficient
301	Nitrogen dioxide	0.2	1
322	Sulfuric acid, H2SO4 molecule	0.3	1
328	Soot	0.15	1
330	Sulfur dioxide	0.5	1
337	Carbon monoxide	5	1
703	Benzopyrene (mkg/100m3)	0.0001	1
2735	Petroleum mineral oil (spindle machine, cylinder oil, etc)	0.05	1
2754	Saturated hydrocarbons C12-C19(solvent РПК-265 П (RPK-265 P) an others)	1	1
2902	Suspended substances	0.5	1

TABLE 6. Description of summation groups of hazardous substances

Group code	Substances in the summation groups (codes)										Potential coefficient
	1	2	3	4	5	6	7	8	9	10	
28	322	330	0	0	0	0	0	0	0	0	1
31	301	330	0	0	0	0	0	0	0	0	1

TABLE 7. Description of distribution of background concentration (U is wind speed m/s)

City code	Substance code	Background task	Coordinates of observation posts		Concentration (proportion of MAC) at U<=2	Concentration (proportions MAC) at 2<U<U* by directions							
			X, m	Y, m		N	N-E	E	S-E	S	S-W	W	N-W
1	301	a			0.15								
1	322	a			0.4								
1	328	a			0.4								
1	330	a			0.2								
1	337	a			0.3								
1	703	a			0.4								
1	2735	a			0.4								
1	2754	a			0.4								
1	2902	a			0.4								

TABLE 8. Parameters of estimation sites.

N	Coordinates of the centre of symmetry		Length, m	Width, m	Mesh space		Angle of turn of the estimated site relative to the OX axis of general coordinate system, degrees	Zone indicator
	X, м	Y, м			OX axis, m	OY axis, m		
1	25	50	2000	2000	50	50	0	0

Results of estimation by ЕОЛ-Плюс (EOL-Plus) software package

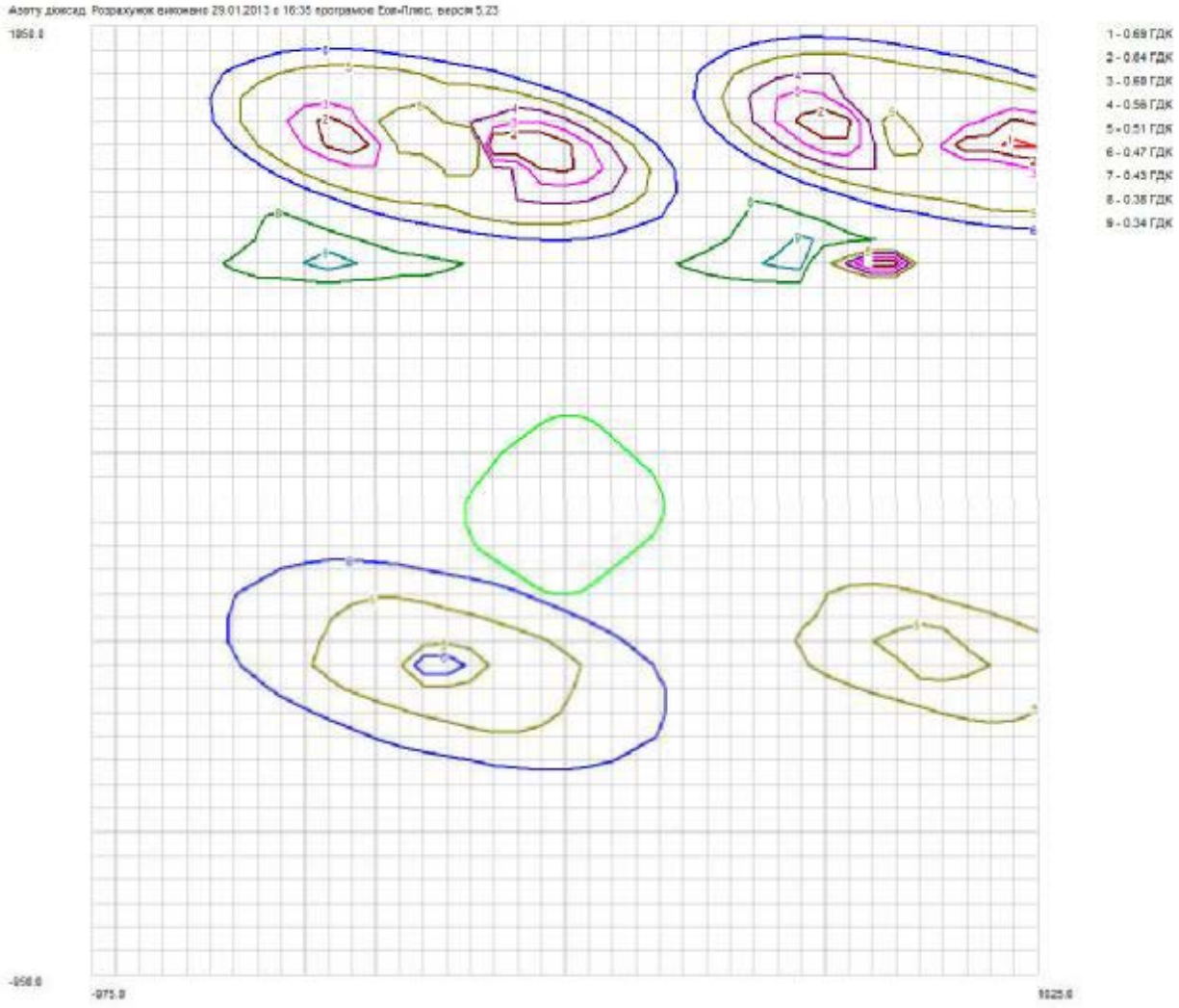
Substance 301 (Nitrogen dioxide)

Estimated concentrations in specified points

Coord. X,m	Coord. Y,m	Concentration in point, mg/m3	Concentration in point, proportion of MAC	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %
40	230	0.068	0.49	70	0.50	29	89.66	38	0.013	39	0.031	22	10.30
120	190	0.083	0.56	100	0.50	29	91.38	38	0.038	39	0.050	22	8.53
210	85	0.11	0.68	162.77	0.50	29	80.62	39	4.59	38	5.01	22	9.78
170	-60	0.10	0.66	237.80	0.50	29	87.46	38	2.25	39	2.64	22	7.65
-40	-150	0.069	0.49	274.66	4.07	22	60.79	38	17.36	29	0.00010	39	21.85
-120	-55	0.059	0.45	339.51	0.50	29	84.93	38	0.22	39	0.41	22	14.45
20	-125	0.074	0.52	298.45	0.50	29	90.46	38	0.035	39	0.089	22	9.42
-145	85	0.069	0.50	10	4.07	22	59.54	39	5.45	38	6.26	29	28.75
-100	200	0.059	0.44	40.55	0.50	29	79.04	38	1.86	39	2.81	22	16.29
-10	600	0.079	0.54	87.35	4.07	22	58.98	38	16.04	29	6.39	39	18.59

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %
0.71	225	50	172.79	0.50	29	79.68	39	5.28	38	5.75	22	9.30



