

On-line Combustion Monitoring with FlameBeat Preventing Gas Turbine Trips

If any irregularities occur in a gas turbine, the control software will ensure that it shuts down to prevent operational failure. This is often accompanied by costly consequential damage. The gas turbine trips. An unstable flame, leading to unacceptable combustion chamber vibration, is one of the causes of such a trip. And downtime costs money. The *FlameBeat on-line combustion monitoring system* is designed to prevent trips due to flame pulsations and to timely recognise damage of hot gas components. Thereby money is saved.



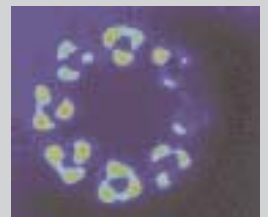
How does it work?

In modern gas turbines a reduction of the NO_x-emissions is achieved with Dry Low NO_x burners, using a pre-mixture of fuel with a large excess of air. The flame of lean premix burners easily becomes unstable. This gives rise to acoustic oscillations that may couple to the structure of the combustion chamber. Strong vibrations endanger the integrity of the gas turbine and the safety system will trip the machine.

The *FlameBeat on-line combustion monitoring system* is based on *high-temperature dynamic pressure sensors*, installed directly on the combustion chamber. The spectra of the acoustical vibrations that occur during normal use are stored in a database as “the fingerprint” of the combustion chamber. Through comparison of the actual spectra with the “fingerprint” the *FlameBeat on-line combustion monitoring system* signals any defects or component degradation at an early stage. In this way it provides information about fissures in combustion chambers, leakage of gaskets, burner damage or variations in fuel quality. It also helps to predict and prevent turbine trips caused by strong amplitude vibrations.

Your benefits

- you can save a lot of money because it will indicate any defects at an early stage and therefore prevent major failures
- you can perform Condition Based Maintenance rather than random repair work
- you can gain an insight into the degradation process of liners and hot gas components, so that you can anticipate their lifetime
- you can prevent turbine trips, due to flame instabilities, from happening
- you can tune the burners more easily at any time



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Case Example - Preventing unnecessary high costs

The *FlameBeat on-line combustion monitoring system* is installed on the gas turbines at the Lage Weide and Diemen power stations in The Netherlands. Variations in the level and frequency of the flame pulsations in one of these units suggested a crack in the combustion chamber. A temporary repair was made and the unit was started up again. The combustion chamber was replaced during the next *scheduled* overhaul. The system is currently operational on two ABB 13E2, three GE MS9001FA and one Siemens V94-3A gas turbines.



DYMAC total system capability

With more than 35 years experience in production and service of instruments for monitoring, analysis and diagnosis of mechanical behaviour of critical machinery, DYMAC's commitment is to provide the optimum combination of product, people and skills to ensure that machinery health monitoring is an added value component of the customer's business.

DYMAC is part of the Reliability Systems unit of the worldwide AB SKF Group. Combining nearly 100 years of bearing and industry knowledge, SKF Reliability Systems offers technology product and service solutions designed to increase plant efficiency and profitability.

*FlameBeat** is part of an integral package of condition monitoring tools. This package comprises, amongst others, Thermoware™*, dedicated to thermodynamic condition monitoring (Performance Monitoring). Furthermore we can deliver the following:

- **Sensors & Signal Conditioning**
- **Machinery Protection Systems**
- **Machinery Condition Monitoring**
- **Service and Support**

*FlameBeat and Thermoware™ are powered by KEMA

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