SUMMARY AUDIT REPORT

for the February 2020
International Cyanide Management Code Recertification Audit

Prepared for:
Limited Liability Company 'Saratovorgsyntez'

Submitted to:
International Cyanide Management Institute
1400 I Street, NW, Suite 550
Washington, DC 20005, USA

DRAFT
1 June 2020

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Bld. 11, Business Centre ABC
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SUMMARY AUDIT REPORT

Name of Plant: Saratovorgsyntez, Limited Liability Company (LLC)

Name of Plant Owner: PJSC Lukoil

Name of Plant Operator: Saratovorgsyntez LLC

Name of Responsible Manager: Vladimir Shulyndyn, General Director

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Location details and description of operation:

Saratovorgsyntez sodium cyanide production plant (plant) is part of a large 227 hectares chemical manufacturing complex located in a designated industrial area of Saratov, approximately 15 km southwest of Saratov city centre. The plant manufactures sodium cyanide briquettes for the mining industry using hydrogen cyanide generated as a by-product from an acrylonitrile plant located within the complex. The plant includes two production lines of similar design. The first line began operation in 2008. A second line was constructed in the same building and began operation in 2015. The first line has a production capacity of 18,000 tonnes/year. In September 2019 the second plant increased production capacity from 15,000 to 18,000 tonnes/year of sodium cyanide briquettes to give a total production capacity of 36,000 tonnes/year.

The key process involves the reaction of liquid hydrocyanic acid with sodium hydroxide to form a sodium cyanide mother solution. The mother liquid is concentrated through evaporation and fed to a crystallizer under controlled conditions. The cyanide crystals formed are separated from the mother liquid and the filtrate is recycled back through the crystallizer. The wet cyanide crystals collected are dried and moulded into briquettes. Until recently briquettes were packed in steel drums, and 400 kg or 1,000 kg plywood Intermediate Bulk Container (IBC) boxes. As of September 2019, the practice of packing briquettes in steel drums was discontinued. The IBCs are transferred to a dedicated warehouse, that is connected to the production plant by means for an enclosed conveyor, to await shipment.

All off-gases from the process and ventilation systems pass through a wet scrubber system to remove cyanide and Hydrogen Cyanide (HCN) gas prior to discharge through an incinerator to the atmosphere. Wastewater from the process and wash down water is collected in tanks and treated with hypochlorite before being piped to the industrial complex biological wastewater treatment plant prior to discharge into the Volga River.

SUMMARY AUDIT REPORT

Auditors' Finding

The operation is: ■ in full compliance
in substantial compliance
not in compliance

Saratovorgsyntez has experienced no International Cyanide Management Code (ICMC) compliance issues since the previous audit.

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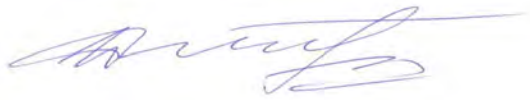

Date(s) of Audit: 25 February 2020 - 28 February 2020

I attest that I meet the criteria for knowledge, experience and conflict of interest for Code Verification Audit Team Leader, established by the International Cyanide Management Institute and that all members of the audit team meet the applicable criteria established by the *International Cyanide Management Institute* for Code Verification Auditors. I attest that this Summary Audit Report (SAR) accurately describes the findings of the verification audit. I further attest that the verification audit was conducted in a professional manner in accordance with the latest version of the *International Cyanide Management Code Verification Protocol for Cyanide Production* and using standard and accepted practices for health, safety and environmental audits.

Saratovorgsyntez
Name of Plant

Signature of Lead Auditor

1 June 2020
Date

SUMMARY AUDIT REPORT

1. OPERATIONS: **Design, construct and operate cyanide production facilities to prevent release of cyanide.**

Production Practice

1.1 Design and construct cyanide production facilities consistent with sound, accepted engineering practices and quality control / quality assurance procedures.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 1.1.

Discuss the basis for this Finding / Deficiencies Identified:

Sodium Cyanide is produced in two production lines commissioned in 2008 and 2015, respectively. Design of the first line began in 2004 by Giprosintez and plant construction began in 2007 after the design was approved by State expertise. Construction supervision was undertaken by Giprosintez. Construction was signed-off by Rostekhnadzor and a Commissioning Act of acceptance was issued prior to start of production. The second line was designed by GLATT Ingenieurtechnik GmbH, a German engineering company, under licence from E.I. du Pont de Nemours and Co., Inc. (USA). The design was approved by Glavgoseksperitza. Construction supervision and acceptance up to the point of commissioning was undertaken by LUKOIL Nizhegorodniinefteproekt, LLC. A Certificate of Conformity to Technical Regulations for Capital Construction was issued on 5.6.2015. Both lines are housed within the same plant (building 650). All Saratovorgsyntez engineering documentation and approvals for construction are available and retained in Saratovorgsyntez's archive library in the main office. There have been no new cyanide production facilities constructed since the last audit.

All the materials used for construction of cyanide production facilities are compatible with applicable reagents used in the production process. Most piping and vessels used to convey and process cyanide solutions are constructed of various grades/standards of stainless steel depending on use and country of origin of the component, with some impellers and other components constructed of carbon steel.

Automatic valves are located at critical points in the circuit to prevent release of HCN gas and other upsets in the process that could result in releases. The valves are activated by pressure, temperature and/or feed rate deviations. The liquid hydrocyanic acid supply is equipped with interlock valves that activate to shut off supply and flush the associated piping with nitrogen if there is a problem. The hydrocyanic acid supply also enters the plant on the fourth floor providing a head of 11 m, which in the unlikely event of a failure of the nitrogen flush system,

provides an addition safety mechanism to drain the liquid hydrocyanic acid line. In addition to the interlock valves the HCN gas sensors are in place at the valve boxes for the hydrocyanic acid lines to detect possible leakage. The HCN sensors also activate the interlocks if HCN gas is detected.

