



# Explosions Protection in the New EU Member States

## The SC Klaipedos Nafta in Klaipeda/Lithuania

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Figure 1: Explosion protected main switch in a tankfarm

Klaipeda, or as it used to be called using the old German name Memel, is located on the Lithuanian Baltic coast directly on the navigable strait connecting the Courland Lagoon to the Baltic Sea. Colonised as early as the 7th century, the city was conquered in the 13th century by the Order of the Teutonic Knights. This Order then built the fortress of Memelburg at this strategically important point. In the centuries which followed, the city underwent an eventful and turbulent history. From 1940 the Republic of Lithuania was occupied by the USSR up to and including 1991 when the Lithuanian people's wish for freedom, like that of everyone in the Baltic States, was victorious and Lithuania regained its independence.

Klaipeda has the most northerly ice-free port on the Baltic and forms an important traffic node – it marks the start of the shortest land routes to the most important Eastern European industrial regions of Russia, the Ukraine and Belarus.

Since May 2004, Lithuania has also been a member of the European Union. Of course, this primarily provides major opportunities for economic and social development of this young Republic but also demands harmonisation of national laws and practices, including laws and practices relating to industrial health and safety, in line with the corresponding regulations in the EU.

On the basis of AB Klaipeda Nafta oil terminal, we shall document how the new economic challenges are being tackled and how European Directives on explosion protection are being implemented.



### **Klaipeda – an oil port with a long tradition**

Klaipeda's traditions in the oil business extend back to the year 1916 when the then Asiatic Petroleum Company which was later merged into the Shell Group installed the first oil tanks in the city's port. From these roots, a brisk business in transshipment and intermediate storage of various oil products developed over the decades. During the USSR occupation the oil terminal, which was constructed in 1959 was the most important for transshipment of the 'black gold' to the West. An export that was lucrative in terms of foreign exchange.

The Klaipedos Nafta company was set up in 1994. This was a joint Lithuanian-American company. Large parts of the old installation were demolished in 1995 and reconstructed into a new and modern installation by 2002 without interruption of the terminal's operation. During this period, the harbour entrance was deepened by 14 m to allow tankers with a capacity of 100,000 metric tons to be loaded. The entire installation is subdivided into the following main parts:

- the tank wagon loading and unloading station
- the boiler house for steam generation
- the storage tanks for crude oil and oil products
- the two jetties for ship loading - unloading in the oil port
- the mechanical and biological waste water treatment installations and
- the oil vapour burning installations.

The overall installation covers an area of 37.4 hectares and has a processing capacity of 7.1 million metric tons of oil products per year.

### **Loading and unloading complex**

During the course of installation modernisation, importance was attached to ensuring that the handling capacity corresponded to that of the other parts of the overall installation. In particular, this was done for the train loading and unloading complex, thus ensuring reliable and continuous material flow.

The station features a maximum capacity of 500 tank wagons, 124 of which can be loaded or unloaded simultaneously in two 4-track terminals; 60 with light oil products and 64 with heavy oil products. Modern transshipment technology, in which the oil to be unloaded is preheated using fuel oil in heat exchangers, eliminates one previous disadvantage of the outdated installation which related to mixing of heating water and oil. Special unloading stations for emptying 120 metric tons tank wagons ensure that the unloading process can be sped up by more than 30 % in comparison to conventional methods.

The direct environment of the tank wagons is classified as Zone 1 owing to the probability of occasional occurrence of a hazardous explosive atmosphere. Explosion protection control devices for controlling the loading and unloading operations, safety switches and flameproof pendant light fittings are installed in this zone. Raw material flow is monitored with flameproof enclosed flow rate and level metering systems.

### **Tank farm, pipeline network and boiler house**

Overall, the company has a storage capacity of 350,000 m<sup>3</sup>. This is split over 30 storage tanks with capacities ranging from 5,000 m<sup>3</sup> to 20,000 m<sup>3</sup>. During storage, it is strictly ensured that no mixing of differ-

ent consignments (cargo batches) occurs. This ensures that the original delivery qualities and quantities are maintained.

Each tank features a computer-controlled measuring system that allows the stored quantity to be quickly determined. The sensors in the tank are approved for Zone 0 and feature type of protection Intrinsic Safety 'ia'.

The quality of the stored oil is checked regularly in the laboratory. Floating roofs in the tanks for storage of crude oil and light oil reduce evaporation of these liquids and associated environmental pollution.

