Pollution of the port of Sillamäe by hydrocarbons produced from oil shale

12 September 2008

Sillamäe

Estonia

Hazardous release
Water pollution
Hydrocarbons
Phenol
Hydrocarbon depot
Rainwater network
Sump
Maintenance
Organization
Alarm

THE FACILITIES INVOLVED

The site:

The involved unit:

The oil terminal company is specialised in storing and loading of tankers with different oil products.

Products arrive by rail and are stored in 12 reservoirs with total capacity of 172 500 m^3. The reservoirs are in 3 reinforced concrete embankment areas. To protect surface water, the area is covered with a geomembrane, which is covered with a layer of sand and a layer of crushed stone. The edges of the geomembrane are turned up to the embankment and the basements of the reservoirs.

Rainwater is collected with drainage tubes in the crushed stone layer and directed through oil catcher to the sea. Drainage of each embankment area is equipped with valve that is usually in "shut" position. The accumulated water is discharged by opening the valves. Each embankment area can hold 110 % of the capacity of the biggest reservoir. In the cases of leakages of reservoirs or pipelines, the geomembrane will keep the product in the embankment area. The oil is collected in the drainage wells and pumped out. The contaminated sand and crushed stone will be replaced.

The turnover of oil products in the terminal together in July, August and September 2008 was as follows:

- Shale oil 22 944 tons;
- Fuel oil 111 971 tons;
- Vacuum gas oil 112 837 tons;
- Low sulphur fuel oil 1 851 tons.

Shale oil is Estonian specific fuel produced from local mineral - oil shale. It is hazardous for the environment, including risk sentences R51, poisonous for water organisms and R53 and can have a longer term harmful effects in waters.

THE ACCIDENT, ITS CHRONOLOGY, EFFECTS AND CONSEQUENCES

The accident:

On the 12th of September 2008 Port of Sillamäe reported Environmental Inspectorate on a pollution of sea on its territory. Inspectors found out that the pollution was discharged into the sea from one of the outlets of the heating station. At first there was no information from where the oil had reached the outlet. Due to the wind from the direction of the sea the pollution had not spread to the open sea but stayed near the coastline. The length of the coastline beside the dark pollution that could be noticed in the sea was about 150 m. The localization of oil in the sea was organised by the port and terminal authorities using special boom.

Typical smell of shale oil was in the air. Inspectors took samples from the sea, the outlet and made photos. Moving upstream the open sewage channel, the inlet of polluted water from the drainage system of the oil terminal was found. Sample of polluting material was taken from this place.


Estonian Environmental Inspectorate

Consequences of the accident:

As the Port of Sillamäe found oil in the harbour territory, it informed Environmental Inspectorate and the municipal administration. According to the pollution response plan the port is responsible to take action in combating the pollution. The possible spreading of oil along the coastline was constrained by special boom that is part of the obligatory equipment of the port. The oil was collected with shovels during the next days and stored in 200 litre barrels. The collected material was given to a special hazardous waste treatment facility. The contaminated booms were also given for cleaning to the same company. After separation of the 2400 kg of collected mixture of oil and seawater it was measured that the amount of polluting substances was 240 kg. Three samples, taken from the polluted site gave the content of 1-based phenols as 0,0558 mg/kg, 0,0486 mg/kg and 0,0421 mg/kg. So it can be assumed, that the 240 kg of pollution contained about 12 mg of phenols.


Estonian Environmental Inspectorate

Phenols are soluble in water and their amount released to the sea was not identified in this case. The Estonian maximal admissible concentration of phenols in seawater is 0,001 mg/l. 1-based phenols are Estonian specific priority hazardous substance that is monitored and reported.

The European scale of industrial accidents:

By applying the rating rules applicable to the 18 parameters of the scale officially adopted in February 1994 by the Member States' Competent Authority Committee for implementing the '*SEVESO*' directive on handling hazardous substances, and in light of the information available, this accident can be characterised by the four following indices:

The parameters composing these indices and their corresponding rating protocol are available from the following website: www.aria.developpement-durable.gouv.fr.

The dangerous material released Q1 parameter was rated at 1 due to the release of 240 kg of hydrocarbons containing 1-based phenol at an average concentration of 0,05 mg/kg (<0,1 % of the 200 t upper threshold of the Seveso II Directive).

No human or social consequence has been noticed.

The environmental consequences parameter was rated at 1 on account of the 150 m of coastline polluted (Env 14 parameter).

The economic consequences of the accident are not known by the public authorities as companies are not obliged to report the costs they have carried in combating of pollution themselves.