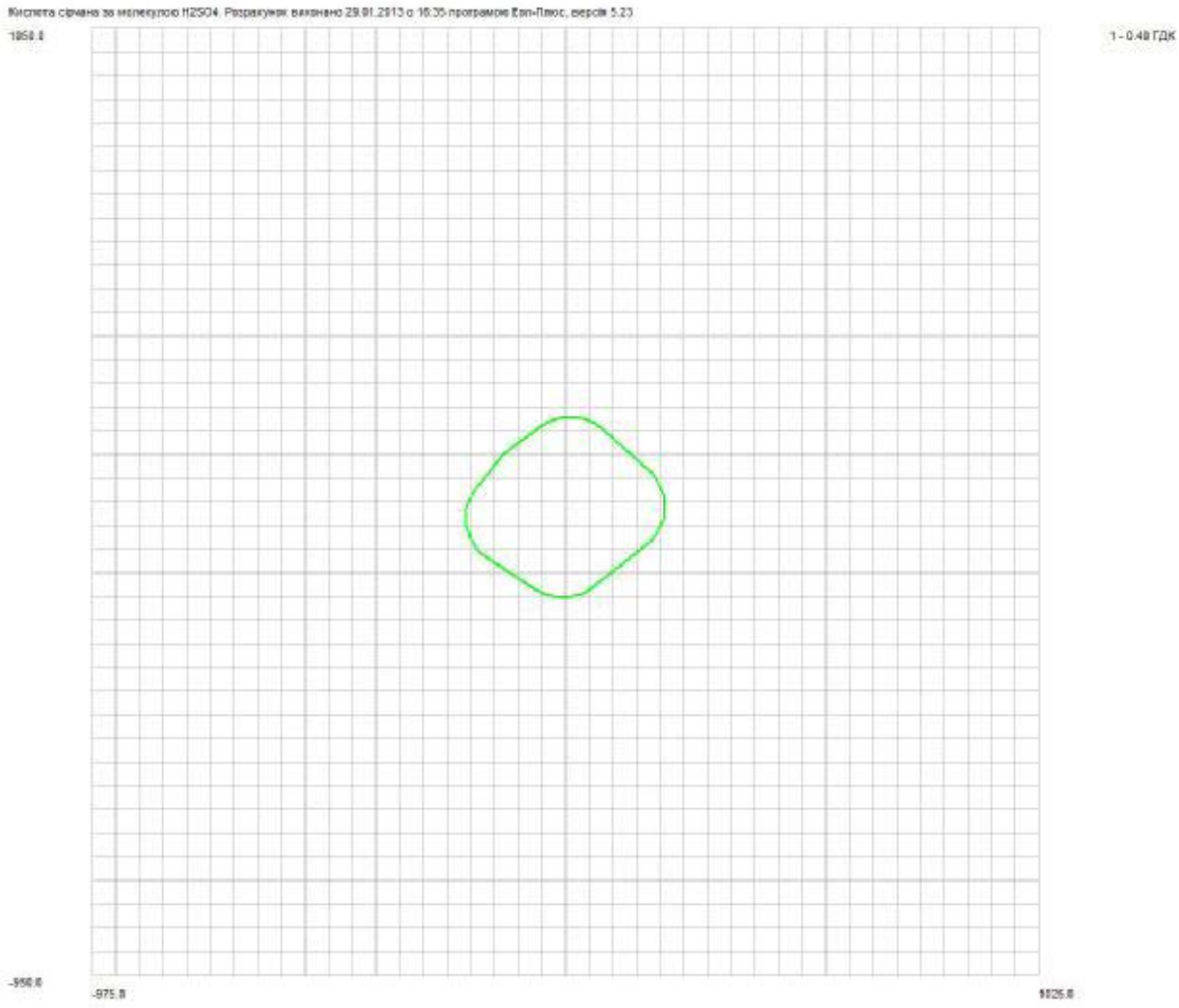
Substance 322 (Sulfuric acid with H_2SO_4 molecule)

Estimated concentrations in specified points

Coord. X,m	Coord. Y,m	Concentration in point, mg/m3	Concentration in point, proportion of MAC	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %
40	230	0.0000016	0.40	120.45	0.75	12	50.39	13	49.61
120	190	0.0000014	0.40	139.83	0.75	12	50.21	13	49.79
210	85	0.0000011	0.40	166.95	0.75	13	50.05	12	49.95
170	-60	0.0000014	0.40	196.67	0.75	13	50.32	12	49.68
-40	-150	0.0000031	0.40	254.72	0.75	13	50.77	12	49.23
-120	-55	0.0000094	0.40	295.76	0.75	13	50.77	12	49.23
20	-125	0.0000030	0.40	233.29	0.75	13	50.73	12	49.27
-145	85	0.0000081	0.40	49.02	0.75	12	50.97	13	49.03
-100	200	0.0000028	0.40	85.48	0.75	12	50.72	13	49.28
-10	600	0.00000036	0.40	97.37	0.75	12	50.18	13	49.82

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of MAC	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %
0.40	-75	50	107.40	0.50	12	50.85	13	49.15



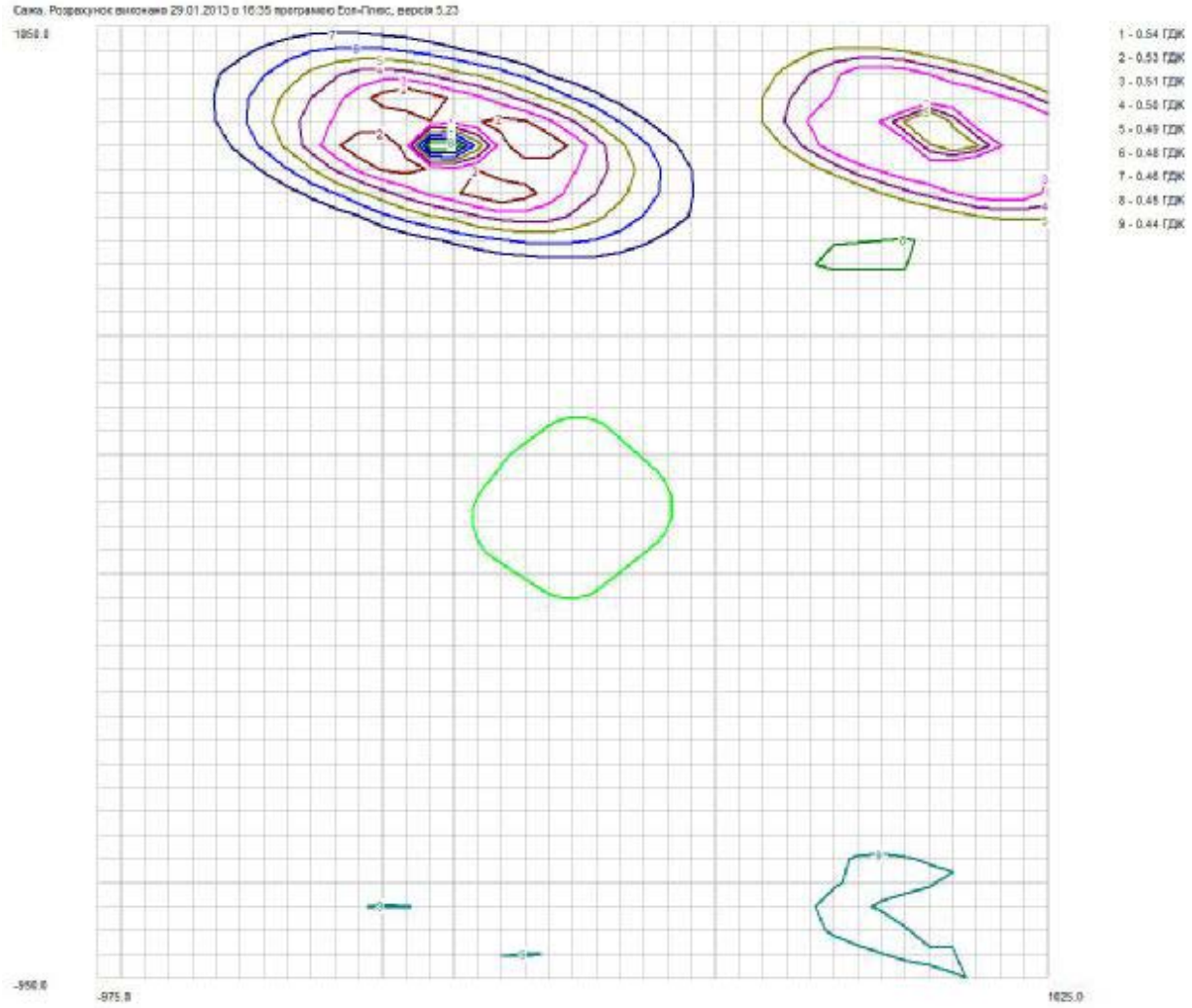
Substance 328 (Soot)

Estimated concentrations in specified points

Coord. X,m	Coord. Y,m	Concentration in point, mg/m3	Concentration in point, proportion of MAC	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %
40	230	0.018	0.52	94.76	4.20	22	100
120	190	0.015	0.50	114.16	4.20	22	100
210	85	0.018	0.52	169.29	4.20	22	100
170	-60	0.015	0.50	207.18	4.20	22	100
-40	-150	0.018	0.52	288.00	4.20	22	100
-120	-55	0.016	0.51	334.09	4.20	22	100
20	-125	0.017	0.51	271.64	4.20	22	100
-145	85	0.016	0.51	1.63	4.20	22	100
-100	200	0.016	0.51	60.19	4.20	22	100
-10	600	0.018	0.52	86.36	4.20	22	100

