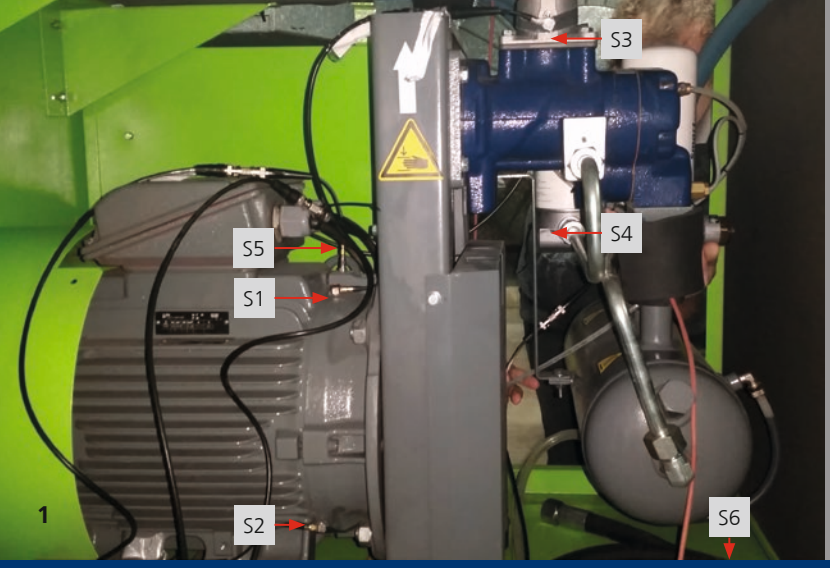

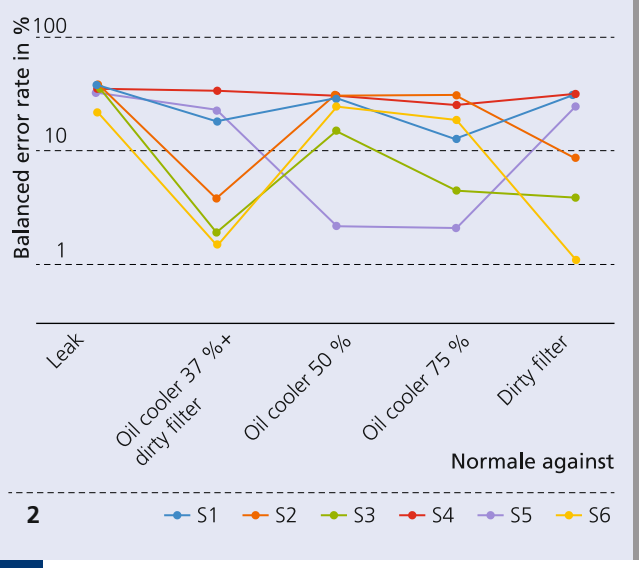

CompWatch – AUTOMATED MONITORING OF COMPRESSORS

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Compressors are an important part of many industrial plants. Their stable operation is therefore required for many processes in the industial and transportation sectors as well as other areas of society. A failure has various consequences, e.g. downtime, repair times, service work and the resulting, often considerable, economic damage. So far, maintenance has mostly been carried out at fixed service intervals and process parameters have been checked on a random basis.

Goal: Event-oriented maintenance

As part of the CompWatch project, procedures are being developed which are intended to enable a transition from fixed to event-oriented maintenance intervals. To achieve this, it is necessary to recognize possible errors early on and thus to be able to predict failures. Hence, the project serves current global trends, such as Industry 4.0 and predictive maintenance.

Anomaly detection based on acoustic signals

Acoustic signals and vibration data contain signatures that allow conclusions to be drawn about the condition of the compressor and its trend. The data is evaluated using methods of artificial intelligence and machine learning. Oftentimes all errors must be known while designing the models in order to be able to recognize them later.

The special feature of our approach is that we predict and determine abnormal conditions (anomalies) without such prior knowledge. This would facilitate quick and easy integration into new environments and running systems.

The collaborating project partners each contribute their competencies: SONOTEC GmbH: modern sensor technology, Petko GmbH: expert knowledge about the operation and maintenance of compressors, as well as Fraunhofer IKTS: AI-based algorithms for error detection.

Different types of sensors for anomaly detection were used in the experiments. The sensor positions (Figure 1) were chosen in such a way that as many components as possible could be monitored. Figure 2 shows the detection rates (scaled logarithmically) for differentiating between an error and the normal state for each sensor. The lower the detection rate, the fewer false alarms occur and the better the detection of defects works. A leak in the compressed air system and contamination of the air filter can be found particularly well with the airborne sound sensor (S6). The cover of the oil cooler was best recognized with the sensor S5. The individual components are currently being integrated into a demonstrator and will then be evaluated on compressors.

This project is funded by the German Federal Ministry of Education and Research (BMBF, funding number 02K18K012) and implemented by the Project Management Agency Karlsruhe (PTKA).

1 *Position of sensors for acoustic anomaly detection at different compressor components.*
2 *The best error rates for each sensor and defect.*

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