The plants are designed to contain any spills. Spillage or wash water from each floor is directed to wastewater tanks located in concrete containment basins for each line just outside the plant building. All wastewater no longer suitable for return to the process is directed to the local wastewater treatment plant before being sent to the biological treatment plant that serves the industrial complex. Each floor in the plant and the concrete containment for the wastewater tanks were observed to be competent and well maintained.

To prevent overfilling, process tanks are fitted with low and high level visual and audial alarms that report to the control room. The alarms are generally set to alarm when solution drops below 20% and to alarm and lock out when solution reaches 80% of the vessel volume. The operation of the alarms is checked each shift and they are regularly maintained by an accredited organization in accordance with the recommendations of the manufacturer.

There have been no changes in secondary containment provided for cyanide production facilities since the previous ICMC certification audit. All operations and process equipment are enclosed within the plant building containment or are located outside in concrete secondary containment areas equipped with pump sumps, generally protected from the precipitation by a canopy roof and appropriately sized to hold a volume greater than that of the largest tank, any piping draining back to the tank, and design storm event. Construction monitoring and QA/QC was conducted of containment structures as part of federal requirements and approved prior to site commissioning.

All solution pipelines with exception of the liquid hydrocyanic acid supply line to the plant and the wastewater lines to the wastewater tank containments and local hypochlorite water treatment plant are located within secondary containment provided by the plant. The hydrocyanic acid supply line is constructed of double welded stainless steel and is equipped with shut-off valves that will flood and flush the pipe with nitrogen if there is a critical change in flowrate, pressure, or temperature outside of normal operating parameters. The pipelines that transfer wastewater from the cyanide production plant to the hypochlorite water treatment plant via the wastewater collection tanks located in the containment basins just west of the plant are also constructed of stainless steel. These pipelines are buried for a short distance between the cyanide production plant and the wastewater secondary containment basin. Between the containment basin and the water treatment plant the lines are constructed aboveground on a pipeline gantry. The integrity of all pipelines and supporting structures are required to be visually inspected annually and hydrotested at intervals depending on the use of the pipeline as specified by Russian regulation. In compliance with these rules, the hydrocyanic acid pipeline is hydrotested every 3 years and the wastewater lines every 8 years.

Production Practice

1.2 Develop and implement plans and procedures to operate cyanide production facilities in a manner that prevents accidental releases.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 1.2.

Discuss the basis for the Finding / Deficiencies Identified:

Saratovorgsyntez has written management and operating plans and procedures for operating its cyanide production plant and maintains management system certifications to International Standards Organization (ISO) 9001 (recertified 6.3.2019), ISO 14001 (recertified 21.8.2019), ISO 50001 (recertified 25.3.2019), and Occupational Health and Safety Assessment Series (OHSAS) 18001 (recertified 21.8.2019).

The facility has a full set of operating procedures that describe the standard practices necessary for its safe and environmentally sound operation. Operating procedures, parameters and instructions covering normal, operational upsets and emergency response and shutdown are documented in operation manuals and work instructions. Procedures are also in place for personal protection equipment (PPE) and instruction for respiratory protection. Other written instructions are in place that cover all aspects of worker safety in the workplace including hot work, fire safety, explosion risk, working at heights, working with electricity, excavation works etc.

Procedures are in place for addressing operational upsets and emergency shutdown. An emergency response plan is also in place to address emergencies including fire, chemical releases and injuries. Operating procedures detail actions to be taken in the event of an upset or an emergency. Alarms and interlocks are in place for critical equipment to shut down the process and alert operators in the event of a potentially serious event. All foreseeable situations are documented in the procedures together with the response required to rectify the situation.

Procedures are in place to address changes in facility, operating practices, personnel, and product specifications. A procedure is established by law for making structural changes of projects previously approved by Glavgosekspertiza. Proposed facility changes are introduced through a company order in which all service areas to be touched by a change, including the safety and environmental departments are directed to discuss the proposed change and develop a term of reference from which the engineering design is developed. The proposed design is submitted to Glavgosekspertiza for approval and issuance of a construction permit. No changes have been made to the cyanide production facility since the 2016 ICMC certification audit that have required review and approval by Glavgosekspertiza. Procedures are also in place requiring approval of the safety and environmental department heads of

development of modification all changes in technological regulations and workshop instructions.

A company standard and instructions are in place for preventative maintenance. As per the standard an annual maintenance plan is developed that itemizes equipment by the name of the equipment and its schematic reference name. The frequency of maintenance (based on the requirements recommended by the manufacturer and provided in the equipment's technical passport) and the month and estimated hours to complete the maintenance are also included. This annual schedule is used to develop a monthly maintenance schedule that itemizes equipment, the date scheduled for the maintenance and the estimated hours to complete the task. The monthly schedule is updated as a record of maintenance completed. Saratovorgsyntez schedules a plant shutdown annually to permit maintenance of critical equipment; usually during September/October when the acrylonitrile plant that supplies the liquid hydrocyanic acid has its scheduled shutdown.

The production process is continually monitored by shift operators in the plant control room. Instrumentation readout is monitored on the control room display console. There are separate consoles and shift operators for each of the two production lines. The control systems are checked and calibrated every two years.