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %
0.55	25	350	90	4.20	22	100



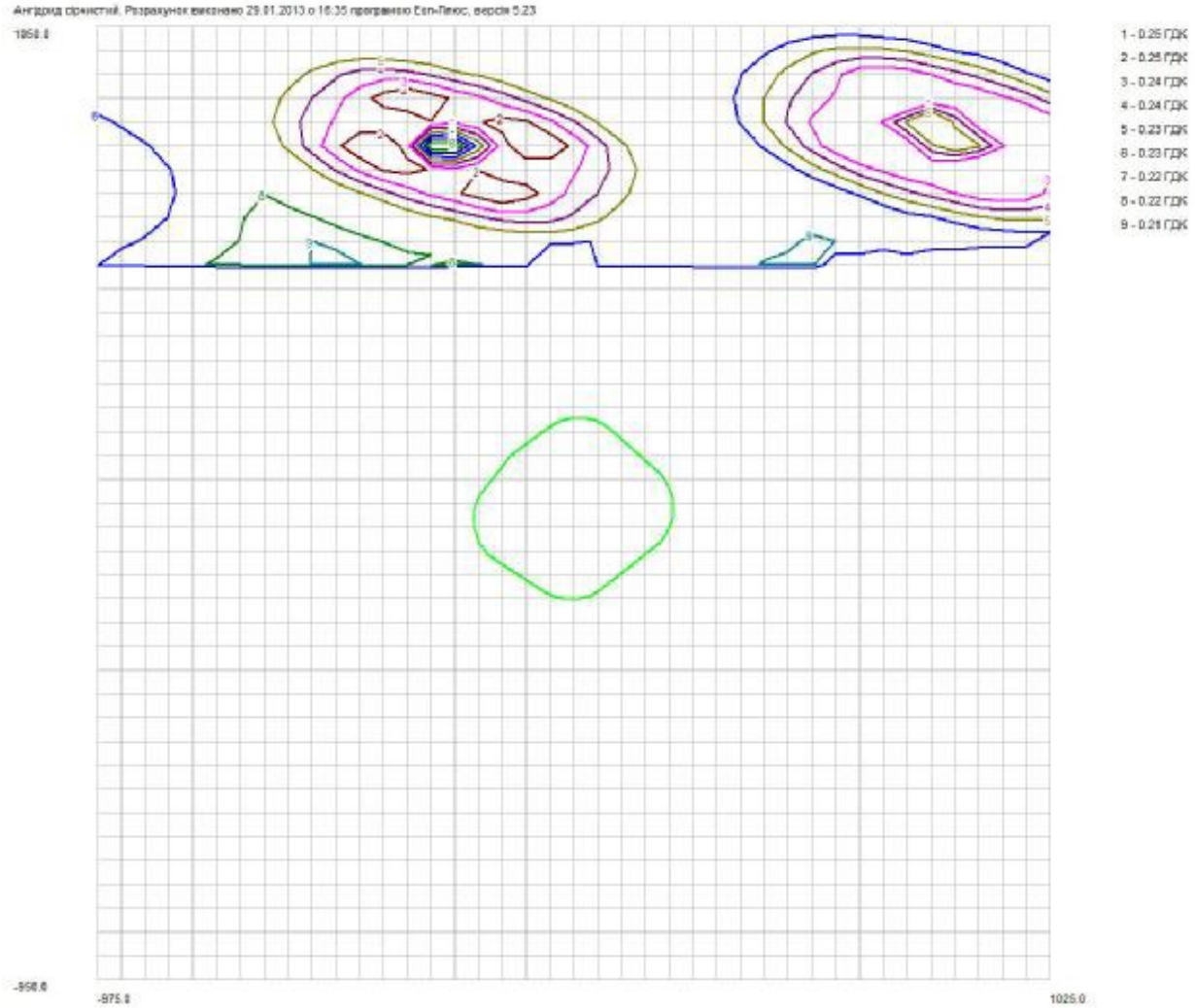
Substance 330 (Sulfur dioxide)

Estimated concentrations in specified points

Coord. X,m	Coord. Y,m	Concentration in point, mg/m3	Concentration in point, proportion of MAC	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %
40	230	0.023	0.25	94.76	4.20	22	100
120	190	0.020	0.24	114.16	4.20	22	100
210	85	0.023	0.25	169.29	4.20	22	100
170	-60	0.019	0.24	207.18	4.20	22	100
-40	-150	0.023	0.25	288.00	4.20	22	100
-120	-55	0.021	0.24	334.09	4.20	22	100
20	-125	0.022	0.24	271.64	4.20	22	100
-145	85	0.021	0.24	1.63	4.20	22	100
-100	200	0.021	0.24	60.19	4.20	22	100
-10	600	0.023	0.25	86.36	4.20	22	100

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %
0.26	25	350	90	4.20	22	100



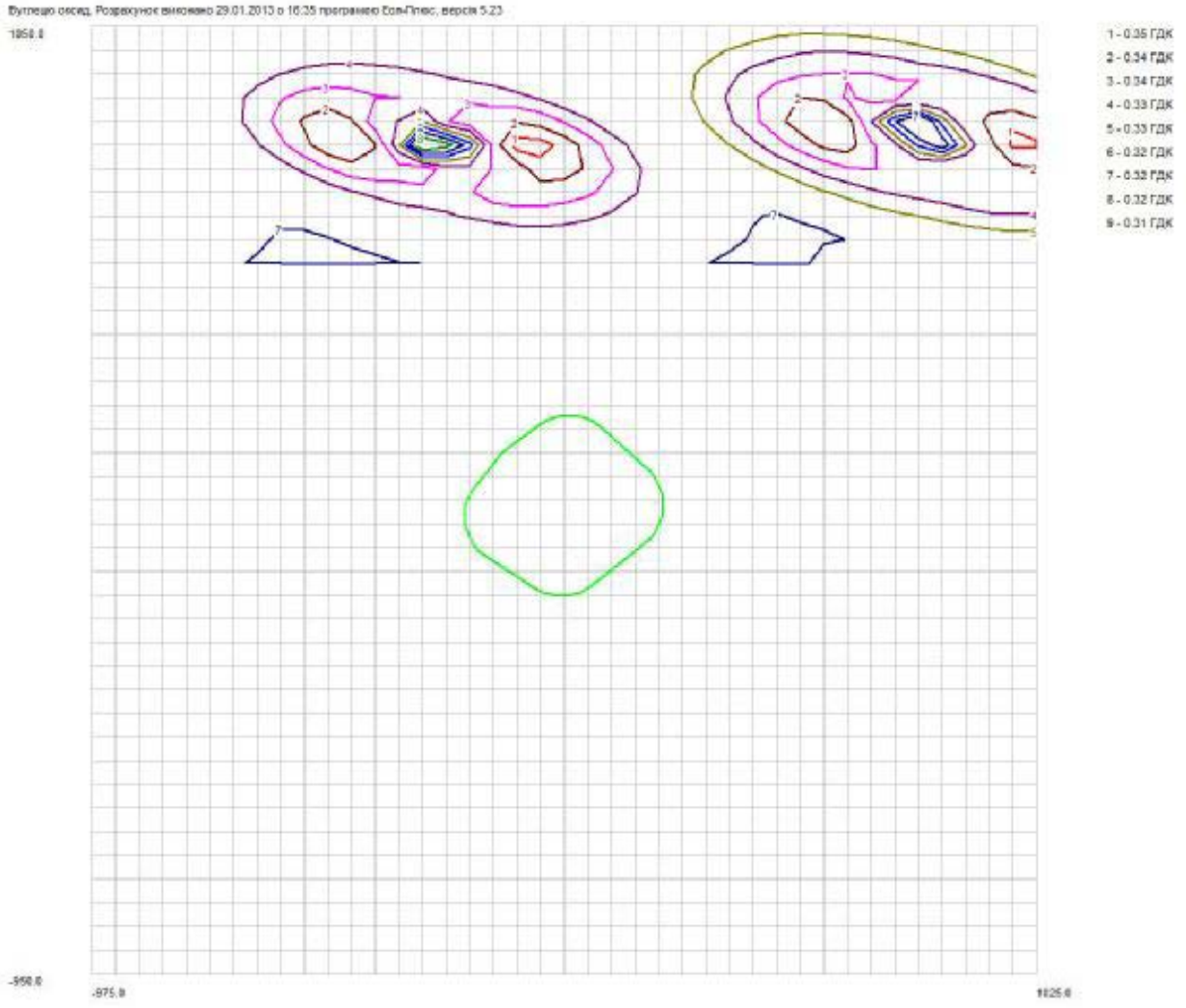
Substance 337 (Carbon monoxide)

