



**Thanks to tele-monitoring OMV has round-the-clock control of two new reciprocating compressors – thereby eliminating the need for a standby machine**

## **Safety right from the word go**

By Uwe Seifert, OMV Deutschland GmbH and  
Eike Drewes, PROGNOST Systems GmbH

Even at the commissioning stage, a tele-monitoring system for two new circulating gas compressors proved their worth for the company OMV Deutschland GmbH, based in Burghausen. It was possible to detect malfunctions in a compressor during the warranty period and eliminate them immediately.

In order to cut down on costs, OMV Deutschland made the decision to do without a third compressor as standby for their new aromatic compounds plant. It goes without saying, then, that it is extremely important that the two new reciprocating compressors are available for production. The maintenance staff had much to do in order to keep outages to a minimum in the old compressors. While some success was achieved through exchanging wearing parts (e.g. valves, piston rings and packing), the basic problem of frequent, unplanned outages remained unresolved.

Two stationary single-crank, double-acting, single-stage circulating gas compressors, each with an output of 185 kW, were purchased. One of the machines was fitted with a valve control system to regulate capacity. While the

non-regulated compressor supplies the constant load, the second compressor can be regulated separately, according to the output required. Since it is known from experience that complications will arise during the commissioning stage, and since OMV wanted to begin production as scheduled, the key thing was to rule out any time-consuming error diagnosis when the new plant was being commissioned. This is where the subject of monitoring came into the picture.

The first basic decision to be made was to choose between periodical (offline) and continuous (online) monitoring. OMV opted for the PROGNOST<sup>®</sup>-NT online tele-monitoring system in order to be able to react immediately to failures and impending damage. In accordance with a preset time schedule, the system automati-

cally notifies operatives either by e-mail, fax or SMS of any change in the state of the compressor. In addition, the system is fully integrated in the process control system, so that management is informed about machine condition at all times.

The main disadvantage of an offline system for the company was that individual inspections would incur very high personnel costs and would also be time-intensive. The operative carrying out the monitoring would need to have extensive metrological experience and the measuring sensors would have to be taken to the machine before each measurement inspection. On the other hand, the online monitoring system PROGNOST<sup>®</sup>-NT offers several advantages:

**Up-to-the-minute information round-the-clock**

- PROGNOST®-NT is easier to operate than offline systems since the user doesn't need to have any special knowledge of metrology.
- Online measurement gives the operatives trend data about the state of the machine at any time. Any change can be indicated and if the status varies, alarm messages can be produced immediately (by phone, fax, e-mail or SMS).
- Most monitoring systems were developed for rotary machinery and don't really cater for the particular requirements of oscillating machinery. However, the moni-

toring function of the system chosen by OMV is tailor-made for reciprocating engines. Crank angle analyses give unambiguous messages about the location and operational significance of the cause of a fault or increased wear.

- A pattern recognition function for the automatic recording and future recognition of damage patterns forms the basis of an intelligent, self-learning system. A database containing a broad range of patterns (damage patterns) from comparable machines allows all users to share their experience, with the providers of the information remaining anonymous. This sharing of

experience enables errors to be detected more readily.

- Apart from the data it records itself, the system can also accept, integrate and monitor all other data relating to the plant (e.g. from the process control system). Examples of this data would include flow, pressure levels and temperatures.
- The system has proven its worth in the ten years since its introduction.
- Thanks to its modular structure, it was possible to customise the system to suit the particular requirements and plans of OMV.

**Direct comparison of online and offline monitoring**

Online monitoring	Offline monitoring
<ul style="list-style-type: none"> <li>• Possibility of integrating DCS data can be acquired for comparison purposes</li> </ul>	<ul style="list-style-type: none"> <li>• Not possible to integrate DCS</li> </ul>
<ul style="list-style-type: none"> <li>• If values vary, they can be compared at any time (continuous measurement)</li> </ul>	<ul style="list-style-type: none"> <li>• Values only obtained after an inspection is conducted</li> </ul>
<ul style="list-style-type: none"> <li>• Early fault detection, so avoiding serious faults</li> </ul>	<ul style="list-style-type: none"> <li>• Early detection of failures only possible during the inspection</li> </ul>
<ul style="list-style-type: none"> <li>• Remote maintenance (also through external service providers) by PC, unmanned operation possible</li> </ul>	<ul style="list-style-type: none"> <li>• 2 to 3 operatives required on site for offline monitoring</li> </ul>
<ul style="list-style-type: none"> <li>• No special training required as easy to operate and automatic error detection</li> </ul>	<ul style="list-style-type: none"> <li>• Qualified operatives with specific technical skills/training required</li> </ul>

Source: PROGNOST Systems GmbH

When the compressor was being commissioned at the Burghausen site, faults in the valve control system of the regulated compressor were discovered. The online monitoring system indicated that the valves were

only active in one half of the cylinder, even though the compressor should have been working at full capacity at this point. After inspection and adjustment of the control, the service department reported that the fault had been

eliminated. To be on the safe side, OMV mechanical engineer Uwe Seifert checked the latest state with the online monitoring system. With the help of the p-V diagram (pressure monitoring), he could see

straightaway that the fault hadn't been corrected.

Again the service personnel got to work on the fault. The evaluations from the condition monitoring system revealed that the fault must have been located in the valve control system. The fault was finally eliminated after all the relevant components were replaced.

Without the monitoring system, initially only a reduced output would have been evident. However, since the plant was new and the maximum output was not known but could only be calculated, the fault could not be explicitly attributed to the output control system. Using the stored measurements, however, OMV had evidence to present to the machine supplier. What was of even more crucial importance than this, though, was that the tele-monitoring system made it possible to quickly eliminate the usual faults which occur in the start-up phase even before the compressor came on stream.

### **Effective prevention of long-term damage**

The condition monitoring system also confirmed a further fault in the plant. By looking at the cylinder discharge values, increased pulsation was discovered in the suction pipe and discharge pipe.

A detailed measurement taken in the pipeline showed that the pulsation caused increased vibration in the plant, which sooner or later could be expected to lead to damage to the machinery and pipelines or breakdown of the equipment.

After the measurements were evaluated, specially designed pulsation damper plates were installed to effectively reduce the vibration.

## **The modules at a glance**

The following tele-monitoring modules are used at OMV:

- Safety monitoring: Permanent crank angle-related vibration monitoring of each revolution creates an alarm message immediately the set limits are exceeded (automatic shut-down also available).
- Vibration diagnosis: The location and operational significance of any damage arising is precisely established and reported by means of the crank angle-related vibration diagnosis, depending on the operating condition (e.g. rotational speed, process pressures, load step).
- P-V diagram/wearing parts analysis: Compressor efficiency can be monitored and increased by means of this online analysis (monitoring of gas dynamics). The main wearing parts, i.e. the suction and discharge valves, are specifically monitored by analysing pressure characteristics.
- Process data integration: The system can be integrated into the process control system (and/or PC network) employed without any major technical adaptations. Incoming process data such as suction pressure or ultimate pressure or valve pocket temperatures give information about the general status of the machinery.
- Reporting: The event recording system automatically generates plain text messages when limit values are exceeded, specifying both the location and the operational significance of the event.