The production process is continually monitored by shift operators in the plant control room. Instrumentation readout is displayed on the control room console. The instrument controls installed for each piece of equipment and the pressure, flow and/or temperature settings of alarms and interlock systems are listed in a Technical Rule Book. This instrumentation is inspected and calibrated as per a Company Standard. Except for instrumentation that cannot be removed and is calibrated in place by government approved contractors, all instrumentation must be sent to a specialized licencing centre for maintenance and calibration.

No solid cyanide waste is generated as it is recycled within the process. Wastewater from the cyanide plant is directed to the wastewater tanks located in a concrete containment basin just outside of the cyanide production plant. All wastewater, except for sanitary waste, is directed to the local wastewater treatment facility for hypochlorite treatment to neutralize cyanide prior to being directed to the biological wastewater treatment plant located near the acrylonitrile plant for further treatment. At the biological wastewater treatment plant, the effluent is further processed to remove contaminants, including any residual cyanide, to meet regulatory environmental surface water standards prior to discharge into the Volga River. The operation monitors the discharge from the local wastewater treatment plant to ensure that it doesn't exceed 0.055 mg/L free cyanide. This discharge limit is set to ensure that wastewater does not exceed 0.048 mg/L free cyanide at the inlet to the biological treatment plant as free cyanide above this concentration would be toxic to the biological treatment process.

Sodium cyanide briquettes produced by the plant are packed into supersacks packed in plastic lined 350 kg or 1,000 kg IBC plywood boxes. The use of drums for shipping cyanide was discontinued in 2019. The IBC boxes are packed and sealed in the packing area located on

the ground floor of the cyanide production plant and transferred to the warehouse via a covered conveyor system, which prevents the containers being exposed to moisture.

A balanced general natural ventilation system is provided at the warehouse which exhausts through baffles and air is supplied through windows and structural openings. The ventilation is designed to turn on in response to hydrogen cyanide gas detectors, in order to ensure the air exchange necessary to maintain the content of pollutant to less than the maximum permissible concentration level (i.e., 0.3 mg/m^3).

The production and storage areas are located within an industrial area that is protected by a very restricted access control system. Access into the plant process compound is controlled by company security guards. Access to the warehouse is further restricted to authorized personnel only and entry requires signed authorization.

The produced cyanide is packed in packages, which are in full compliance with the international regulations for transportation of dangerous goods. Packaging and containers have Certificates of Conformity to the Standards of UN Recommendations on the Transport of Dangerous Goods, International Maritime Dangerous Goods Code (IMDG), The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), and Regulations concerning the International Carriage of Dangerous Goods by Rail (RID).

Production Practice

1.3 Inspect cyanide production facilities to ensure their integrity and prevent accidental releases.

The operation is: ■ in full compliance
in substantial compliance
not in compliance…with Production Practice 1.3.

Discuss the basis for the Finding/Deficiencies Identified:

Routine inspections of the integrity of plant are undertaken by operators at the change of shift as per area operator job instructions and specified schedules for various equipment. Any concerns are documented in the shift log. Procedures are in place and implemented to conduct routine inspection and maintenance of tanks, valves, and pipelines in compliance with these procedures. Instructions are in place that detail inspections of pumps used in the plant. There are also regulatory requirements for inspection and maintenance of piping and valves with operating pressures up to 100 MPa. Regular expert assessment is also carried out on industrial safety of components of the hazardous industrial facilities in accordance with the engineering maintenance and repair provisions and detailed work instructions. In addition, inspections of industrial building structures (including secondary containment areas) are undertaken by the building maintenance department. The results of inspections are recorded

in technical journals or, for significant deficiencies, in regulations or acts that address the deficiencies.

The inspection and maintenance frequencies are selected based on the specific equipment passport requirements which follow Rostekhnadzor requirements. Also, because the facility is a Class I hazardous operation monthly inspections are undertaken by Rostekhnadzor inspectors. Based on observations made during the site visit the plant appeared to be neat and equipment well maintained indicating that inspection frequencies are sufficient to assure that equipment is functioning with design parameters.

All inspection services of the Company file a designated form on the results of the inspection, which includes information on the nature of observed deficiencies, the date of the inspection, as well as the date of deficiency being eliminated, the name of the inspector, and the measures undertaken to address and fix deficiencies identified.

2. WORKER SAFETY: Protect workers' health and safety from exposure to cyanide.

Production Practice

2.1 Develop and implement procedures to protect plant personnel from exposure to cyanide.

The operation is: ■ in full compliance
in substantial compliance
not in compliance…with Production Practice 2.1.

Discuss the basis for this Finding / Deficiencies Identified:

Safe work procedures manual provides descriptions on the main hazards to be encountered, basic rules of work, fire safety, PPE, personal hygiene, and cyanide exposure first aid measures. In addition, there are specific instructions on the safe performance of hazardous tasks, including, respiratory protection, confined space entry, hot work, working with chemicals, working at heights, working around mobile equipment, and for performing specific maintenance tasks. Operational procedures are also in place that provide instruction on work tasks associated with operating the plant. These include instructions to evaluate and rectify non-routine or abnormal situations, address emergency situations and undertake emergency shutdown.

As discussed in Section 1.2, procedures are in place to address changes in facility, operating practices, personnel, and product specifications. All potential changes and modifications to the operation process are executed in a form of changes made in the *Technological Rule Book*. In addition, job safety analysis is implemented. In accordance with Russian regulation Saratovorgsyntez must carry out a hazard and risk analysis in which all relevant aspects

regarding safety of work are considered. The hazard and risk analysis documents are reviewed routinely by an expert team, and periodically by internal audits with partial input of employees.