Estimated concentrations in specified points

Coord. X,m	Coord. Y,m	Concentration in point, mg/m3	Concentration in point, proportion of MAC	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %
40	230	0.13	0.33	120	4.20	22	66.97	39	13.87	29	4.0000E-9	38	19.16
120	190	0.15	0.33	140	4.20	22	64.54	38	17.36	29	2.7000E-8	39	18.10
210	85	0.17	0.33	172.77	4.20	22	66.56	39	15.66	29	0.088	38	17.69
170	-60	0.16	0.33	217.80	4.20	22	58.65	38	18.82	29	0.041	39	22.49
-40	-150	0.17	0.33	274.66	4.20	22	61.74	38	16.87	29	0.000020	39	21.38
-120	-55	0.13	0.33	299.51	4.20	22	67.83	39	14.91	29	0.0000016	38	17.26
20	-125	0.15	0.33	258.45	4.20	22	61.84	38	16.43	29	0.00000064	39	21.73
-145	85	0.13	0.33	10	4.20	22	76.76	39	6.58	38	7.61	29	9.05
-100	200	0.14	0.33	60.55	4.20	22	73.20	38	12.00	29	0.011	39	14.79
-10	600	0.18	0.34	87.35	4.20	22	61.82	38	16.87	29	1.67	39	19.64

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of MAC	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %
0.35	325	50	181.89	4.20	22	57.00	39	19.27	29	3.66	38	20.06



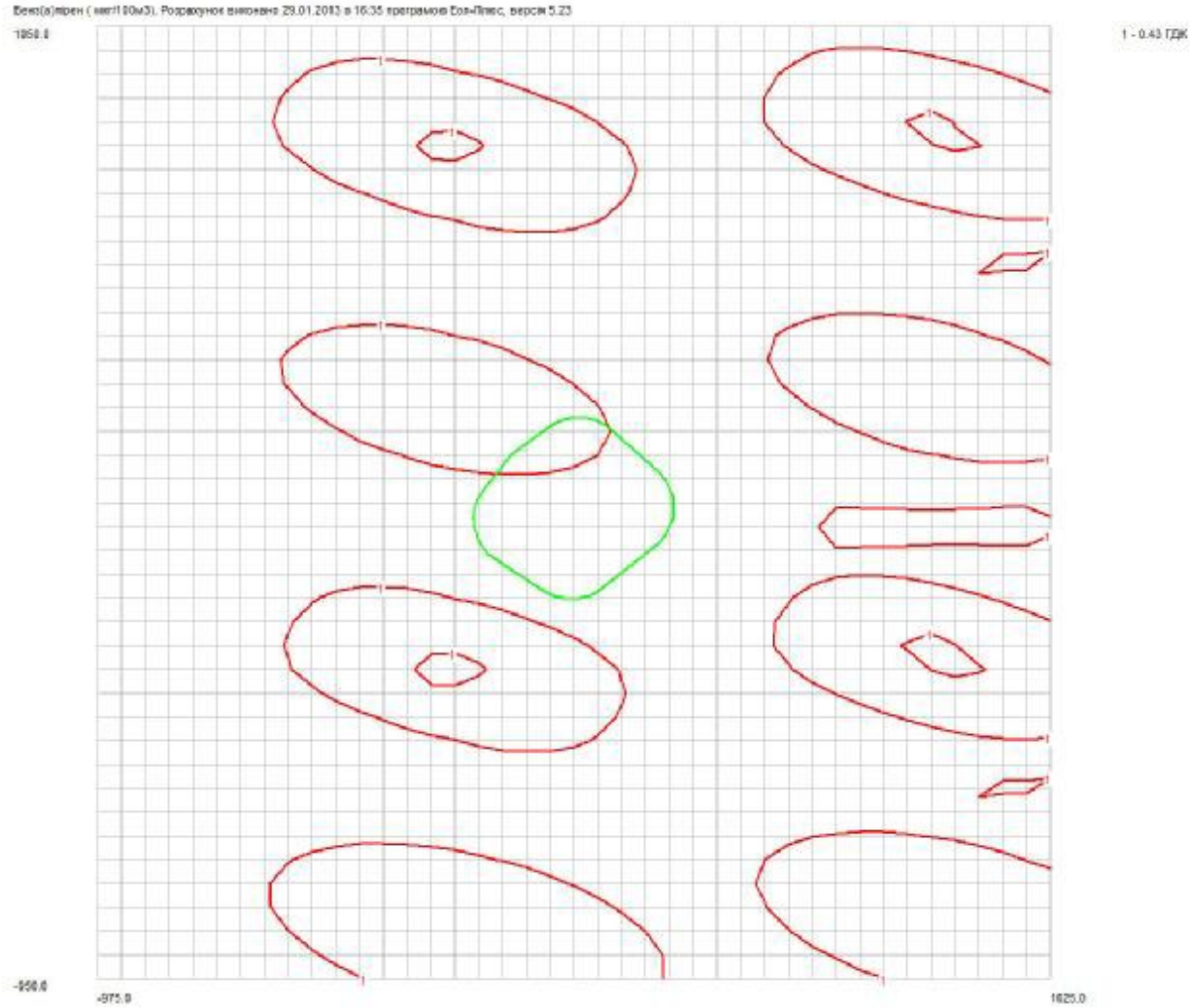
Substance 703 (Benzopyren (mkg/100m³))

Estimated concentrations in specified points

Coord. X,m	Coord. Y,m	Concentration in point, mg/m3	Concentration in point, proportion of MAC	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %
40	230	0.0000036	0.44	94.76	4.20	22	100
120	190	0.0000032	0.43	114.16	4.20	22	100
210	85	0.0000037	0.44	169.29	4.20	22	100
170	-60	0.0000031	0.43	207.18	4.20	22	100
-40	-150	0.0000037	0.44	288.00	4.20	22	100
-120	-55	0.0000034	0.43	334.09	4.20	22	100
20	-125	0.0000035	0.44	271.64	4.20	22	100
-145	85	0.0000033	0.43	1.63	4.20	22	100
-100	200	0.0000033	0.43	60.19	4.20	22	100
-10	600	0.0000036	0.44	86.36	4.20	22	100

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %
0.45	25	350	90	4.20	22	100



