SAKHALIN-1 PROJECT
WASTE MANAGEMENT CONCEPT

EXXON NEFTEGAS LIMITED

2017
ENL Waste Management Strategy

Organization of waste management system is considered by ENL to be one of the highest priorities in the Sakhalin-1 Project. The waste management system is based on the standards and requirements that are common for all Sakhalin-1 Project facilities, strategic planning, centralized waste management, improvement of infrastructure and methods of operation, activity results analysis by key parameters and as compared against best practical results in industry, taking necessary corrective measures.

According to the basic principles of the Russian Federation national waste management policy, the purpose of this system is to provide cost efficient and environmentally safe waste handling at each stage of work.

In order to achieve this purpose, ENL implements the waste management strategy based on international standards, ExxonMobil corporate waste management standards and incorporating the following principles listed in the sequence of application:

- **Minimizing of waste generation**
  
  Minimizing of waste generation is the most important part of Sakhalin-1 Project waste management strategy due to remote location of the company's production facilities.

  In order to solve the tasks of prevention and decrease of waste volumes, ENL implements on an annual basis a number of initiatives and actions aimed at utilization of low waste and resource-conscious production technologies and prevention of waste generation at source.

- **Waste recycling and reuse**
  
  Waste collection, separation and mechanical treatment is focused on identification of waste sources and separated collection of waste that may be reused in core processes or delivered for recycling as recoverable material.

- **Utilization of best available technologies for waste neutralization and dumping**
  
  Waste neutralization (including waste burning in incinerators) is the key way to decrease hazardous waste properties and to preserve land resources due to reduction of waste dumping volumes.

  As to waste disposal, ENL performs injection of drill waste, produced water and household wastewater into isolated zones of the subsoil license areas. This method is generally acknowledged as the most environmentally safe one in drilling and oil production waste handling.

- **Waste dumping at special landfills**
  
  The Sakhalin-1 Project waste not liable for neutralization, recycling or reuse shall be buried in environmentally safe manner at landfills satisfying the requirements of the Russian Federation environmental laws and regulations.
Types and Amounts of Generated Waste

The main sources of waste are:

- Main production facilities: waste generated during construction of infrastructure facilities, drilling and operation of wells, crude oil treatment process, maintenance and repairs of equipment, and operation of production facilities.

- Support production infrastructure: operation and maintenance of motor vehicles, heat and power generating equipment, warehousing facilities, and maintenance shops.

- Infrastructure facilities: office and accommodation buildings, cafeterias and mess rooms, housekeeping and utility areas, and water supply and water discharge systems.

ENL has completed certification of all generated wastes in accordance with the RF laws.

More than 95% of all waste generated every year comprise drilling cuttings and produced water. The primary waste management method used on the Sakhalin-1 project is the injection of waste into deep isolated subsurface formations of the license areas.

In addition, ENL ships the drilling cuttings to contractor companies for recycling and reuse.

As production increases, the volume of produced water increases every year as well. All the produced water is injected into deep isolated subsurface formations of the license areas.

The rest 3 to 5% of annually generated waste in the course of the Project are domestic wastes and production wastes that are similar to utility wastes. Their volume is about 6,000 to 9,000 tons per year.

The bulk of process and domestic waste consists of several key groups: iron and non-ferrous scrap, waste timber, oily sludge and oily water, construction waste, plastic, office and amenity space waste, and food waste. For each of the key groups, ENL has developed and follows the strategy of maximized recycling / decontamination of waste, which, among other things, is based on separated collection of waste at their sources, segregation, availability of waste management infrastructure, and creation of proper conditions for collection, storage and pre-shipment processing of waste.

Waste Management Methods and Facilities

ENL manages the wastes based on the license # 27 00251 of 19 December 2016 for collection, transportation, treatment, recycling, decontamination and disposal of I-V Hazard Class wastes.

In accordance with the provisions of the Law No. 89-FZ of the Russian Federation “On Production and Consumption Wastes”, several types of waste management activities are carried out at the Sakhalin-1 facilities, as specified below:

- **Accumulation** - Primary and/or temporary storage of waste for the period of up to eleven months on specially equipped storage areas in special containers or tanks pending further use, decontamination, disposal, and transportation.
At the Sakhalin-1 facilities, waste is collected and segregated by types and hazard classes to ensure further decontamination, recycling or disposal of the waste under the applicable regulations and ENL standards. The types of waste that are suitable for recycling are segregated directly at the source, to minimize contamination and maintain the quality of materials to be re-used.