THE ORIGIN, CAUSES AND CIRCUMSTANCES SURROUNDING THE ACCIDENT

The emergency plan of the oil terminal considers the burning of the big reservoirs as maximum accident. The 2nd most important aspect of the accidental cases is the movement of polluting substances through the surrounding ditches towards the sea. The oil products can be emitted to the aquatic environment in the cases of breakage of equipment, overfilling of the reservoirs or accidents with railway tank wagons. The accidental emissions of oil products could be long-lasting through a small hole or thrown immediately in great tears.

The emission of oil products into the soil and surface water was considered to be excluded during the normal operation of the terminal. The reaching of great amount of oil products to the sea was considered not much likely as in this case all the valves near the reservoirs and in the pumping station should be in open position at the same time.


Estonian Environmental Inspectorate

As the inspection on September 12th showed there had been recently a leakage of vacuum gas oil during the loading from the railway tank wagons. The railway is built on a reinforced concrete pool that is filled with crushed stone and the rainwater is discharged through a drainage system equipped with oil separators. The pumped rainwater is discharged into the sewage system of the nearby heating station and should reach the Baltic Sea. The system has valves and a well, which collects the oil products that have leaked. These should be pumped out from the well.

Actually for a long period the leaked oil products had not been pumped out from the pool under the railway. Thus, not only the recently leaked vacuum gas oil, but also significant amount of previously loaded shale oil reached the ditch running towards the sea.

The discharge of pollutants from that ditch into the sea is regulated by environmental permit. The holder of the permit has the task to measure periodically the content of polluting substances and the amount of the water discharged into the sea and to calculate the pollution load. According to the amounts of discharged substances, environmental charge has to be paid to the state budget.

The limit concentration for oil in the water in the discharge point was 1 mg/l. The measured content of oil was 0,032 mg/l and the amount of discharged water in July, August and September was 500 000 m³. Thus the regular amount was calculated 0,016 tons of oil discharged during three months. Phenols were not regulated by the permit and there was no obligation to monitor them.

The sample of water taken on September 12th showed a concentration of 340 mg/l of oil and 0,0558 mg/l for 1-based phenols. That was the main basis of evidence of the violation of the water act. The other evidence material was the identification of the polluting material of different samples including also the sample taken from the oil separator of the loading station on the railway.

According to its emergency plan, the oil depot had to observe the situation of the well and the valves constantly but it was not fixed more precisely how to keep records on that procedure. On that inspection day there was no more evidence why did the oil overflow suddenly from the well and if there had been smaller releases into the sewage system earlier.

ACTIONS TAKEN

The following shows how environmental legislation was used in practice. It was complicated for the environmental administration, as the accidental discharge of polluting substances occurred in the wastewater discharge system that belonged to another company, which had applied for permit to discharge wastewater and substances in this water. This company was not a public water supply and canalisation company. This holder of the environmental discharge permit was thus made responsible to control its clients himself.

- on September 12th Environmental Inspectorate composed a protocol in order to inspect the polluted site that included also the inspection of the site that caused the pollution of the sea.
- on September 15th analytical comparison of oil samples was ordered in Central Environmental Research Laboratory.
- on September 17th the waste handling company was requested to measure and inform the administration about the amount of collected oil.
- on October 2nd administrative violation protocol was composed to the holder of the permit to discharge wastewater. The holder of the permit had no right to discharge phenols and the maximum permissible concentration for oil products was significantly less than it was measured the sample taken on the 12th of September.
- on October 24th the Regional Environmental Department, who approve the wastewater discharge calculations and collect the pollution charges, made a correction to the calculation of permit holder. The company had calculated usual pollution charge, which took into account “the overall compliance coefficient 0,5”. Thus the permit holder had to pay 26 720 € for pollutants in discharge outlets, instead of originally calculated 13 360 €.
- on October 30th the decision of administrative penalty in amount of 1 000 € together with the obligation to compensate the proceeding costs in amount of 3 000 € was put on the owner of the permit.

The depot owner company has planned to equip the drainage water collection and discharge system with an alarm signalisation. The permitting authority can decide on revoking the environmental permit if the company having the permit is not aware of the situation of its clients.

LESSONS LEARNT

This incident led to the following lessons learnt:

- to prevent environmental pollution, legislation should foresee higher rates of environmental charges for illegal emissions, and the administration should be able to apply them. In this case the application of higher charges served as a tool for sewage discharging company to control its connected clients;
- lessons from accidents lead the control authorities to the matters which should be paid more attention during permitting and inspecting;
- preparedness to combat oil pollution should be in place;
- the shut valves, that can be opened only in special cases, should be equipped with alarm and signalisation to avoid negligence;
- the oil separators and the collecting well should give signal to the operator if it is full or needs cleaning.