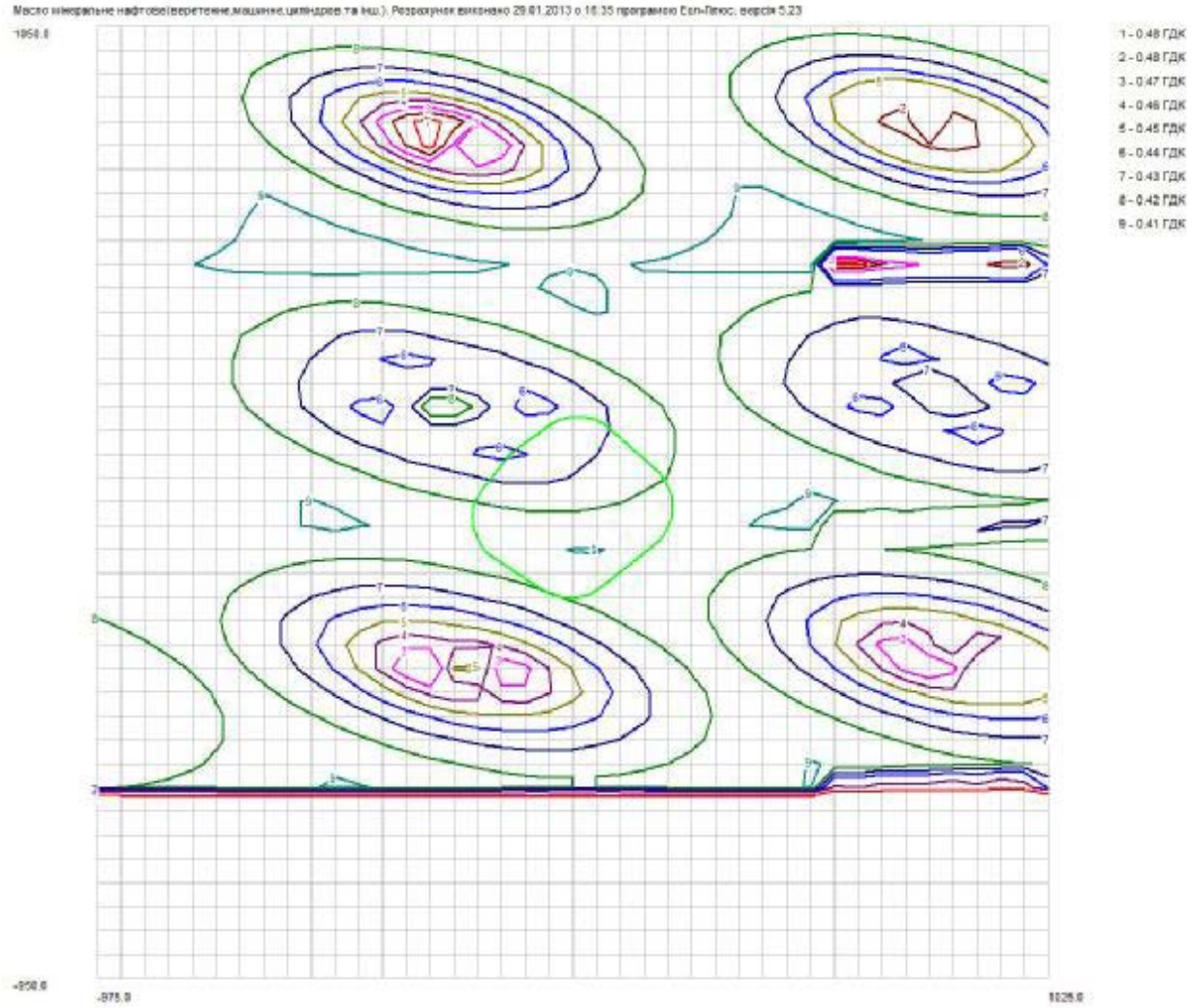
Substance 2735 (Petroleum mineral oil (spindle, machine, cylinder oil etc.))

Estimated concentrations in specified points

Coord. X,m	Coord. Y,m	Concentration in point, mg/m3	Concentration in point, proportion of MAC	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %
40	230	0.0045	0.49	102.26	0.50	9	100
120	190	0.0045	0.49	144.46	0.50	9	100
210	85	0.0038	0.48	188.75	0.50	9	100
170	-60	0.0035	0.47	228.47	0.50	9	100
-40	-150	0.0032	0.46	281.73	0.50	9	100
-120	-55	0.0037	0.47	308.45	0.50	9	100
20	-125	0.0034	0.47	268.81	0.50	9	100
-145	85	0.0042	0.48	349.38	0.50	9	100
-100	200	0.0043	0.49	36.47	0.50	9	100
-10	600	0.0019	0.44	87.05	0.75	9	100

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of MAC	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %
0.49	125	150	162.35	0.50	9	100



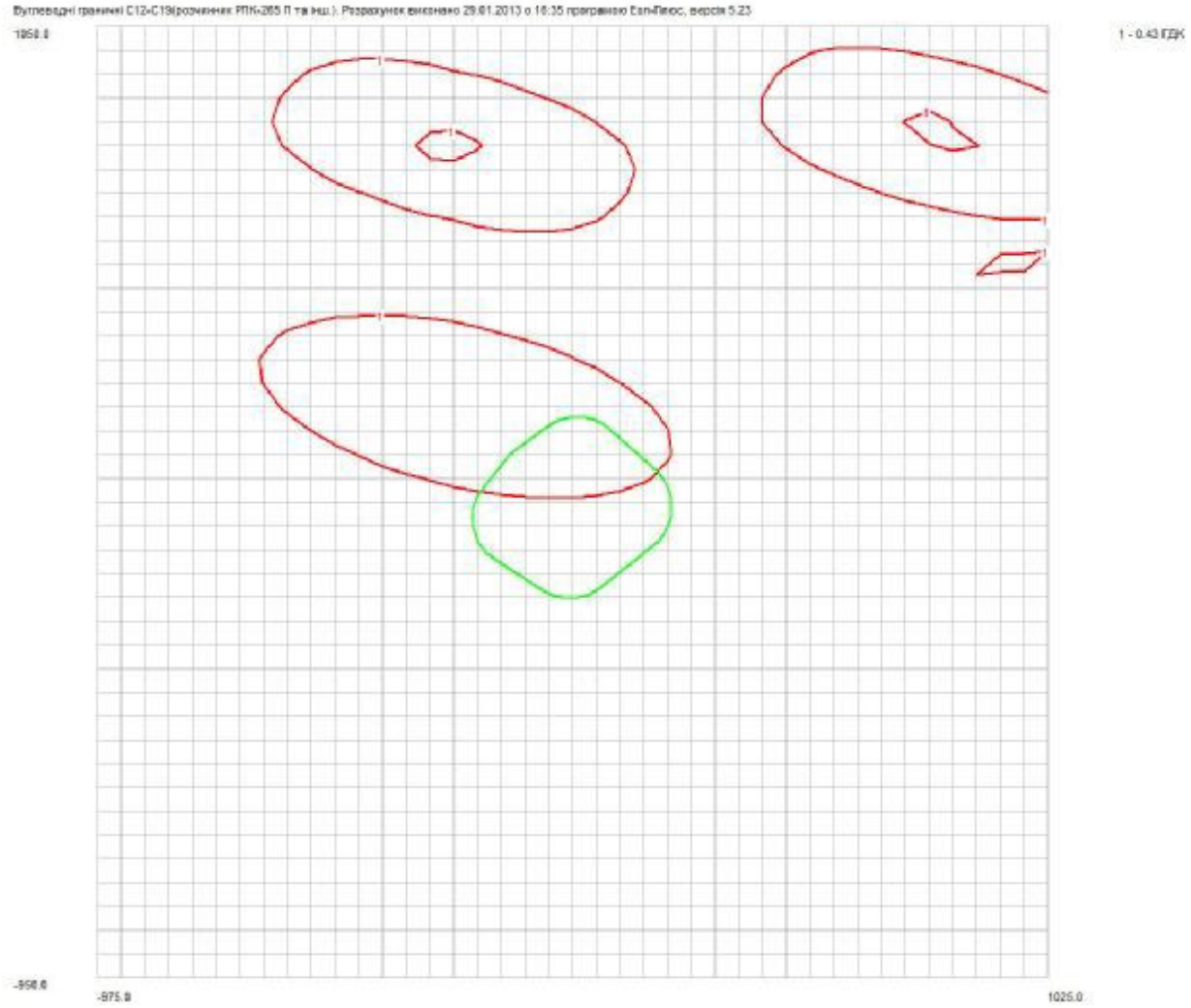
Substance 2754 (Saturated hydrocarbons C12-C19(solvent РПК-265 П (RPK-265 P) and others))

Estimated concentrations in specified points

Coord. X,m	Coord. Y,m	Concentration in point, mg/m3	Concentration in point, proportion of MAC	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %
40	230	0.034	0.43	94.76	4.20	22	100
120	190	0.030	0.43	114.16	4.20	22	100
210	85	0.035	0.44	169.29	4.20	22	100
170	-60	0.029	0.43	207.18	4.20	22	100
-40	-150	0.035	0.43	288.00	4.20	22	100
-120	-55	0.032	0.43	334.09	4.20	22	100
20	-125	0.033	0.43	271.64	4.20	22	100
-145	85	0.031	0.43	1.63	4.20	22	100
-100	200	0.031	0.43	60.19	4.20	22	100
-10	600	0.034	0.43	86.36	4.20	22	100

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %
0.44	25	350	90	4.20	22	100



