

EXTENDED SUMMARY OF FINAL REPORT
on
ENVIRONMENTAL RESTORATION WITHIN THE DECOMMISSIONED
MILITARY FACILITY NEAR
POKROVSKOYE SETTLEMENT, ONEGA MUNICIPALITY,
ARKHANGELSK REGION

The environmental restoration activities within the decommissioned military facility near Pokrovskoye settlement, Onega Municipality, Arkhangelsk Region, have been performed by “GORST” Ltd. in 2009-2010, as specified in Service Agreement №CS-NPA-Arctik-12/2009 dd. 2 October 2009 between “GORST” Ltd., the “Executive Board of the Russian Program for Investment into Environment Enhancement” (EB РПИЕЕ/ИД РПОИ) and Committee on Environment of the Arkhangelsk Region.

The contracted environmental restoration activities included three stages:

1. In the first stage (2009), we performed the following environmental restoration activities:
 - preparatory work;
 - oil products collection and loading, with the use of EK-18 backhoe, from the storage reservoir into the container for temporary storage;
 - local heating of oil products up to 60°C by using tubular electric heaters with further pumpover by GAZ KO-503 and KAMAZ KO-505 vehicles, with the use of mesh filters, into KAMAZ and Scania bitumen carriers.

The amount of oil products extracted from the oil storage and loaded onto bitumen carriers has practically totaled 3000 tons. The oil products were further transferred to the specialized company “Ecopromservice” Ltd. to be used as secondary material resource.

2. In the second stage (2010), the environmental restoration operations included the following:
 - a) removal, from the oil storage reservoir bunded area, of 1.5 m³ of polluted shrubs for further contamination at “Forsage-1M” facility at the firing temperature of 1000°C;
 - b) extracting, from the storage reservoir inner surfaces and bunded area, of 635 tons of off-test products, by using EK-18 backhoe, to be temporarily stored (until deciding on decontamination procedure) at “GORST” Ltd.’s operations base in Onega, Arkhangelsk Region;
 - c) extraction, from the 311.1 m³ area adjacent to the oil storage reservoir, of the oil-polluted ground in volume of 560 m³ (560 m³ * 1.65 t/m³ = 924 tons) by using EK-18 backhoe and decontamination thereof at “UZG-1M.1,2/6.7.12” facility at the firing temperature of 800-900°C.

The collection, utilization, decontamination, transportation and disposal of the harmful wastes have been performed by “GORST” Ltd. according to License No.OT-27-000301 (29)

dd. 5.02.2009 issued by Directorate for Technological and Ecological Supervision of Rostekhnadzor for Arkhangelsk Region, License valid until 05.02.2014.

d) grading and leveling of 0.57 hectare – with use of bulldozer and trenching tool;

e) planting of 113.5 kg of grass and grass mixtures (meadow fescue, timothy grass, red fescue).

In the first and second stages of work, we sampled water and soil for oil products content and also took a sample of oil product for its composition.

The laboratory tests have shown that the oil products concentration in soil varies between 19 and 174 mg/kg and does not exceed the maximum permissible level for soil (1000 mg/kg); oil products concentration in the waters of the Pilnema River, either, does not exceed the maximum permissible level established for sources of drinking and recreational water (0.3 mg/dm³).

3. The third stage of the environmental restoration activities performed by “GORST” Ltd. included the analysis of Russian and foreign (Scandinavian – Norway, Finland, Sweden and North America – Canada and USA) practices of oil-polluted ground treatment in the Arctic environment:

The essential methods used in oil-polluted ground treatment can be grouped into

- *Physicochemical* (“MONTANA”, “DUPON” and “General Elektrik” using IASAGNA the technology based on electrokinetic treatment of oil-polluted ground; the Dutch “RAIL-PRO,” German “LURGI AG”, Russian “Sharykz” using water flushing techniques).

This oil-polluted ground treatment technique will appear rather costly to be used in High North and the Arctic. In addition, the application of ultrahigh-frequency fields will result in fast and evenly distributed ground heating, which, in turn, will cause dehydration, disassociation of hydrocarbons, their oxidization and even melting. This method, therefore, is not suitable to be used on grounds containing clay loams, as their structure will change.

- *Chemical* (“MEISSNER GRUNBAU”, “WEST ALPINE” relying on solidification of oil-containing wastes, lacquer varnishes, resins).

This technique requires the use of chemical agents to treat liquid and solid oil-containing wastes. The method is thus cannot be used on highly humid grounds, i.e. in the High North of Russia and the Arctic, as the threat of secondary pollution is evident.

- *Biological* (the preparations used in Russia include Devoroil, Bioprin, Soilex, Ruden).

The method is based on various microbial strains’ potential to degrade and absorb, in their biomass, many of organic pollutants. However, in conditions of the Arctic and High North of Russia, the method appears inefficient, as low temperatures will make the process extremely slow.

- *Thermal* (Danish AS 51 402, ASWI 402 incinerators; Norwegian GOLAROG 200, VESTA MAX 255 incinerators; Russian IN incinerators, “Vihr”, “UZG” turbo bubblers).

The “UZG” facility was in 2009 successfully used by “GORST” Ltd. to decontaminate 1738 tons of oil-polluted ground in the area of High North and near Polar Circle. This facility is mobile and equipped with three-stage treatment for off-gases.

The experience and results obtained by “GORST” Ltd. enable to conclude that it is the thermal method that suits best to restore the soils polluted with dark-oil products and oil slurry. This method, as compared with the use of preparations, is more efficient.

When rehabilitating the oil storage reservoirs and polluted areas of the decommissioned military facilities in the Russian Arctic, the following should be taken into consideration:

- rehabilitation of the above facilities needs a tailored approach, with climatic and geographic factors to be considered as well;
- it is necessary to decide whether the use of oil slurry or off-test products as a secondary material resource is expedient, and how to transport these products to the processing site;
- thermal method is one of the essential to be used in rehabilitating the oil-polluted areas of the Russian Arctic;
- the period most optimum for works performance in the Arctic and High North of Russia is June-October.

The outcome of the environmental restoration activities performed within the decommissioned military facility near Pokrovskoye settlement, Onega Municipality, Arkhangelsk Region, is that the area is now cleaned off oil products. The area reclaimed totals 0.57 hectare (5667 m²).

The above area, thus, can now be used for forestry purposes (species plantations), for construction of industrial premises and structures, or for any other designated purposes.

In addition, it is necessary to settle the issue of funding decontamination of additional volumes of the off-test products extracted from the oil storage and temporarily stored at “GORST” Ltd.’s operations base in Onega, Arkhangelsk Region.