As observed in the 2016 ICMC certification audit, worker input is encouraged. This is achieved through designated worker Health and Safety (H&S) representatives on the Saratovorgsyntez professional union H&S committee. Committee meetings are held quarterly during which worker representatives present input. Saratovorgsyntez also holds and annual H&S review competition in which workers are invited to present ideas for Occupational Health and Safety (OH&S) improvement. The winners of the competition receive a financial bonus. The 5S (efficiency and effectiveness management) competition held between Saratovorgsyntez departments is still in place in which several operational aspects are judged during this competition. The competition encourages improvement in production efficiencies and overall organization including H&S management and general housekeeping. The winning department receives a financial reward. Saratovorgsyntez has also embraced the Six Sigma Lean program to encourage improvement in process and energy efficiency. There is also a suggestions box located at the main office reception that can be used to communicate anonymously.

Fixed HCN gas monitors are located on all floors of the plant as well as in the warehouse. The detectors monitor ambient conditions in the workplace as well as interstitial space in liquid hydrocyanic acid lines and conduits to monitor for potential HCN gas leakage. The monitors are equipped with audial and visual alarms and are set to alarm at 0.3 mg/m^3, the maximum permissible concentration. Maintenance keeps additional monitors in stock for replacement as monitors are taken out of service for maintenance and calibration. In addition, Saratovorgsyntez has 12 portable HCN monitors. The fixed and portable HCN gas monitors are maintained on an annual schedule in conformance with the recommendations of the manufacturer and as required by the regulatory certificates. Maintenance is only permitted to be conducted by organizations accredited to undertake the work. Relevant records and documents are retained. Written instruction is in place that sets out the actions to be taken in the event an HCN gas alarm is activated and all personnel are trained in these procedures.

All hazards associated with the workplace are identified and workers are trained in use of appropriate PPE, including mandatory PPE to be used in the workplace as well as additional PPE required for undertaking specific tasks. The required PPE is displayed on signs posted throughout the plant.

Operators have radios for communication with the control room. There is also a loudspeaker system and cameras located about the plant that are monitored from the control room. Health and safety work instructions specify those tasks where a second person is required to be in attendance.

All employees are subjected to obligatory preliminary and further regular medical examinations to determine their fitness to perform their specified tasks. Medical examination

is a requirement of the Russian Federation Labour Code. A medical clinic is located at the site and undertakes the employee medical examinations.

The clothing change policy is unchanged since the 2016 ICMC certification audit. All employees, contractor representatives and visitors must use PPE, including facility provided coveralls. Coveralls must be removed, vacuum cleaned in a dedicated "undusting" room, and stored in separate lockers at the end of shift. Onsite laundry facilities are to be used for work clothes. Workers are provided with two sets of coveralls and are required to shower at the end of each shift and launder their coveralls at least every four days.

Hazard warning signs are prominently located throughout the plant to inform workers of the various chemicals and other hazards present. Signs are also posted that display the PPE required to be worn in various areas of the plant. Tanks and vessels are labelled to identify their contents and piping is colour coded and labelled to identify the contents and flow direction.

As part of personal hygiene requirements, no food, cooking or eating is permitted to be conducted on the industrial premises except at specific locations or in the dining room. It is a requirement to wash hands before eating. Smoking is only permitted in designated smoking rooms. The use of open flames is prohibited without a hot work permit.

Production Practice

2.2 Operate unloading, storage and mixing facilities using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 2.2.

Discuss the basis for this Finding / Deficiencies Identified:

An Emergency Response Plan (ERP) is in place for the site. The plan provides the response actions to be taken for various emergency scenarios. Actions for response to cyanide exposures are presented in an instruction manual for health and safety. The Plan is approved and signed off by senior management of Saratovorgsyntez and representatives of government response agencies.

There are no acidic portable fire extinguishers in the plant. In the event of a fire this building is equipped with an automatic system charged with Freon gas. Each floor is also equipped with an oxygen supply escape hood. The warehouse is provided with an automatic "Buran" type sprinkler system that is charged with a dry powder fire suppressant.

Showers and low-pressure eye wash stations non-acidic fire extinguishers are located at strategic locations on each floor of the plant throughout the site. For the dry zone there is a nearby shower station and eyewash in the adjoining room. The units are inspected as part of daily shift inspections and maintained on a regular basis.

Fire extinguishers are checked and recharged in conformance with an established schedule. The scope and frequency of maintenance of fire suppression systems is undertaken in accordance with the recommendations of the equipment manufacturers. Maintenance of these systems is conducted by an organization licensed to carry out activities on installation, maintenance and repair of fire safety equipment for buildings and structures.

An antidote management system and corresponding procedures are in place. Antidotes are changed according to the approved schedule by the OHS department. First aid equipment including amyl nitrite is checked once every 30 days.

Amyl nitrite antidote kits are stored in refrigerators in the plant control room, the medical clinic, the warehouse, and in the Rescue Team Centre within the temperature range recommended by the manufacturer. At the Rescue Team Centre amyl nitrite is also packed in ice in an emergency ready medical response bag. The ice is changed every 3 hours by the on-duty medic to ensure the antidote is maintained within the recommended storage temperature. The amyl nitrite is carried by maintenance personnel when undertaking maintenance work in the plant and returned to the head of shift and refrigerator at the end of shift. First aid equipment including amyl nitrite is checked once every 30 days.

Medical oxygen and resuscitator kits are kept at the Rescue Team Centre and on the rescue team vehicle. Sodium thiosulphate antidote is also maintained for used by the Rescue Team Centre Doctors. The Rescue Team Centre also has equipment for recharging the oxygen bottles. Operators have radios for communication with the control room. There is also a loud speaker system and telephones. An emergency dispatch control centre is located at the Rescue Team Centre that is manned 24 hrs.