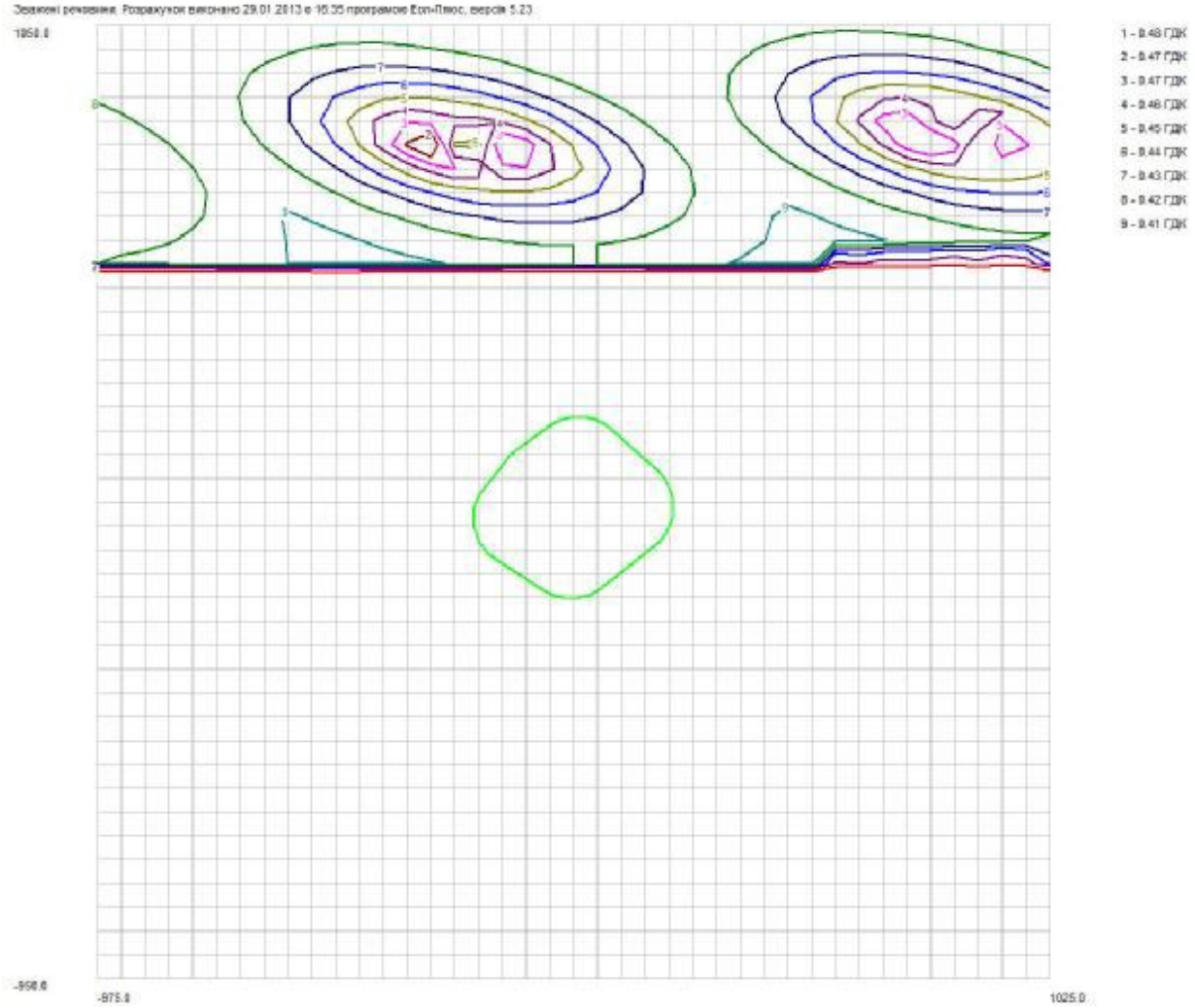
Substance 2902 (Suspended substances)

Estimated concentrations in specified points

Coord. X,m	Coord. Y,m	Concentration in point,	Concentration in point, proportion	Wind direction,	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %
40	230	0.031	0.46	75.27	0.50	24	50.94	36	0.0052	35	0.0044	34	0.0057	33	0.0073
120	190	0.028	0.46	103.42	0.50	24	49.17	36	0.0091	35	0.0082	34	0.0091	33	0.010
210	85	0.034	0.47	164.23	0.50	24	37.70	36	0.0046	35	0.0060	34	0.0068	33	0.0070
170	-60	0.032	0.46	231.55	0.50	24	41.74	36	0.000016	35	0.000080	34	0.00057	33	0.0018
-40	-150	0.033	0.47	296.55	0.53	24	36.19	36	0.0085	35	0.0090	34	0.0099	33	0.0097
-120	-55	0.037	0.47	331.24	0.53	24	38.76	36	0.0019	35	0.0034	34	0.0056	33	0.0065
20	-125	0.032	0.46	282.08	0.50	24	30.39	36	0.0045	35	0.0034	34	0.0075	33	0.0095
-145	85	0.039	0.48	12.27	0.53	24	38.90	36	0.0019	35	0.0021	34	0.0041	33	0.0057
-100	200	0.034	0.47	45.55	0.53	24	38.98	36	0.0045	35	0.0042	34	0.0059	33	0.0073
-10	600	0.019	0.44	83.30	0.79	24	40.90	36	0.0072	35	0.0072	34	0.0077	33	0.0080

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %
0.49	-75	50	3.77	0.50	24	40.58	36	0.000072	35	0.000063	34	0.00090	33	0.0029



