

Smart lock



The lock in Eefde, Netherlands, was built in 1933 and assumes an important function in the region. It is the entrance from the IJssel to the Twente Canal.

Predictable maintenance

Numerous world-wide acting companies aim for World Class Maintenance. The high standards in all corporate sectors lead to an improvement of all processes. These guidelines are also followed for the waterway infrastructure in the Netherlands.

There is a big demand for innovations for maintenance and infrastructure management. In the Fieldlab project "CAMINO", different parties are working together to develop applications to make maintenance of the water infrastructure 100 % predictable using sensors and data analysis. In the context of this project, the Dutch ministry "Rijkswaterstaat" and the project partner Mobilis TBI have initiated a pilot project in the lock complex in Eefde, to test and apply new or innovative technologies to get more insight into the condition of the lock itself, including its close environment. The purpose is to make maintenance of infrastructure works 100 % predictable.



The lock in Eefde (Netherlands) was built in 1933 and is now extended by another lock chamber.



Conventional solutions such as corrective and preventive maintenance activities are no longer sufficient. The challenge is just-in-time maintenance: just in time to prevent that something goes wrong, but not too early so that costs are reduced. This requires a smart approach: intelligent maintenance, for which new developments such as the use of sensor systems, data prediction models, big data and the Internet of Things (IoT) are used. ifm as provider of real-time maintenance solutions is one of the project partners.

All participants contribute with their know-how and experience in the fields of maintenance, monitoring and administration of water systems and structures, measurement and analysis techniques as well as data architecture and storage.

■ Example: Lock in Eefde

The purpose of the project in Eefde is to develop a "smart lock" which automatically indicates the actual condition, analyses it by means of algorithms and automatically suggests improvements of the construction or the required maintenance.

Ruben Ogink, Fieldlab CAMINO Project Manager, World Class Maintenance comments: *"Sluis Eefde is a special project, during which, in my opinion, certainly many partners can learn. Special about this project in the context of Fieldlab CAMINO is not that there are many new technologies which are not used anywhere else, but rather the fact that existing technologies are integrated at one location. The partners can learn a lot from the application, but certainly also from the cooperation. The positive development of this project at the moment is already the fact that different partners from different disciplines such as government, commercial enterprises as well as scientific institutions such as a university work together. So there is investment for everyone to develop their own solutions. ifm is playing an important role in this project because they contribute a lot of knowledge of sensors, applications of these sensors in other industries and a lot of experience which can also be used in this context. And I am very happy with it."*

” *ifm’s involvement in this project is very important for us, as they contribute a lot of know-how and experience*

■ Avoid failure

The lock in Eefde assumes an important function in the region. It is the entrance from the IJssel to the Twente Canal. Many companies rely on the canal for transport. An unplanned interruption of the lock would cause considerable problems.

The lock was built in 1933. Rijkswaterstaat (the government authority responsible for the infrastructure) wants to have a better control of the maintenance of vital plants.

Angelien van Boxtel, Project Manager Rijkswaterstaat Netherlands, explains: *„We try to plan the maintenance of the lock as precisely as possible, so that shipping can prepare for it. In the event of sudden failures or unpredicted maintenance this would not be possible.“*

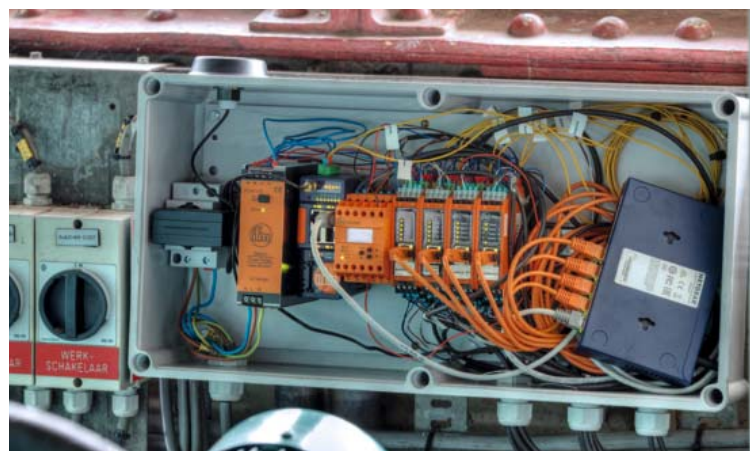
■ Permanent condition monitoring

To ensure smooth operation to open and close the lock and to avoid unplanned downtime, a condition-based maintenance solution was installed. In this respect, project partner ifm has installed a vibration diagnostic unit at the motors and gears of the lock gates. Imminent damage to the bearings leads to changed vibration characteristics. The sensors detect it and signal when threshold values have been reached. So the replacement of the components can be planned and made before a defect causes a sudden standstill.

Ruud Schoenmakers, Asset Manager Mobilis TBI, Netherlands explains: *“100 % predictability, that’s what we want. This means that preventive or corrective maintenance is a matter of the past. We measure all data, to optimally plan and implement the required maintenance works. We call predictive maintenance when we*



Two vibration sensors each, installed slightly shifted, permanently monitor the condition of the rotating bearings.



The VSE-type electronics for vibration evaluation, an ifm synchronisation monitor and the radio gateway to transfer the data to the control station, are installed in a space-saving control cabinet.



measure data, collect data and get information from it to carry out maintenance at the right point of time. The right point of time is determined by a series of predictive and fixed, measurable factors such as the performance of objects, components and systems, failure characteristics, degradation behaviour, but also factors such as weather conditions, water levels and availability of staff as well as operating hours of the locks. On the basis of these measurable and objective factors, we can choose the optimum point of time for the maintenance to avoid unpleasant surprises.”

Before, there used to be regular maintenance. But this was expensive and could not completely minimise the risk of unplanned downtime. In addition, components the wear margin of which had not been completely used up yet, were replaced in case of doubt. That again caused unnecessarily high costs. With predictive maintenance, costs are minimised and operational reliability is maximised.

■ No intervention in the existing plant

It was important to the operator to leave the historic lock complex unaffected. Therefore ifm has installed the solution without interfering with the plant or affecting operation in any way. Vibration diagnostics is, so to speak, “slipped over” the plant as an autonomous system.

Ruben Boom, Project Manager Smart Industry, ifm Netherlands, states: “We have placed the sensors with solenoid on the housings of motors and gears instead of screwing them there via a thread to be bored. Because it was important to the customer not to make any changes to the existing machine. One of ifm’s strengths is that we

The power train to lift and lower the heavy lock gates. The condition of motors, shafts and gears is permanently monitored by means of vibration diagnostics.

can comply with such special requests of our customers due to our experience and know-how of many years.”

Besides the vibration, the temperature of the plant and the humidity are determined by means of sensors and included in the condition assessment. The measured values and the alarms are transferred to the control station via the radio gateway where the data is evaluated and analysed. Moreover, the ifm DS2505 synchronous monitor monitors the left and right chain hoist at the lock gate.

■ Conclusion

Vibration monitoring is only one small module in World Class Maintenance. However, on the basis of the acquired data it helps to better understand the processes, to optimise them and to use these findings for other projects in the future so that the water infrastructure becomes 100 % predictable and failures are avoided.

Ruud Schoenmakers: “At this moment, TBI is building a new lock, in addition to the maintenance of the existing lock. We can use the things that we learn here, for the design and implementation of the new lock. Therefore, the findings we make here on the technical level have a great impact on new objects but also on the renovation task which comes from Rijkswaterstaat.”

This project of a “smart lock” shows how all partners benefit from each other and bring forward their own know-how.