Hazard information, appropriate PPE, exposure symptoms and first aid measures are documented in the Health and Safety Manual. Product MSDS sheets are available for distribution to customers in the Russian language. Additional information is available in writing at working places where cyanide handling is carried out and on signage concerning the presence of cyanide and precautions that should be taken.

As discussed in Section 2.1 the facility has a decontamination procedure for leaving areas with the potential for skin exposure to cyanide. As part of personal hygiene requirements, no food, cooking or eating is permitted to be conducted on the industrial premises except at specific locations or in the dining room. It is a requirement to wash hands before eating.

Cyanide awareness training, including symptoms of cyanide poisoning and first aid, are a part of all cyanide plant personnel training. Several facility personnel are also trained as first

responders to apply amyl nitrite. The Saratovenergoneft complex retains an emergency rescue team and medical centre under contract. The medical centre (Medis) has 3 doctors on night shift and 10 doctors on day shift. The rescue team comprises a total of 32 emergency response personnel. All doctors and the rescue team are trained in the application of amyl nitrite and use of medical oxygen. Doctors are also approved to apply intravenous antidote such as sodium thiosulphate. The medical centre maintains an ambulance for conveying workers to the local hospital.

The decision on sending a worker exposed to cyanide to a particular medical facility is made by the ambulance personnel, arriving at the enterprise. Russian Federal Law requires all medical facilities across the country to provide emergency first aid without the need for a special agreement. Nevertheless, the facility has notified local hospitals, clinics, etc. of the potential need to treat patients for cyanide exposure, and the site is confident that the medical provider has adequate, qualified staff, equipment and expertise to response cyanide exposures.

Operational mock emergency drills are conducted monthly based on a schedule that is developed annually. These drills simulate operational upsets including equipment failures, depressurization, and chemical releases. In addition, mock drills are also undertaken by the rescue team to test emergency response to releases and personnel exposure and injury to hazardous chemicals. These drills include participation of third party responders. The drill results are evaluated and analysed and are used to further enhance the procedures. All results are archived and controlled. Records on most recent drills conducted in the cyanide production were provided for review.

Procedures are in place to investigate and evaluate cyanide exposure incidents to determine if the operations programs and procedures are adequate. No cyanide related incidents have occurred since the certification audit, but records are available for other incidents demonstrating the procedure is being used. According to Russian requirements an evaluation of an incident situation must be completed, and the ERP reviewed and updated as applicable after each and every incident.

3. MONITORING: Ensure that process controls are protective of the environment.

Production Practice

3.1 Conduct environmental monitoring to confirm that planned or unplanned releases of cyanide do not result in adverse impacts.

The operation is:

- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 3.1.

Discuss the basis for the Finding / Deficiencies Identified:

There are no indirect discharges to surface water. The cyanide plant is provided with containment to prevent seepage into groundwater. No cyanide related spills have occurred outside of containment areas in the past three years

Prior to discharge to the Volga River all wastewater from the production area undergoes local treatment with sodium hypochlorite at the local hypochlorite wastewater treatment plant to neutralize cyanide. This is followed by further treatment at the Saratovenergoneft industrial complex biological treatment facility prior to discharge to the environment.

The standard for the level of cyanide ion concentration at the control monitoring point prior to discharge to the biological treatment facility is 0.055 mg/l. The cyanide concentration is further reduced as the discharge is diluted with other sources of wastewater entering the sewer as it flows to the biological wastewater treatment facility located approximately 1.3 km away from the sodium cyanide plant. Because of toxic effects to the biological process, the maximum allowable concentration of free cyanide permitted in feed to the biological treatment plant is 0.048 mg/L. At the biological wastewater treatment facility residual cyanide concentrations are further reduced before discharge to the Volga River. The regulated maximum permissible concentration at the discharge point to the Volga River is 0.05 mg/l for protection of fishery water bodies. Review of analytical records for the last 3 years showed that the concentration of free cyanide ions to the Volga River never exceeded 0.005 mg/L, which is far below the levels of both maximum permissible concentration and concentration limits set out in the Code (0.022 mg/l) for protection of aquatic life.

There is a network of groundwater monitoring wells located within the Saratovenergoneft industrial complex of which nine wells are monitored quarterly by Saratovorgsyntez. There are also additional wells located outside the plant boundary, four of which are located proximate to and downgradient of the sodium cyanide plant. A program is in place to upgrade the offsite wells by replacing them with new wells. Between 2017 and 2019 five of these wells were upgraded. The offsite wells are sampled semi-annually. Monitoring data from the wells inside and outside the industrial complex for 2017 through 2019 show that the groundwater has not been impacted by cyanide production activities. The concentrations of free cyanide ions in all wells within and outside the complex were below the detection limit of 0.005 mg/l; i.e., less than 0.022 mg/l standard established for the protection of aquatic life.

To protect workers, there are HCN gas detectors located throughout the plant that alarm at 0.3 ppm, the maximum exposure limit for HCN.

Atmospheric emissions from the production lines are controlled by scrubber units and incinerators to ensure that the maximum permissible concentration limits for atmospheric air quality of residential areas are not exceeded at the boundary of the sanitary zone of the enterprise. Interlocks activate on the incinerator if temperature or flow upsets compromise the quality of emissions. The point emissions from the production facilities are sampled

quarterly and the records show that emissions have not exceeded regulatory standards in the last 3 years.