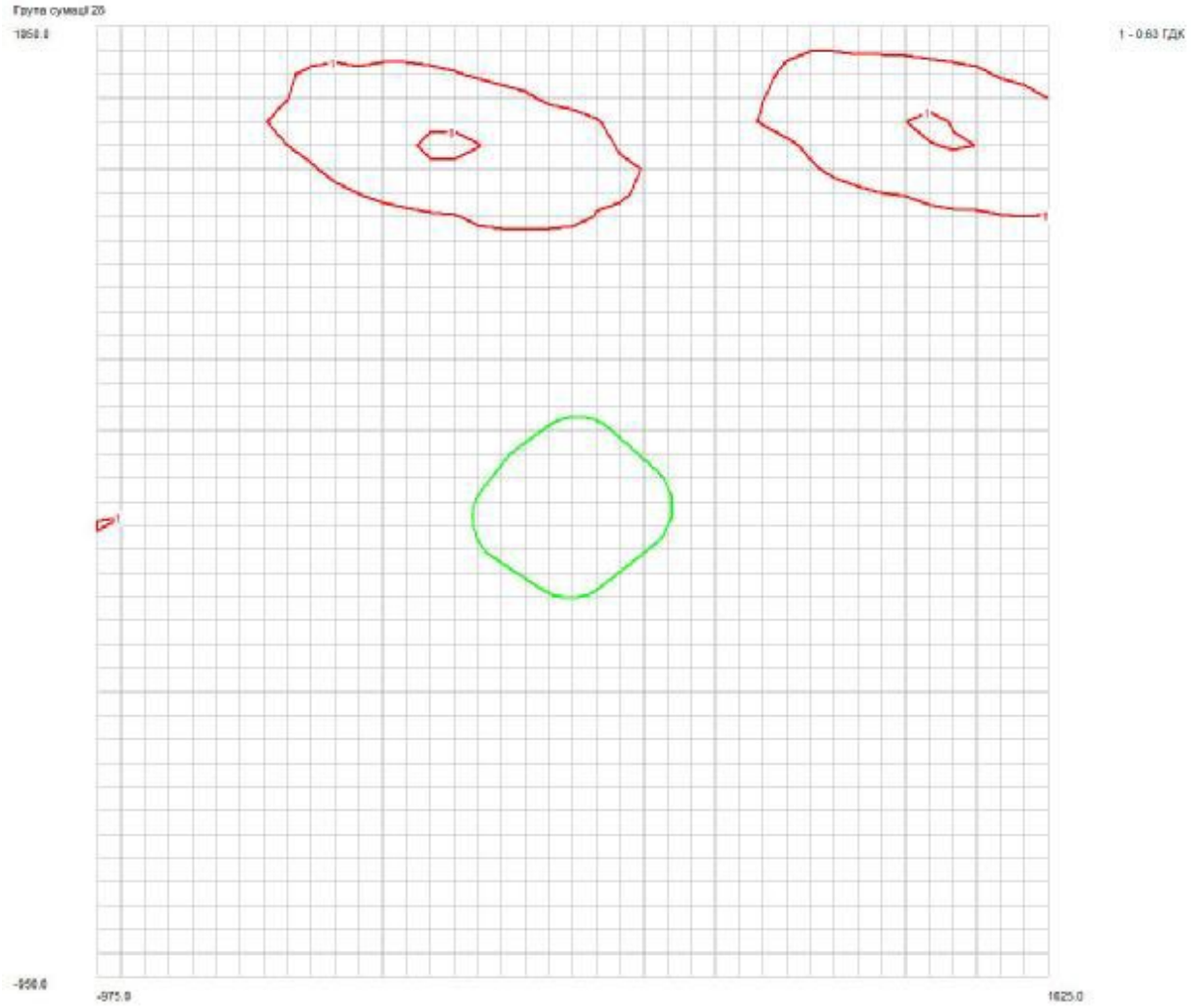
Summation group 28

Estimated concentrations in specified points

Coord. X,m	Coord. Y,m	Concentration in point, mg/m3	Concentration in point, proportion of MAC	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %
40	230	-	0.64	90	4.20	22	100.00	13	0.00000011	12	8.3000E-8
120	190	-	0.64	110	4.20	22	100.00	13	0.00000017	12	0.00000012
210	85	-	0.65	170	4.20	22	99.99	13	0.0044	12	0.0046
170	-60	-	0.64	200	4.20	22	99.99	13	0.0062	12	0.0064
-40	-150	-	0.65	280	4.20	22	100.00	13	0.0000024	12	0.0000023
-120	-55	-	0.64	330	4.20	22	100.00	13	3.4000E-8	12	1.4000E-8
20	-125	-	0.64	270	4.20	22	100.00	13	4.0000E-9	12	4.0000E-9
-145	85	-	0.64	3.11	4.20	22	100	13	3.0735E-11	12	4.6562E-11
-100	200	-	0.64	62.01	4.20	22	100.00	13	0.0000073	12	0.0000065
-10	600	-	0.64	89.03	4.20	22	100.00	13	0.00080	12	0.00078

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %
0.66	25	350	90.88	4.20	22	100.00	13	0.000063	12	0.000055



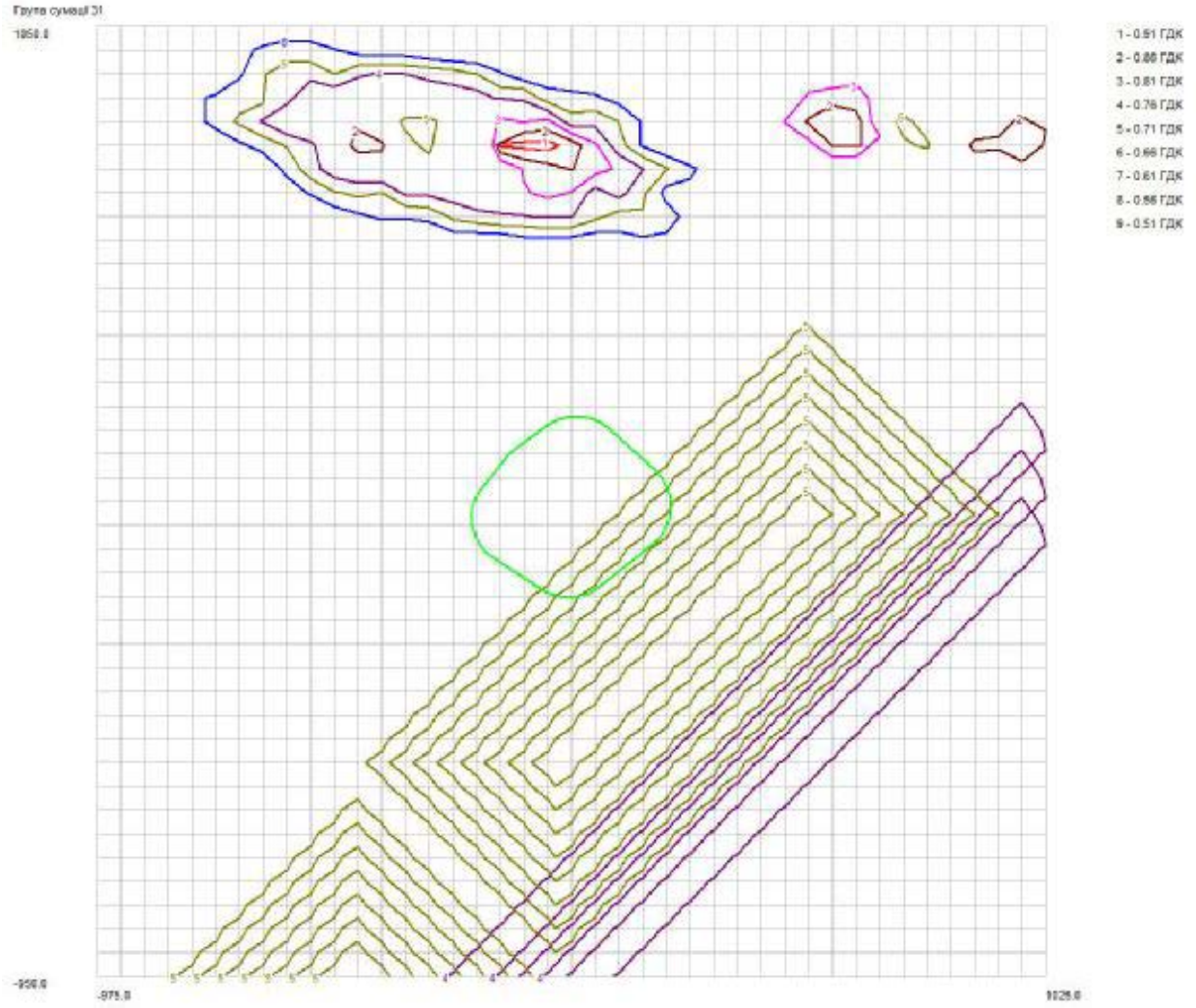
Summation group 31

Estimated concentrations in specified points

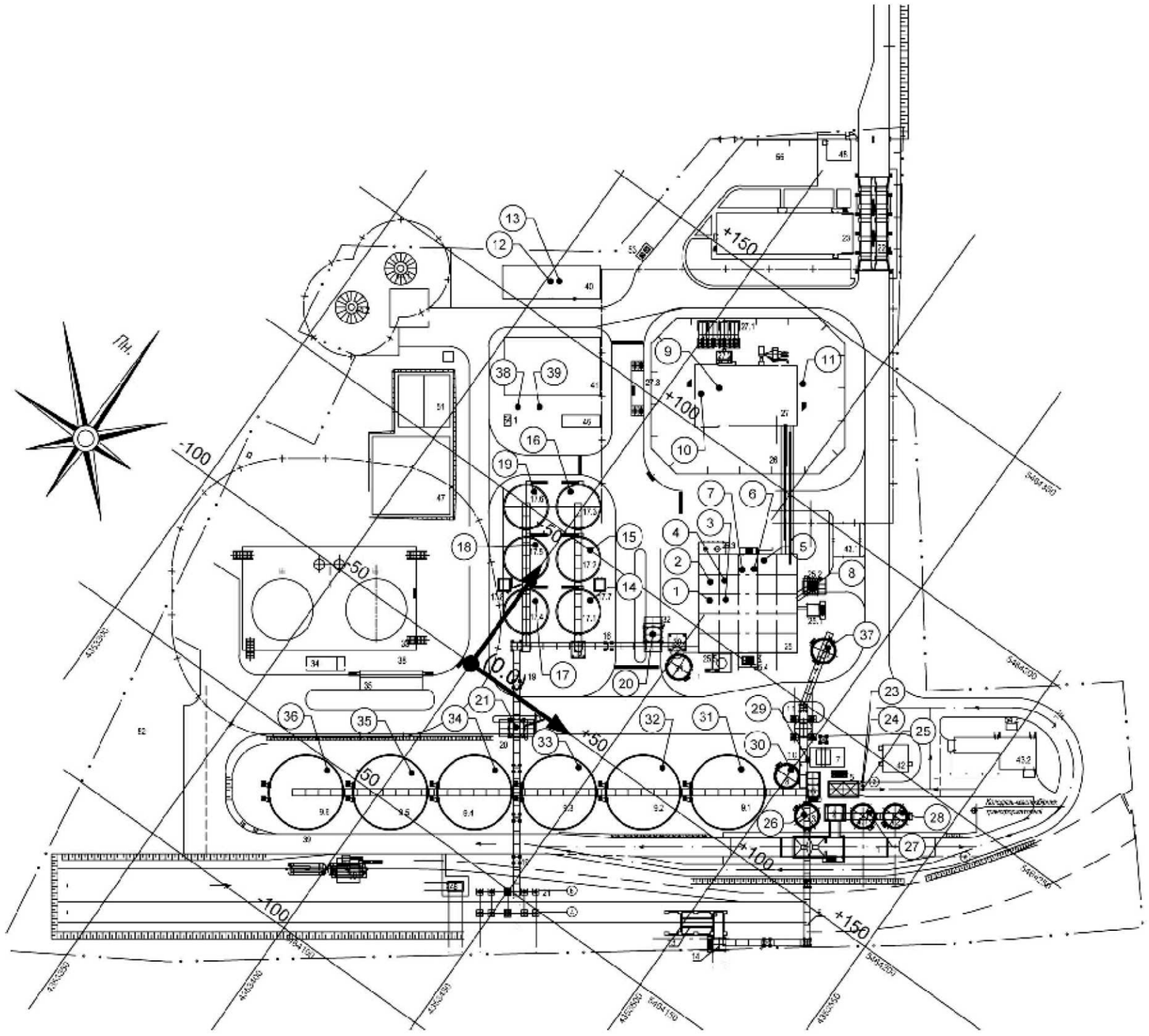
Coord. X,m	Coord. Y,m	Concentration in point, mg/m3	Concentration in point, proportion of	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %
40	230	-	0.70	70	0.50	29	87.85	38	0.013	39	0.030	22	12.10
120	190	-	0.77	100	0.50	29	89.85	38	0.038	39	0.049	22	10.06
210	85	-	0.90	160	0.50	29	81.20	39	3.69	38	4.06	22	11.06
170	-60	-	0.87	230	0.50	29	80.83	38	4.35	39	4.72	22	10.10
-40	-150	-	0.71	270	4.20	22	59.49	39	19.57	29	0.0000057	38	20.94
-120	-55	-	0.67	340	4.20	22	72.08	38	0.0000015	39	0.0000066	29	27.92
20	-125	-	0.72	300	0.50	29	89.25	38	0.020	39	0.054	22	10.68
-145	85	-	0.70	3.11	4.20	22	71.11	38	7.04	39	8.68	29	13.18
-100	200	-	0.68	62.01	4.20	22	76.16	38	11.62	29	0.017	39	12.20
-10	600	-	0.78	89.03	4.20	22	59.61	38	17.44	29	3.59	39	19.36