The oil can be moved at any time of year within the sections of the installation via a total of 30 km of electrically heated, heat insulated pipelines. The steam required for moving the oil is generated in a newly constructed boiler house with two boilers for generating 84 metric tons of steam per hour and one boiler for generating 18 metric tons of steam per hour. It has been possible to substantially reduce pollutant emissions the use of natural gas for steam generation. Admittedly, natural gas is more expensive than the fuel oil previously used but its use has made it possible to eliminate annual emissions of around 500 metric tons of sulphur compounds.

### **Oil port**

As mentioned in the beginning, the deepening of the harbour entrance which was carried out during the course of installation renovation, now allows ships with a capacity of up to 100,000 metric tons to be loaded.

There are two jetties in the port itself, which feature a wide variety of modern marine loading arms. These allow refuelling of up to 2,000 m<sup>3</sup> of light oil, 4,000 m<sup>3</sup> of heavy oil, and 3,800 m<sup>3</sup> of crude oil per hour.

The environment of the jetties is classified as Zone 1 due to the possibility of flammable liquids being released. The controls of the marine loading arms are designed with a combination of type of protections Flameproof Enclosure 'd' and Increased Safety 'e'. Flameproof enclosed pendant light fittings are used for illumination.

The terminal was one of the first in Europe with equipment for burning volatile hydrocarbons. These are extracted from the tankers and combusted up to 98 %. This also makes a substantial contribution towards protecting the environment.

All transshipments from the ship into the tank wagons and vice versa involve intermediate storage in the tanks, and are monitored and controlled by a process control system.

### **How are the new EU requirements met?**

When Lithuania regained its independence in 1991, it was then possible for the industrial installations in the country to be used freely, and for the country's own economic benefit. The old oil port in Klaipeda had already been recognised in 1959 by the USSR government as an ideal location for oil export business with the West and had been expanded to become one of the most modern terminals and storage locations of its time. As a result, the facility quickly achieved the status of the best oil export port in the former Soviet Union. The transshipment capacity rose continuously from year to

year and reached its zenith with a figure of 10.8 million metric tons per annum.

As in many other industrial sites in the USSR, these increases in transshipment capacity were not accompanied by ongoing maintenance, repair and modernisation of the installation so that, finally, in the late 80s, the installation was in such a poor state of repair that even the responsible authorities in Moscow had no choice but to make the decision to release funds for comprehensive modernisation. Of course, this planned modification did not take place owing to Lithuanian independence. However, the new government of Lithuania also realised the high economic importance of the terminal and came up with the required funds.

Reconstruction resulted in one of the most modern installations of its type in Europe. Even though, in the mid-90s, negotiations on accession of the country into the EU had just begun, measures were taken to ensure, even at this early stage, that all relevant European Directives were strictly observed. Since 2001, experts from BP have been conducting an annual audit and have confirmed that all required measures to ensure health, safety and environmental protection are being implemented in compliance with EU Directives and regulations, including fire protection and explosion protection. For the latter, the assistance of experts from the old EU countries has also been sought in a targeted manner. One example worthy of mention at this point is a training programme for staff from the technical departments

given by the experts of R. STAHL Schaltgeräte GmbH in November 2003, which explicitly discussed the two EC ATEX Directives 94/9/EC and 99/92/EC, as well as, a wide variety of practical aspects relating to explosion protection of electrical equipment.

Lithuania and the other Baltic states still have a great deal of catching up to do in regards to know-how, particularly in this safety-critical, complex area. One must bear in mind that the old GOST Standards applied here in the past, as they did everywhere in the Soviet Union (see article on Page 14). Admittedly, there was not a great difference from the other acceding countries such as Poland, Hungary or the Czech Republic, which also had national standards that differed from the EC Directives and Standards. But, unlike these countries, Lithuania did not have its own national testing authority as advisory instances since these were located in the territory of other Soviet republics.

The National Programmes for Adoption of the Acquis (NPAA) which were agreed upon in 2001 between various countries including Lithuania and the EU stipulate how the various EC Directives are to be implemented specifically in the acceding countries. These programmes also stipulate the dates by which ATEX Directive 99/92/EC become mandatory in installations such as the oil terminal at Klaipeda. However, in view of the existing high technical level of the installation and the well-trained workforce, it can be assumed that there will be no problems in harmonising with the Directive.



Figure 2:  
Explosion protected distribution fuse-board at oil offloading stations in the harbour