



CHALLENGE

TO REDUCE HIGH RISK EXPOSURE BY ELIMINATING HUMAN ENTRY INTO FUEL TANKS



Cleaning and inspecting underground storage tanks safely

Artelia has significantly increased safety and reduced risk associated with fuel storage tank cleaning and inspection by implementing new and innovative work methods.

The Challenge

An essential objective in Oil & Gas retail business is to ensure safety for all, whether for a customer, station employee or operative performing maintenance duties. Fuel storage tanks require regular cleaning to ensure the quality of the product. In addition, local regulators may request continuous inspections to be carried out. The cleaning or inspection of tanks is one of the highest risk work activities among petrol station maintenance due to the fact that it involves workers entering and carrying out activities inside the tank. As the worker operates in a confined space with a risk of gas build-up (explosive atmosphere) serious injuries can occur if anything goes wrong. There are many reported cases each year where the works resulted in employees ending up with serious burns or, worse yet, fatalities. Shell has a 'No Fuel Tank Entry' policy and thus challenged Artelia to develop and implement a plan to cease human tank entry in the European countries where it was still taking place.

The Artelia solution

Starting in 2010 Artelia carried out market research within many European countries (where thousands of manned entries still took place every year). The situation varied greatly from one country to another, depending on the country's legal regulations/obligatory requirements and/or local work practices. In some cases manned tank cleaning and inspections were practised for purely traditional reasons. Following this analysis, Artelia developed a strategy based on specifically tailored action plans per country. The actions involved not only identifying technical innovations that could be put into use as alternatives to human tank entry, but also corresponding with and lobbying regulators to convince them of the benefit of eliminating human risk.

Tank cleaning:

Artelia's solution consisted in replacing manual cleaning processes with alternative methods without human entry. These methods, which already existed in the industry, provided remote pressure washing/rinsing with either a wash wand or robotic washer. Fuel cleaning by circulation through a remote filter could also be carried out. The result was an immediate improvement in terms of safe work practices, drastically reducing the number of tank entries on hundreds of sites per year. In ten European countries, where no legal obligation for tank inspection exists, manned tank entry was entirely eliminated.

Tank inspection:

In certain countries, legislation included specific tank inspection requirements. Artelia thus needed to implement additional innovative technologies to address particular challenges, such as tank corrosion assessment and tank integrity testing.

Tank corrosion assessment:

Artelia's solution consisted in replacing the human visual survey by a camera survey. This allowed for the internal tank assessments to be controlled remotely by the inspector watching a TV screen in a safe place. It also enabled the inspector to carry out the corrosion evaluation using a higher resolution image, much more accurate than the human eye. Many systems have been applied using small or endoscopic cameras which can be lowered through minimal diameter openings. The cameras are fitted to mechanical arms or even robotic vehicles which move the camera to the required areas in the tank. Where an enhanced internal corrosion survey is needed, it is carried out by analysing the **tank wall thickness**. This is measured by installing an ultrasonic device installed on the robotic vehicle. It is possible to measure the thickness of both the steel sheet and coating. To have a complete picture, an external coating damage survey can be carried out by testing conductivity between the tank body and backfill.

Tank integrity testing:

A traditional pressure test is replaced by a very efficient **acoustic test**. The tank is pressurized and any possible leakage flow is detected by a hydrophone. This operation can take place without opening the tank lid and even with fuel in the tank. Alternative testing methods have also been applied on pressurized tanks, namely an acoustic test with detectors on the external tank side and a camera test observing air bubbles in a full tank. These various tank inspection methods have been introduced in a number of countries by Artelia, notably in Poland and the Netherlands where the Artelia/Shell innovations were adopted into the local regulations.

Outcome and key benefits

Artelia succeeded in greatly increasing safety during tank maintenance within the Shell programme throughout Europe by reducing the number of occurrences that workers need to enter into a dangerous, confined space from thousands to only a few per year. In addition to the safety benefits, the overall maintenance expenditures in most cases are reduced and site disruption is shorter. The key success is achieving the same technical results while having less people risk their lives.

Is it the end of the story?

Certainly not as the development continues in order to achieve zero entries in all countries throughout Europe. The applied methods can also be continuously improved to further increase efficiency. And then - what happens if the tank fails testing? What about no manned tank relining? For now these are only visions for future Case Studies, but then again Artelia is a visionary company....