Point of maximum concentrations and the list of sources with maximum contribution

Concentration in point, proportion of	Coord. X,m	Coord. Y,m	Wind direction, degrees	Wind speed, m/s	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %	Source code	Contribution, %
0.94	325	-50	200	4.20	22	49.70	38	17.06	29	15.95	39	17.28



Master layout with indication of emission sources



Explication of emission sources			
No.	**Emission source**	**X**	**Y**
1	Fan chimney	49	60
2	Fan chimney	45	65
3	Fan chimney	55	75
4	Fan chimney	55	68
5	Fan chimney	58	78
6	Fan chimney	55	77
7	Fan chimney	51	76
8	Loading of waste into automobile transport	75	80
9	Fan chimney	15	115
10	Fan chimney	10	110
11	Exhaust chimney	35	130
12	Fan chimney	-45	110
13	Fan chimney	-48	112
14	Hopper deflector	20	35
15	Hopper deflector	15	50
16	Hopper deflector	-10	65
17	Hopper deflector	5	25
18	Hopper deflector	-8	40
19	Hopper deflector	-20	55
20	Loading of granulated husk	40	40
21	Loading of solvent cake	25	-10
22	Automobile transport	25=240m	50=220m
23	Exhaust chimney	120	40
24	Exhaust chimney	121	39
25	Exhaust chimney	122	38
26	Hopper deflector	115	22
27	Hopper deflector	125	35
28	Hopper deflector	135	40
29	Fan chimney	105	38
30	Hopper deflector	100	30
31	Hopper deflector	85	25
32	Hopper deflector	70	60
33	Hopper deflector	45	-10
34	Hopper deflector	25	-22
35	Hopper deflector	5	-40
36	Hopper deflector	20	-53
37	Hopper deflector	85	70
38	Smoke flue	-40	75
39	Smoke flue	-30	78

NOTE: see explication of buildings on page 118

Explication of buildings and structures

No.	Name	Note
1	Automobile transport grain receiving station ЗПП АВ У-АРГ Н150 (ZPP AV U-ARH N150)	Under construction
2	Grain transfer point ЗПУ (ZPU) 4,7х4,7 7,5 2,0	Under construction
3	Wet grain storage station ЗНПвл 73К.12 Н100 (ZNPvl 73K.12 N100)	Under construction
4.1-4.2	Wet grain storage station ЗНПвл 73К.12 В150 Н100 (ZNPvl 73K.12 V150)	Under construction
5	Grain peeling station ЗОП МКZМ Т П (ZOP MKZM T P)	Under construction
6	Grain transfer point ЗПУ (ZPU) 3,7х(3,7+3,7) 70	Under construction
7	Grain drying station ЗСП SBC 25 LE (ZSP SBC 25 LE)	Under construction
8	Dry grain storage station ЗНПс 73К.12 Н100 (ZNPs 73K.12 N100)	Under construction
9.1-9.6	Grain depot 3Х 42(6х24-20 В100 Н100) ZKh 42(6х24-20 V100 N100)	Under construction
10	Overhead grain transportation line ЗТЛ В (ZTL V)	Under construction
11	Automobile transport grain loading section ЗПО АВ 55К.06 (ZPO AV 55K.06)	Under construction
12	Day bunker	Under construction
13	Railway transport grain receiving station ЗПП ЖД Н 150 (ZPP ZhD N 150)	Under construction
14	Grain transfer point ЗПУ (ZPU) 3,7х3,7 5,5 3,25	Under construction
15	Overhead grain transportation line ЗТЛ В (ZTL V)	Under construction
16	Overhead transportation line ТЛ В (TL V)	Designed
17.1-17.3	Solvent cake depot ШХ4, 15(3х14-12) В60 Н60 (ShKh4, 15(3х14-12)V60 N60)	Designed
17.4-17.6	Solvent cake depot ШХ4, 15(3х14-12) В25 Н60 (ShKh4, 15(3х14-12)V25 N60)	Designed
17.7,17.8	Pumping station	Designed
18	Solvent cake transport unit ПУШ 3,7х3,7 5,5 (PUSh 3,7х3,7 5,5)	Designed
19	Overhead transportation line ТЛ В (TL V)	Designed
20	Automobile transport solvent cake loading section ПОШ АВ (POSh AV)	Designed
21	Railway car solvent cake loading section ПОШ ЖД (POSh ZhD)	Designed
22	Automobile transport weighting station	Under construction
23	Software and hardware complex with the laboratory АПК Л3 41х12х2-А (APK L3 41x12x2-A)	Under construction
25	Treatment department	Designed
25.1	Grain elevator tower (for supplying soybeans from the daily bunker to production)	Designed
25.2	Automobile transport waste loading station	Designed
25.3	Receiver park	Designed
25.4	Chiller platform	Designed
25.5	Pallet of the buffer tank	Designed
26	Process rack No.1	Designed
27	Extraction department	Designed
27.1	Return petrol storage	Designed
27.2	Petrol trap	Designed
27.3	Tank car loading and receiving rack	Designed

No.	Name	Note
30	Solvent cake and husk transfer point ПУШЛ 3,7х3,7+5 (PUSHL 3,7x3,7+5)	Designed
31	Husk storage station	Designed
32	Automobile transport husk loading section	Designed
33	Oil feed tanks	Designed
34	Pumping station of oil feed tanks	Designed
35	Tank car loading station	Designed
36	Railway tank car loading station	Designed
37	Process rack No.2	Designed
38	Process rack No.3	Designed
39	Process rack No.4	Designed
40	Production laboratory	Designed
41	Boiler plant	Designed
42	Electric control room. Operator room	Under construction
43.1	Transformer substation	Under construction
43.2	Transformer substation	Designed
44.1,2	Well (2)	Existent
45	Tower cooler	Designed
46	Railway car weighting station	Designed
47	Rainwater tank	Designed
48	Check point	Under construction
51	Fire reserve water tank	Under construction
52	Workshop	Existent
53	Waste site	Under construction
54.1-54.2	Generator	Designed
55	Site for private cars	Under construction
56.1,2	Recreation site	Designed
57	Fire pumps control station	Designed