Ambient air quality is monitored using a mobile vehicle laboratory furnished with air sampling and analysis equipment. At the time of the last ICMC certification audit the mobile vehicle only collected air samples for analysis in the laboratory. This vehicle has since been upgraded to also allow air quality analysis to be undertaken in the mobile laboratory and radio the results directly to the local government and Saratovorgsyntez laboratory. Measurements are collected at several points downwind of the industrial complex each day (except Sunday and Monday), with some special points sampled twice a day. No exceedances have been recorded during the past three years.

There is a schedule to a both surface water discharge and groundwater quality. The water quality of the Volga River is monitored both upstream and downstream of the discharge point from the biological treatment plant.

Monitoring of wastewater quality after biological wastewater treatment facilities is carried out according to the "*Schedule of Analytical Control of Service Centre of "Saratovenergoneft" for* W*astewater and Water Protection Sites*", approved by designated legal authorities. Groundwater wells on the site are monitored quarterly while the offsite wells are monitored semiannually.

Air quality monitoring at the enterprise is conducted according to the "*Schedule of Analytical Control of Industrial Emissions of Pollutants at LLC" Saratovorgsyntez*", which is an integral part of the Project for the Standards for Maximum Permissible Emissions, approved by (Federal Environmental, Industrial and Nuclear Supervision Service of Russia). It is the opinion of the auditors that the frequency of monitoring is adequate to characterize the medium being monitored and to identify changes in a timely manner.

4. TRAINING: **Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.**

Production Practice

4.1 Train employees to operate the plant in a manner that minimizes the potential for cyanide exposures and releases.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 4.1.

Discuss the basis for the Finding / Deficiencies Identified:

All new workers are required to complete a training program on hazard awareness and emergency response. This training includes hazards associated with cyanide and response to cyanide related emergencies. Semi-annual knowledge refresher training is also a regulatory requirement. Induction training is required prior to any work being undertaken on-site and over the period that certification is done. This training includes emergency response actions to alarms and evacuation requirements and, for those personnel that undertake work in and around the cyanide facilities, detailed safety induction including specific measures to protect human health and environment from cyanide release and exposure. Regular training with obligatory refresher training is conducted for workers once every half a year. Regular trainings are carried out in accordance with the list of obligatory instructions with the record being made in every worker's personal training card.

Saratovorgsyntez has evaluated the risks, hazards, skills and training required, and developed written policies, practices and procedures to protect employees during the course of their work and in the use of appropriate PPE including gas masks and respirators. This training is mandatory and must be repeated according to the approved schedule.

The site trains workers to perform their normal production tasks with minimum risk to worker health and safety and in a manner that prevents unplanned cyanide releases. The annual training plan is developed at the beginning of the year. The plan includes training elements and specific training materials for each working place. New employees are required to work under direct supervision for 2 months and pass all elements of the job before being permitted to work alone.

Training elements necessary for each job are documented in plant operating manuals and working instructions. There are written instructions for the creation of new documents, incorporating changes and for the superseding of existing documents. Health and safety procedures are developed and amended, as required, through the incorporation of staff feedback questionnaires.

Training is provided by engineering personnel of the cyanide production and degasification areas and is certified in compliance with the procedure established at the Company. Trainers are all engineers with higher education and specific safety training. They have worked at the plant for a minimum of 3 years and are required as part of Russian Regulation to take refresher training every 5 years through examination by special committee.

All new employees for the whole period of job training and training in safety are required to be accompanied by designated persons (supervisor or qualified specialists) according to a Company Order to acquire hands-on experience in the workplace. In case a newly hired worker does not possess the necessary qualification, the worker is offered a training course in an educational agency in accordance to his/her major field of occupation.

Upon the completion of the course and the traineeship, workers are examined in the field of standard operating procedures and/or specific occupations by a workshop's qualification

committee prior to being permitted to work unattended. Training records are documented and retained for all personnel, including contractors, governmental inspectors and visitor inductions.

To obtain hands-on experience in the field of safety, accident prevention and elimination in production facilities with Class I and II explosion hazard, all workers and engineering staff, directly involved in management of technological process and equipment operations at such facilities, are required to take the qualification course assisted by contemporary training and skills development devices (e.g. computer simulators) in line with the Federal norms in the field of industrial safety "*General Codes on Explosion Protection for Explosive and Fire Hazardous Chemical, Petrochemical Plants and Oil Refineries*".

Examinations are undertaken on completion of training and annually as part of knowledge assessment refresher training. Examination is by special committee approved by Company Order. Job competence is also assessed informally through task observation. All workers must pass the testing before being allowed to work unsupervised, the testing is provided by the certification committee, consisting of engineering personnel of the production and degasification areas, representatives of the OH&S Department, Training and Information Centre, and the Department of Production and Operation. Following Russian requirements, the trainings are documented as required: to be traced back personally to each individual, covering the training subjects, trainers, topic, date, duration and kind of verification of understanding and effectiveness.

Production Practice

4.2 Train employees to respond to cyanide exposures and releases.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 4.2.

Discuss the basis for the Finding / Deficiencies Identified:

The operation trains employees to respond to cyanide exposure and releases. All personnel working in or around the cyanide production plant are trained to respond to emergency cyanide release incidents in accordance with planned response specified in the on-site emergency plan. This training is an integral part of the field of civil defense and protection from emergencies training that is conducted annually at the workplace on a basis of a 16-hour program. Four training groups have been created in the cyanide production plant. All trainers have passed through specialised training at a regional level (City of Saratov). All the staff of the cyanide production plant was trained in civil defense and emergency situations. The training is provided by the heads of departments and shifts and is carried out in accordance with the special program of course training of the working population in the field of civil defense and protection from emergencies approved by the Minister of the Russian Federation for Civil Defense,

Emergencies and Elimination of Consequences of Natural Disasters, approved by the order of the site General Director.