At each facility, waste is collected at specially arranged primary collection areas, and then, as sufficient quantity is accumulated, removed to temporary waste storage areas or other designated areas, enclosed spaces and facilities. The containers for primary collection of waste are marked with labels specifying the name of waste and its hazard class.

Waste segregation areas are supplied with suitable containers for segregation of waste, electric compactor, weights, and transfer pumps.

- **Waste preparation** - Preliminary processing of wastes for further handling, including segregation, sorting, treatment.

Specific operations that are conducted at waste segregation areas include:
- Weighing of waste;
- Segregation of solid waste that is not to be incinerated (aerosol spray containers, plastic bottles, metal);
- Secondary segregation of potentially recyclable waste;
- Compaction of waste before shipment to re-cycling and re-use.

Waste segregation areas are supplied with suitable containers for segregation of waste, electric compactor, weights, and transfer pumps.

- **Utilization** – use of wastes for production of goods (products), for work performance and services provision including reuse of wastes for the intended purpose (recycling), their return in the process cycle upon the required processing (regeneration) as well as extraction of the useful components for reuse thereof (recuperation). For instance, oily water generated during the core and support production processes is utilized at the company’s own production facilities (recuperation).
Neutralization – decreasing of wastes mass, modification of their composition, of chemical and physical properties (including incineration and/or decontamination at special installations to reduce the risk of adverse effect of the wastes on human health and environment;

Thermal treatment of waste is an important element of the ENL Waste Management Strategy. The use of industrial incinerators and special plants allow:
- Safe decontamination of oily waste, and production and domestic waste;
- Reduction of toxicity and hazardous properties of generated waste;
- Reduction of the volume of generated waste;
- Using the capabilities of waste disposal facilities to maximum effect.

In addition to waste incinerators, the key production facilities of ENL have utility and domestic wastewater separators and treatment plants, designed for treatment and decontamination of greywater effluents.

Some thermal waste disposal plants used in Sakhalin-1 project

<table>
<thead>
<tr>
<th>Incinerator, INFRATECH 200MC</th>
<th>Oily sludge treatment plant, UZG-1M</th>
<th>Mobile incinerators, Forsazh-1</th>
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</thead>
</table>

Storage – waste storing at specialized facilities for a period over eleven months for utilization, neutralization and burial.

After collection and segregation, the waste intended for storage is delivered to specially arranged areas and facilities for temporary storage. These areas and facilities are intended for the safe storage of waste in accordance with the requirements of environmental laws and centralized waste management. The waste is kept in temporary storage until sufficient quantity is accumulated, and then it is removed for re-circulation, treatment or burial.

Temporary waste storage facilities are:
- On the offshore drilling platforms: designated zones and enclosed areas on decks and below decks;
- Temporary waste storage areas (TWSA);
- Contained waterproofed pits for the storage of drill cuttings and oily waste at Chayvo WS and Odoptu North WS. The volumes of these pits are 4,500 m³ and 4,000 m³, respectively.

Additionally, waste storage pits are considered as back-up storage facilities that will accommodate large amounts of oily waste, if needed, in the events of the emergency oil spill response operations.

Some of the Sakhalin-1 temporary waste storage facilities

| Chayvo TWSA | Odoptu WS oily waste pit | Olfan TWSA |
Waste management concept

TWSA at Chayvo OPF is the main waste storage area, and is used for centralized management of the removal of waste from the key Project production facilities. Chayvo TWSA is arranged on waterproofed foundation, and has a fence and lockable gates. The storm water drainage collection system on the temporary waste storage area is closed into contained waterproofed evaporation pond. The condition of ground water in the temporary waste storage area and its vicinity is monitored in two monitoring wells.

The zones and facilities included in the temporary waste storage area are:
- Open waste storage zones: area with concrete pavement for bulk storage of some waste items of hazard class 5;
- Enclosed storage zone containing 20-ft and 40-ft ISO shipping containers for temporary storage of waste of hazard classes 1 - 5. Each container has a label indicating the waste item and its hazard class;
- Solid domestic waste handling zone;
- Metal separator pit for oily waste. The pit comprises a metal three-compartment tank for separation of liquid and solid phases of oily waste. The bottom of the tank has a grading, allowing the liquid phase (oil/oily water) to be collected in the lower compartment, which has an additional divider for separation of oil and water;
  - Evaporation pond for collection of stormwater runoffs and closed-drain system;
  - Waterproofed (reinforced plastic liner) pit for the storage of oily soil or snow;
  - Motor truck weight bridge for oversized and bulk waste materials;
  - Indoor workshops and weigh area;
  - Office buildings.

