

Real-time monitoring for increased safety at Umeå Harbor

by Wonderware Scandinavia

“The Wonderware solution has given us a real-time overview of pressure changes during discharges, and has made the work for our dock workers much safer. We are also able to go back to previous data to identify patterns and easily recognize business critical situations.”

Viktoria Larsson,
Harbor Engineer, Umeå Hamn AB



VALUE DRIVERS	KEY METRICS
<p>Goals</p> <ul style="list-style-type: none"> • To create a safe workplace for the employees; • To create a real-time monitoring system of the pressure lines during discharge; • To be able to view historical information on previous discharges. <p>Challenges</p> <ul style="list-style-type: none"> • Relocation of the old inspection shed and the need for a new monitoring system; • Real-time monitoring for increased safety at Umeå Harbor; • Demand for increased safety and real-time logging. 	<p>Wonderware Solutions</p> <ul style="list-style-type: none"> • ActiveFactory software; • InTouch HMI; • Wonderware Historian. <p>Results</p> <ul style="list-style-type: none"> • The new system helps provide an excellent real-time overview of the pressure throughout the discharge process; • It is now easier to go back and get a historical view of the entire dispatch process; the level of safety at the workplace; • Increased the level of safety at the workplace; • The Wonderware Historian provides the means to go back through old data, analyze and learn from specific processes.

Company Overview

Umeå Hamn AB - Holmsund, Umeå, Sweden

The 92-hectare harbor is managed by Umeå Hamn AB, which is wholly-owned by Umeå Municipality. Twenty-six companies currently operate in the harbor with a total of 360 employees. Over 1,000 vessels put in at the harbor every year and the 105-meter wide and 13-meter deep channels make Umeå Harbor capable of handling the most modern of vessels. The pilot distance is only six nautical miles. Umeå Harbor also has an 80-meter long oil dock with a water depth of 11 meters. The harbor receives between forty to fifty vessels per year for the discharge of petroleum-based products. The predominant harbor exports are forestry products, lumber and kraftliner. In terms of imports, the harbor is a center for the distribution of petroleum products, but other imports include cement, recycled fiber, feed products, etc. Umeå Harbor has regular departures to the U.S., Scandinavia, Europe and the Mediterranean.

Umeå Hamn AB receives goods and products for reloading from ship to railway for further transport inland. The harbor also receives tankers for the discharge of petroleum products such as gasoline, kerosene, diesel, heavy fuel oil and bitumen (a binding agent made from petroleum). Petroleum products are unloaded from tankers and then transported through pipelines to oil company cisterns. The discharge of petroleum products is an operation in which safety is of the greatest importance, in part because of the risk for accidents, but also due to the environmental impact a leakage from one of the vessels could entail. A safe workplace for the employees combined with real-time monitoring of the pressure in the lines during discharge was the primary goal behind Umeå Harbor's decision to seek out a new solution for its discharge monitoring.

The handling of petroleum products is one of the most hazardous operations at Umeå Harbor. Because of the explosion risks involved, gasoline, oil and bitumen all require cautious handling, with a great emphasis on safety measures. In addition to the secure transfer from vessel to cistern, work in explosion-classed areas also requires that the working environment as a whole is safe and secure.

The handling of class-1 products places particular demands on both equipment and personnel, and Umeå Harbor has been diligent in its efforts to make the harbor as safe and secure as possible.

When unloading oil-based products, it is also very important to be able to continuously log pressure and pressure changes in the oil pipes. Excessive pressure in a pipeline increases both the stress on the pipes and the risk of leakage.

In addition to the automated monitoring system, Umeå Harbor also conducts hourly manual inspections of the oil tankers, the surrounding pier and the water area around the vessel during discharge – all in order to facilitate the discovery of leaks or other defects.

The pressure at which the oil or other product is pumped over may not exceed 7 bars, and there are a number of manometers in place on the dock which continuously measure the pressure in the pipes. These are read in conjunction with the rest of the inspection, the so-called "round."

A normal discharge takes approximately fifteen hours and after completion each vessel is released from the harbor with a complete specification of pressure levels, rounds and water area inspections.

The entire logging process was previously carried out manually, and the values from the pressure readings and inspections were entered by hand in a log in the work shed. There was no control of how high or low the pressure was between the manual readings, the handwritten notes in the logbook entailed a certain risk for misinterpretation of the measurement values and there was a danger that rounds could either be missed completely or forgotten.

Relocation of the old inspection shed and the need for a new monitoring system

Umeå Harbor previously had a work shed located directly on the dock for monitoring discharge operations. From the shed, it was possible to survey both the ships and the manometers, and with good visibility, one could always ensure that the pressure in the pipes did not exceed the maximum value of 7 bars. However, the area surrounding the pier is explosion-classed and the shed needed to be moved to a safer location outside of the explosion-classed area. Construction on the new work shed began in fall 2006 and was completed in summer 2007.