Workers are trained how to respond to exposure to cyanide through the induction training process and on-going training. Workers are trained to respond to worker exposure to cyanide and routine drills are used to test and improve their response skills. Drills are conducted regularly, and lessons learned are analysed and taken into account during updates of the training programs.

The risks scenarios are practiced by routine mock drills. These drills are conducted in accordance to the schedule approved by Company Order and the Emergency Response Procedures to make sure the facility takes planned actions during emergencies. The drill results are evaluated and analysed and used to further enhance the procedures. All results are archived and controlled.

Corrective actions are derived, defined and implemented. The staff of the plant is involved throughout the complete mock drill activities to improve their skills and to optimize their awareness.

Training is entered in a logbook that includes the type of training, trainee name and signature, date of training, and trainer name and signature. A Personal Registration Form is also completed, which is filed in the employee's personal file. Training session schedules and session logbooks are kept and signed by the trainers. Training session schedules and session logbooks are retained by the Health Safety and Environmental Department and stored in the Training and Information Centre.

5. EMERGENCY RESPONSE: Protect communities and the environment through the development of emergency response strategies and capabilities.

Production Practice

5.1 *Prepare detailed emergency response plans for potential cyanide releases.*

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 5.1.

Discuss the basis for the Finding/Deficiencies Identified:

The Facility has an ERP to address potential releases of cyanide that may occur on site and considers all relevant and potential failure scenarios that may otherwise require response.

Saratovorgsyntez LLC's action plan for emergency prevention and response was agreed with the main Department of the Ministry of Emergency Situations (EMERCOM) of Russia for the Saratov Region and approved on 03.07.2018 by the company order signed by General Director. The plan for increase of security of critically important facility LLL 'Saratovorgsyntez' was also agreed on 16.10.2017 with the Main Directorate of the Russian Ministry of Emergency Situations for the Saratov Region and approved on 11.01.2018 by the General Director.

The ERP is linked to specific emergency situations and the appropriate procedures and responses within the site's systems. The scope of the ERP and associated procedures include all potential accidental releases of cyanide and potential failure scenarios. The ERP addresses the following emergency scenarios: accidents with the release of hydrogen cyanide and other hazardous chemicals, explosions and fires, transport accidents, the collapse of building structures, absence of energy resources, terrorist acts, and natural emergencies. The ERP identifies credible emergency scenarios for catastrophic release of hydrogen cyanide, releases during loading and dissolution operations, pipe, valve and tank ruptures as well as, but not limited to, impacts of power outages, fire, etc.

The Company has developed a plan for the evacuation of Saratovorgsyntez LLC personnel in natural and man-made emergencies threat and occurrence. Specific response measures, first aid measures and use of cyanide antidotes, as well as analytical environmental monitoring are described. Specific measures on personnel response actions are presented in modules (according to the potential emergency scenarios). The ERP describes specific emergency response actions for different situations, including control of any release at source; evacuation of workers and potentially affected communities; use of first aid measures and antidotes; and containment, assessment, mitigation and future prevention of releases. The plan was agreed on with the Saratov Municipality Administration Department for Protection of the Population and Territories from Emergency Situations on 6.4.2018 and approved by the Head of Administration of the Zavodsky District of the Municipality of the City of Saratov on 7.6.2018.

Production Practice

5.2 Involve site personnel and stakeholders in the planning process.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 5.2.

Discuss the basis for the Finding / Deficiencies Identified:

Because cyanide is classified as a poisonous substance in Russia, cyanide production, storage, transport and handling are strictly regulated by the government, and government involvement in emergency planning is legally required. The site has involved its workforce and stakeholders in the emergency response planning process.

Governing authorities of the Region, the City of Saratov, Saratovsky District, and enterprises and organizations located in the 2.5 km zone are made aware of the nature of the risks. The ERP contains a list of the industrial neighbours which may be affected in case of cyanide release. Their activities, addresses, contact details and contact names are given. The company conducts regular joint drills with city emergency services to check the compliance of communication and emergency response measures.

The Fire Brigade, which provides its services to the facility under agreement. The Paramilitary Gas Rescue Squad, LLC "Medis" medical institution, and security for the facility, are involved in development of all emergency response plans and measures.

Site is engaged in regular consultations/ communications with relevant stakeholders to assure that the ERP addresses current conditions and all risks.

The Company engages with the Saratov Oblast and Saratovsky District governing authorities, and federal executive authorities on the matter of:

- emergency situations data gathering and exchange;
- assignment of additional forces and resources for the liquidation of emergency situations;
- order of emergency response measures to be initiated;
- arrangement of security at the facility during emergencies, including terrorist attack.

Production Practice

5.3 Designate appropriate personnel and commit necessary equipment and resources for emergency response.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 5.3.

Discuss the basis for the Finding / Deficiencies Identified:

The operative part of the ERP on localization and liquidation of emergencies at the cyanide production and degasification area specifies the responsible parties and the emergency response procedures they are to follow and defines the roles and responsibilities and descriptions of certain functions such as security personnel, fire-brigade, medical service, 24-hours-standby duty service team and the site rescue team. The responsible coordinators and functional leaders are also defined.

The ERP trainings are conducted in the course of emergency drills for every module and scenario for every shift, including all specialized response services being called. A list of emergency response equipment is developed and in place.