Some TWSA facilities at Chayvo

- Mercury lamp storage container house
- Closed waste storage zone
- Evaporation pond
- Motor truck weigh bridge
- Separator pit
- Open waste storage area

- Burial - containment of waste not subject for subsequent utilization at special storage facilities preventing ingress of harmful substances into environment.

One of the key environmental activities implemented under the Sakhalin-1 project is the disposal of drilling waste, formation water, and other process waste in the isolated subsurface formations through waste injection wells. At present day, this technology is accepted as the most advanced, and is successfully used worldwide
during the drilling of oil and gas wells in environmentally sensitive areas, such as and in the first place, the coastal areas and offshore drilling platforms.

- **Transportation** – movement of wastes using transportation means beyond the limits of a land plot owned by a legal entity;

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<thead>
<tr>
<th>Removal of waste cardboard for re-cycling</th>
<th>Transportation by sea</th>
<th>Loading scrap metal</th>
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<tbody>
<tr>
<td>Loading used tires for re-cycling</td>
<td>Discharging oily sludge to the separator pit</td>
<td>Removal of waste timber to be delivered to the local community</td>
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</tbody>
</table>

Movement of all waste is traced from generation locations to locations of final disposal / utilization / use. Information on the waste generation and movement is input to the database developed with account for Sakhalin-1 Project specifics. Such bases are used for analysis aimed at continuous improvement of the waste management strategy, timely measures for protection of public health, for ensuring safety and protection of environment.
Waste management concept

**Contracts and Interfacing with Contractors**

**Service level contracts**

The main waste management scope at the Sakhalin-1 Project facilities is performed by the specialized companies within the contractual service provision.

The strategy of ENL contractual policy is aimed at obtainment of full waste management service package, from waste collection and separation at source (which requires continuous availability of the contractor's personnel at all Project facilities) to the utilization of resource base of the waste management contractor.

Availability of necessary licenses, certificates and contractual operation authorities is a mandatory requirement for the contractor.

Based on cost efficiency conditions, the Sakhalin-1 Project specifics and market environment, ENL utilizes two or three contracts covering the entire range of waste management services. This makes it possible for the contractor management and personnel to understand their position within the general framework of Sakhalin-1 Project operations, know and understand the objectives and tasks of ENL waste management strategy. Such approach raises the contractual relationship to the level of partnership and significantly improves efficiency and performance.

**ENL interfacing with contractor companies**

Only three parties participate in the procedure of waste transfer to specialized enterprises for decontamination, utilization and burial: ENL as waste generator, the contracting and/or transportation company and the final waste consumer (in a number of cases it is the contracting company).

This methodology of ENL interaction with contractors is based on ENL responsibility for wastes generated in the Sakhalin-1 Project that makes it possible to eliminate waste handover to any intermediary organizations that do not have real production facilities for waste handling and do not perform such activities.

The procedure for selection of waste consumer companies has been developed in compliance with ExxonMobil corporate requirements and ISO14000 and included into ENL waste management guidelines. One of its key points is environmental audits of contracting and subcontracting companies providing waste management services for Sakhalin-1 Project.

The main aim of the audit is to confirm legal and technical readiness of the contractor to provide high-quality waste management services. The audit is conducted:

- for all new contractors and subcontractors - in a mandatory manner before contract signing;
- for existing contractors and waste consumers at a regular intervals (once in 5 years);
- and in case of change in the scope and types of rendered services.

The audit objectives include collection of detailed information on availability/content of environmental permitting documents, assessment of technical capabilities of potential contractor for provision of services (availability and condition of production goods, production bases, qualified personnel), survey of capabilities, experience and reputation of contractor and subcontractor companies. The compulsory part of the audit is on-site assessment of the company's facilities. Particular attention is given to compliance of the contractor's facilities with the Russian Federation environmental requirements and ENL corporate standards.
ENL has developed and regularly updates the schedule of audits of waste consuming companies. Under the existing practice, 3 or 4 audits are conducted annually. The practice of regular audits of waste consumers also makes it possible to get their feedback on joint activities, discuss the actions for its improvement and to improve performance.