The Offshore Challenge

Let the Data Travel, not the People

Setting up a vibration Condition Monitoring programme in the Offshore Oil & Gas industry is challenging. Platform staff is rarely trained in vibration and the data collection itself can turn out to be risky for the personnel. In this challenging environment, collecting reliable measurement data while minimizing the time spent on the task are practical requirements for modern maintenance programmes.

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In the offshore industry, Condition Monitoring is now common practice. It is indeed essential to carry out vibration analysis on critical machines in order to control and minimize unplanned shutdowns due to unforeseen machinery failures. However, operators are facing specific challenges due to the day-to-day management of offshore platforms. A typical working schedule for personnel is to be e.g. 4 weeks on the platform and 4 weeks off. This limited time offshore makes it almost impossible to qualify the staff involved to perform efficient vibration data collection. Subcontracting the entire process to a service company is also not a sustainable option, as transporting service engineers by helicopter to the platform and back is costly and time consuming, and it also requires a lot of planning.

Reliability, Time and Safety

Classical route-based data collection is often carried out with a handheld vibration ana-

FIGURE 1. *Offshore drilling platforms are highly complex constructions. Their management requires efficient tools for maximizing profitability.* © *Seadrill*

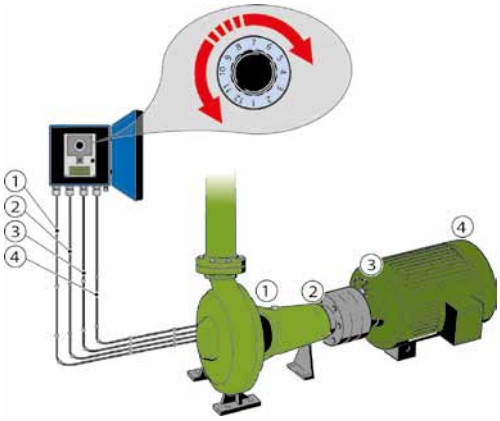

FIGURE 2. *Working principle of a manual switchbox.*

lyzer and a sensor attached to a mounting magnet. This method presents some limitations in terms of data reliability especially when the measurement locations are hard to reach. For the vibration analyst the collected data can turn out to be meaningless when the readings were not taken at the exact same position across the various periodic measurements.

In hazardous areas, the collection of vibration readings using handheld devices can also present safety risks for untrained staff since the assets to be monitored are remote (e.g. drilling platforms), machines are hard to reach and located in hazardous areas. For the operators of pumping stations, drilling platforms, refineries and comparable sites with intrinsically safe areas, the safety of the employees must be ensured at all times. Therefore operators are interested in keeping the vibration data collection process as short and easy as possible in order to decrease the exposure to risks.

Specifically in the offshore sector, the requirements for data integrity are very high because data analysis is carried out onshore by in-house analysts or external service providers. Their reports are used as a basis to extend the inspection interval of critical equipment by classification societies like DNV (Det Norske Veritas).

In other words, route-based vibration data collection should be quick, safe and reliable. Ideally, online monitoring systems automatically take care of the critical equipment's health. When this is not possible, other solutions are available, which allow keeping the data collection process as easy as possible while ensuring that the high requirements for safety and data integrity are fulfilled.

One existing approach is to use so-called "switchboxes"; the concept is simple and shown in FIGURE 2.

Permanently installed vibration sensors are wired to a junction box with a multipoint connector inside. The operator carries out the measurement by connecting the vibration analyzer to the main connector of the switchbox. The readings are then taken one sensor at a time. In order to do so, the operator must manually turn the switch into the correct position for each measurement location. This concept ensures that the readings are not carried out directly in front of the machine and that the values are reliable, since the sensors are permanently mounted on the machine. However, this solution is still prone to human error. Who can guarantee that an untrained person assigns the right channel to the measurement that