The ERP calls for the designation of personnel to fill the roles of Emergency Response Coordinator, identifies the emergency response team, defines training needs, includes call-out procedures and 24-hour contact information for the Emergency Response Coordinator and response team members, and specifies their duties. The ERP also lists all emergency response equipment that should be available and includes procedures to inspect emergency response equipment and assure its availability when required. The ERP also describes the role of outside responders, medical facilities and communities in emergency response procedures.

The ERP was developed with input and agreement with third party organizations, involved in localization and liquidation of emergencies; and with the facility security service, fire brigade and gas rescue squad. A mock drills schedule for facility areas is developed annually and is introduced by the Order of the Senior Engineer of the Company. The Schedule is distributed among all facility areas and third parties: facility security service, fire brigade, gas rescue squad, and medical service.

Outside entities are included in the ERP through the Regional Authority who produces the External Emergency Plan for the City of Saratov. The facility provides confirmation that outside entities included in the Plan are aware of their involvement and are involved in mock drills and implementation exercises. Records of three drills conducted in 2019 were reviewed and showed that the formal follow up training were reviewed and accepted. Training needs of the organization are defined in the emergency response plans, and formal training of all personnel involved in cyanide production/handling is carried out. Telephone numbers, addresses and contact persons (includes internal contacts and external contacts such as authorities, police, neighboured companies, public institutions, transport companies, hospitals and medical support, and public media) are listed and kept up to date.

Production Practice

5.4 Develop procedures for internal and external emergency notification and reporting.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 5.4.

Discuss the basis for the Finding/Deficiencies Identified:

The ERP includes procedures and contact information for notifying management, regulatory agencies, outside response providers and medical facilities of an emergency. If external medical support or follow-up care is required, medical facilities and care are available at Saratov City hospitals. The ERP includes the following appendices:

- scheme of notification organisation;

- scheme of management organisation; and
- scheme of communication organisation.

The ERP includes procedures and contact information for notifying potentially affected communities of the incident and/or any response measures, and procedures for communication with the media.

In case of emergency threat or its occurrence, an operator of the Production Dispatcher Division of the facility notifies enterprises and organizations within 2.5 km from the site using the means of local alerting network. Local Civil Defense and Emergency Situations Authorities are notified using point-to-point communication. The Production Dispatcher Division operator (personnel work in shifts covering 24-hours) has a list of contacts for immediate notification, which is annually updated.

Production Practice

5.5 Incorporate into response plans and remediation measures monitoring elements that account for the additional hazards of using cyanide treatment chemicals.

The operation is:
- ■ in full compliance
- in substantial compliance
- not in compliance…with Production Practice 5.5.

Describe the basis for the Finding/Deficiencies Identified:

The ERP incorporates appropriate specific remediation measures and application and monitoring requirements associated with the use of cyanide treatment chemicals. The ERP describes emergency spill clean-up measures and personnel actions including removal of contamination; disposal to appropriate approved facilities; use of decontamination chemicals; monitoring requirements/methods, and provision of alternative drinking water where necessary. Saratovorgsyntez has the capability and resources to respond to all but the largest events and has made arrangements to request assistance from third party responders as needed. Remediation would be planned and executed by the environmental department with assistance from environmental contractors as needed.

The possibility for cyanides being released into surface water is extremely low due to the provision of secondary containments and a system for collection of cyanide releases into wastewater collection reservoirs and subsequent sodium hypochlorite treatment at the local treatment facility prior to discharge to the Saratovenergoneft biological treatment facility for additional treatment. Staff understand that the use of chemicals such as hydrogen peroxide, ferrous sulphate or sodium hypochlorite for the removal of cyanide near surface waters is prohibited.

Analytical monitoring is carried out throughout all stages of treatment. Discharge into the biological treatment facility is exercised only under permission given based on the results of laboratory analyses of wastewater at the inlet. Cyanide concentrations control at the biological treatment facility inlet is carried out every two hours. All types of polluting substances are neutralized at the biological treatment facility using microorganism activated sludge, which achieves minimum pollutant concentrations in wastewater treated. The level of cyanide ion concentrations prior to discharge into surface water (i.e., Volga River) is evaluated at 0.0049 mg/L.

The ERP addresses the potential need for environmental monitoring to identify the extent and effects of a release and includes sampling methodologies, parameters, and where practical, possible locations. For that purpose, the Company established a mobile environmental monitoring station, at which the contamination zone is identified, and analysis results are reported to the operator at the facility. Additional wastewater sampling is conducted at an observation well prior to wastewater being discharged to the biological treatment facility. The storm water drainage system is designed to collect in wastewater reservoirs which discharge into the industrial sewer system for further treatment. All releases and discharges from the cyanide production and degasification area are kept separate from the storm water drainage system and treated at the local hypochlorite wastewater treatment plant before being discharged to the industrial sewer system for further treatment.

Production Practice

5.6 Periodically evaluate response procedures and capabilities and revise them as needed.

The operation is: ■ in full compliance
in substantial compliance
not in compliance…with Production Practice 5.6.

Describe the basis for the Finding/Deficiencies Identified:

The ERP and emergency response documentation contain provisions for periodical review and evaluation of their adequacy as prescribed by Russian Federation regulation, and they are being implemented. Mock emergency drills are conducted periodically to test response procedures for various emergency scenarios including release of hazardous chemicals, explosion and fire, and exposure and injury to personnel. Over the period of certification intensive and routinely performed mock emergency drills have been conducted with all necessary respective interested parties (See Section 2.2). Review of findings and room-for-improvement analysis are part of a systematic evaluation process of emergency response actions and mock drills. Review of drill results did not identify the need to update the ERP itself, but decisions had been made to deliver elements of the emergency response training materials more widely within specific services of the organisation.