"In many cases, the ship pumps have the capacity to put out substantially higher pressure than our maximum limit of 7 bars, and that was why we needed a continuous monitoring system for the pressure in the lines," says Bernt Holmgren, Harbor Master at Umeå Harbor. *"The relocation of the work shed put some distance between us and the manometers, and that's when we started to discuss computerizing the measurements. For those of us working physically during the discharge, it is important to be able to quickly get an overview of the pressure in the lines – in part for the safety of the workers and in part because we are partially responsible for the discharge itself."*

To make the oil dock a safer workplace for the employees, a system was needed that could continuously monitor the pressure in the lines. In order to be able to learn from previous experiences, Umeå Harbor also wanted to be able to go back and view information about previous discharges.

"We saw a need for changing our discharge processes, and since the shed couldn't remain on the dock itself for safety reasons, we started to look around for an automated system that could give us real-time monitoring of discharges," says Viktoria Larsson, Harbor Engineer at Umeå Harbor. *"It made sense to modernize the system in conjunction with conducting a survey of the safety of the entire oil dock."* Ship and shipping company employees are on hand during discharge, as is a discharge supervisor and a



Manometers on the oil dock, with maximum pressure 7 bar marked

security guard from the harbor. The oil company's Discharge Supervisor has full responsibility for the entire operation and all involved maintain radio contact with each other so that the work can be supervised and synchronized and so that safety is ensured. The discharge can be easily stopped by an order over the radio lines or if the warning light over the shed begins to blink.

Demand for increased safety and real-time logging

The previous manual pressure logging via visual inspections of the manometers only took place once an hour and was therefore not adequate for continually ensuring and verifying that the pressure in the lines remained under 7 bars throughout the process. Umeå Harbor had requested a new solution that would give them continuous surveillance of the process as well as the possibility of storing data from each discharge. Lars-Eric Fjellvind at WSP Automation Umeå presented a solution for the continuous measurement of the pressure.

WSP Automation suggested a solution in which the pressure indicator was mounted up against the manometers, which were then connected to a computer inside the work shed. Each change in pressure was logged in the computer and saved in Wonderware Historian, in order to be able to easily produce statistics upon demand. The data saved in Wonderware Historian also helped make it possible to produce reports through ActiveFactory software in Word or Excel.

InTouch HMI functions as an interface and visualizes both the products discharged and the pressure at which they are discharged.



Work shed at the oil pier in Umeå Harbor

"This new system helps provide an excellent real-time overview of the pressure throughout the discharge process and it is also easy to go back and get a historical view of an entire dispatch process," says Lars-Eric Fjellvind. *"The idea with the system is not only to increase the level of safety at the workplace, but also to give Umeå Harbor the opportunity to go back through its old data when necessary to analyze specific processes and learn from them."*



Wonderware InTouch HMI visualizes the discharge process and the pressure monitoring

If the pressure in the pipes is too high, the system sounds an alarm, both on the operator screen on the computer in the work shed and through the warning light on the roof. The system logs each change of more than one percent so the dock workers are given a good overview of the situation throughout the entire discharge.

"As far as possible, we want our employees, who already work in a risk-filled environment, to feel safe at their workplace," says Viktoria Larsson, Harbor Engineer at Umeå Hamn AB. *"With the new system; we've taken yet another step toward eliminating the risk of accidents in the harbor."*

From manometer to computer

The monitoring system for the oil dock is a computer-based system with InTouch HMI as user interface and Wonderware Historian as historical database. The system continuously logs the measurement readings and can generate pumping statistic reports after concluded pumping operations. It is also possible to pull out statistics over a longer time span, both per shipping company and per ship. InTouch HMI serves as the interface between Wonderware Historian and the user, and visualizes the products discharged and the continuous pressure readings.

Umeå Harbor also uses ActiveFactory software to produce reports for logs and rounds from each discharge. ActiveFactory software is well-integrated with both Excel and Word and can easily produce conveniently formatted reports.

The solution is based on a historical database, Wonderware Historian, and an operator site installed on the same computer. The system is connected via Ethernet to a PCL system for data acquisition. A PLC system from Wago is in place in the work shed office, while the pressure indicators are installed on the dock itself, in connection with the analog manometers. The pressure

Oil & Gas

ActiveFactory software, InTouch HMI,
Wonderware Historian



Umeå Hamn building

indicators are connected to the PLC system via explosion-tolerant I/O units. The pressure indicator readings are logged and saved in Wonderware Historian to facilitate subsequent recreation and reporting.

Each user must also log in to the system in order to check off his/her rounds and inspections, thus ensuring that only authorized personnel have access to the system.

Future prospects for the system

The scalability in Wonderware products in the solution that WSP Automation has provided for Umeå Harbor makes them suitable for use in other products discharged in the harbor. The advantages are many and the human error factor is minimized.

“Besides logging data and making statistics accessible, the system is – generally speaking – infinitely expandable,” says Viktoria Larsson. *“Now that it has been installed, it is easy to add and monitor other products in addition to those already in place, such as biogas or bitumen.”* *“We are now assessing the possibility of including these products in the system we have now.”*

“We’re also in discussion with the oil companies concerning an electronic format for final discharge reports. The opportunities for this are already in place in the current system, thanks to the integration with Word and Excel. The most important thing about the solution we use today, however, is that we have a much more secure working environment than we had before, and a safer workplace for our employees,” concludes Viktoria Larsson.

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