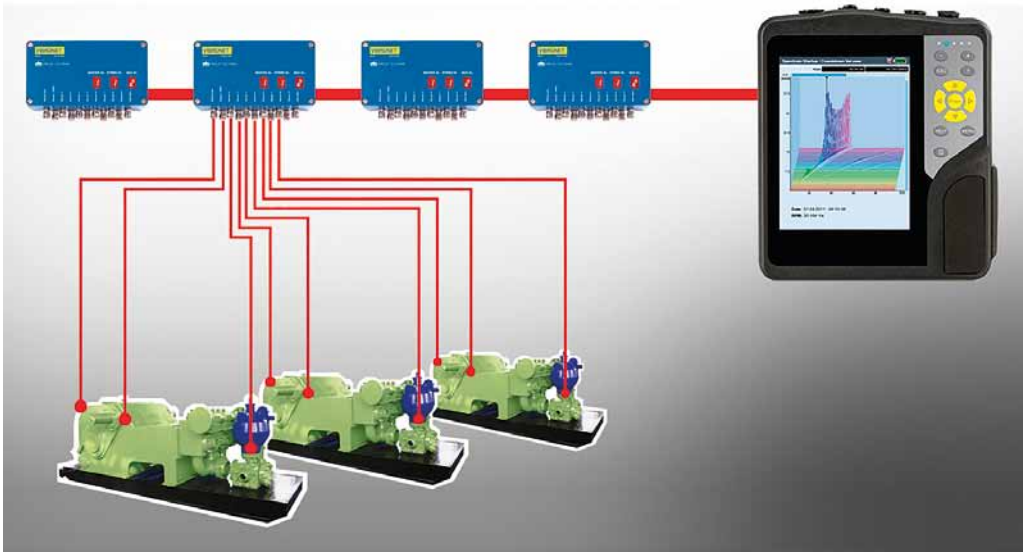

FIGURE 3. *Automatic switchbox connected to a data collector. Several switchboxes can be connected in series.*

should be taken? In the worst-case scenario, false alarms may be triggered later on due to incorrect sensor assignment.

The Automatic Switchbox for Faster and Error-free Data Collection

An automatic switchbox that works with a data collector and FFT analyzer (FIGURE 3) has been developed specifically to eliminate any risk of possible human error in the data collection process. The automatic switchbox "multiplexes" through the sensors autonomously. The list of sensors to be connected onto the machines is predefined within the analysis software.

The advantages of the automatic switchbox solution convinced the offshore drilling company Seadrill. "Multiplexers" – as the boxes are also called – have been implemented on sixteen of Seadrill's offshore drilling platforms primarily to monitor the conditions of the thrusters of the platforms. Apart from the advantages that manual switchboxes already offer, the automatic switchbox requires a minimum training for the rig personnel. The data collection process is faster, very easy to follow and the analysts can rely 100% on the collected data.

The procedure is simple: The operator connects the analyzer to the automatic switchbox and initializes the measurement. The vibration data of all connected sensors are taken automatically one after the other and all results are correctly assigned to the locations. In case of alarms being indicated by the analyzer, the automatic measurements can be paused in order to perform in-depth analysis. Although some of the rig staff are not fully trained in taking vibration readings, the data collection is not a big challenge for them since it is fast and seamless.

The automatic switchbox guarantees error-free data collection and because there is no need for manual switching, the operator gains additional time. This extra time can be spent performing visual inspection of the assets whilst the readings are taken, or even carrying out small work orders like greasing bearings, checking lubrication levels or taking lube oil samples.

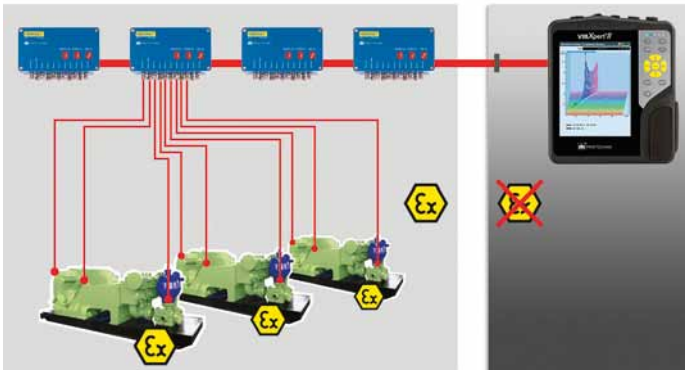

FIGURE 4. *Integration into intrinsically safe areas.*

The implemented vibration sensors use the Current Line Drive (CLD) technology. In practical terms, this means that the vibration signal can travel over long cable distances; the signal can be transmitted up to 300 meters without significant quality losses. Hence, it is also possible to daisy chain multiple switchboxes over long distances to cover large areas of up to 600 meters. As a result, up to over 50 vibration measurement locations can be managed with the operator only accessing the first switchbox in the line.

Easy and Cost-effective ATEX Integration

In addition to its advantages in the daily route measurement, the automatic switchbox is easily integrated into intrinsically safe areas; only one "barrier device" per multiplexer group is needed. As a result, multiple machine trains in ATEX zones can be monitored by a non-ATEX vibration analyzer (FIGURE 4). The automatic multiplexer switchbox itself being an intrinsically safe apparatus, it can be placed close to the machine, hence reducing cabling costs to a minimum.

Outlook

The concept of automatic switchboxes offers a new approach to address the challenges that managers have to overcome when setting up reliability-based maintenance programmes. The solution pays off in the offshore and Oil & Gas industry but other industries have also already installed automatic switchboxes on their critical machinery in order to align with the demands of a modern, successful and efficient maintenance programme. ■