

## Focussing on the whole

In order to provide to most beneficial outcome from experimental investigations for the clients Energiring offers comprehensive solutions. The instrumentation and the interaction with the data acquisition system including hard- and software is often a source of serious problems. Solving issues with the communication between different instruments, the data transfer and storage but also the data evaluation is a time consuming task.



*Turbine test rig with original engine hardware from Larzac 04 jet engine for investigations on blade cooling flow*

Energiring's 360° approach allows the clients to focus on the measuring task .

All components from the measuring location via the sensors and the data transmission and acquisition to the storage and analysis can be provided as a complete turnkey system including the suitable measuring software. This makes sure that all parts of the measuring chain fit to each other and that the measuring results are highly reliable. Different tasks require different solutions. Therefore Energiring is able to provide tailor-made solutions using standard components where possible but applying specific components where necessary

- Pressure and temperature probes and rakes
- Pressure and temperature sensors
- Pressure and temperature scanners
- Data transmission systems
- Data acquisition instruments

In combination with the offered services from the planning to the support and performance of measuring activities the customer can choose the best solution for his application.



## Better competitiveness due to detailed knowledge of the machine & system condition

Detailed information about the operating behavior of a machine and the related system is essential for safe running. This knowledge helps to detect abnormal conditions like performance loss, deterioration or damages. A proper instrumentation paves the way for a better understanding of the operational behavior.

Various levels of sophistication provide insight in the aero/thermodynamic and mechanical situation. In order to obtain meaningful results the whole chain from the sensor down to the analysis program needs to be understood and applied in a reliable and reproducible way. Therefore Energiring offers a broad spectrum of services in the field of testing and measurements in power conversion machines and related systems.

- Consultancy service for testing, instrumentation and monitoring.
- Layout and planning of test campaigns
- Supervision of test campaigns and support for measurements
- Improvement of existing instrumentation
- Layout and planning of additional instrumentation
- Short courses on measuring techniques, instrumentation and monitoring

Energiring's services enable the operators to improve their insight in the machine and plant conditions by performing targeted performance measurements and vibration analyses.



*Dynamic pressure measurements in a centrifugal blower in steel work to analyze the reasons for several impeller damages*

## Consulting based on long lasting experience

Any testing or monitoring task is based on an appropriate instrumentation. The knowledge of the capabilities and limitations of different measuring techniques is the most important building brick for their successful and reliable application. Energirings experts have a more than 30 years lasting experience in the field of experimental investigations in turbo machines, the regarding measuring techniques and related topics. This profound expertise guarantees the most effective way of planning, setting-up and performing measuring campaigns in industrial environment.

Starting from component tests up to whole machines and plants Energirings can offer the best suitable solutions for successful experimental investigations which will provide reliable and profound data for an optimization of the machine or plant operation. This will help to increase:

- Reliability of the machine
- Availability of the whole process or plant
- Performance of the machine and plant
- Life time of the components

The knowledge of the condition of the components in a plant provides significant information for the appropriate scheduling of maintenance actions which will reduce costs and the risk of unforeseen shut downs or even large damages.

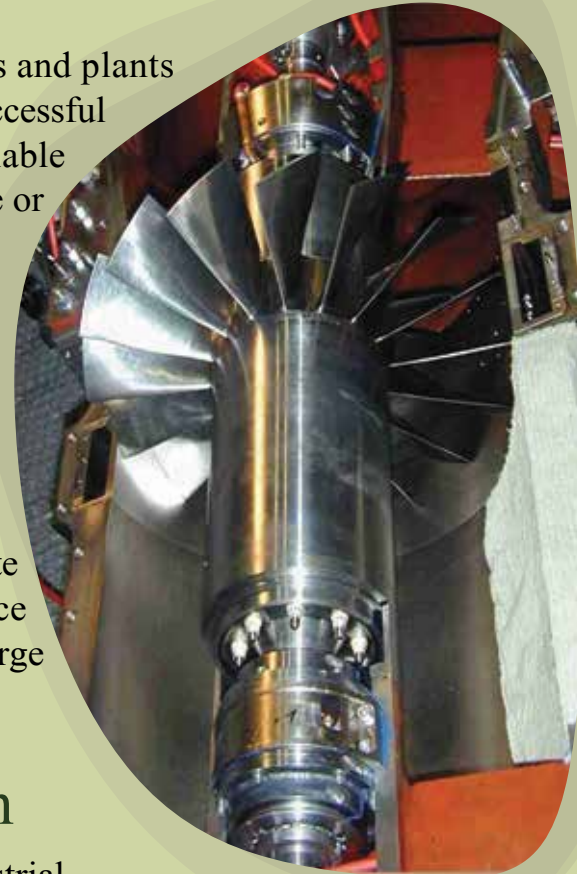
## Keeping the operation going on

The main priority for all measuring activities in industrial environment is the pre-servation of the production process with as little interruption as possible. Therefore Energirings experts always focus on:

- Operational safety (no risk of machine damages by the instrumentation)
- Operationability (minimum stand still times for the installation of the sensors)
- Reliability (selection of robust sensors which can withstand long term operation in harsh environment)

From many instrumentation and measuring projects worldwide Energirings experts have recourse on extensive experience in different industrial plants like

- Power plants
- Steel works
- Chemical plants
- Compressor stations
- Refineries
- Pumping stations



*Open compressor test rig being prepared for new instrumentation*

Based on this expertise the planning of the measuring tasks, the choice of the appropriate measuring techniques and sensors and the measuring strategy gives the clients the certainty of getting out the maximum information from the system at minimum disturbance of the operation.

*Aerodynamic probe measurements in a jet engine to investigate the influence of compressor blade erosion on the performance and to provide a data base for the development of a regarding monitoring system*

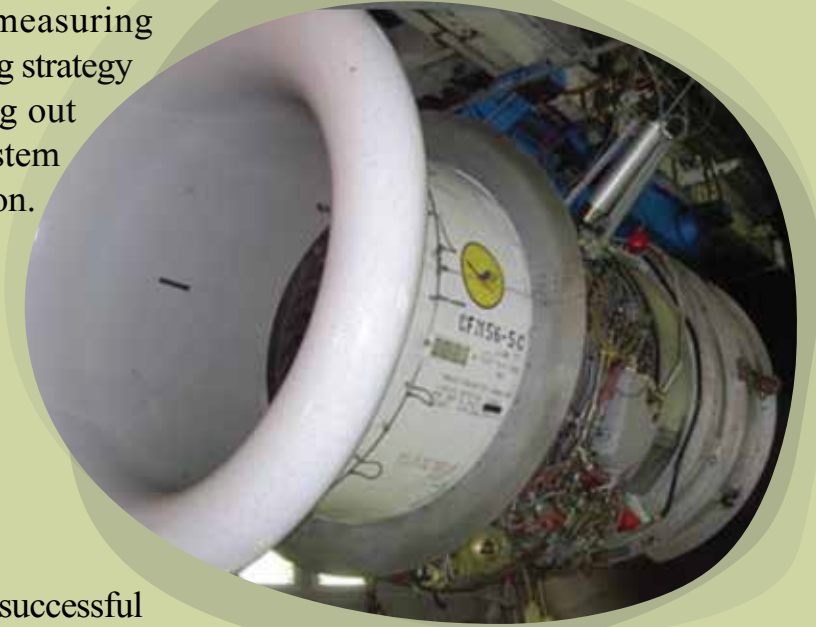
## Concentrating on the clients needs

The most important step on the way to a successful solution for any testing or measuring issue is the detailed analysis of the specific requirements of the customer. The common understanding of the targets and the way forward is the basis for the layout of the measurements and the suitable measuring techniques. The expected results define the right set-up and the effort. The most common measuring tasks are

- Commissioning tests
- Tests of the machine integrated in a system (interactions, optimization of the operating behavior etc.)
- Test runs to obtain data for improvements (operation scheme, optimization of inlet or outlet conditions etc.)
- Performance, health or stability monitoring



*Aerodynamic probe measurements and dynamic pressure measurements in a heavy duty gas turbine to verify the design and off design performance and to provide a data base for the development of a compressor stability monitoring system*



Each of these activities requires a specific approach and instrumentation. Energirings experts are experienced in providing consultancy and support from the planning of the tests to the evaluation of the measuring results.

The final target is to enable to client to figure out operational issues of the machine and to analyze their reasons. Energirings also offers short courses on different topics related to measurements in turbo machines so that the clients get a better feeling how different measuring techniques are applied and what kind of results they can expect