

THERMOCOAX Turbines Solutions Long-life Thermocouples

Thermocoax announces a new thermocouple generation :

- 24 000 operation hours in heavy duty gas turbine
- Exceptional resistance to vibration, thermal stress, corrosion...
- Already demonstrated in air-cooled 446MWatt machine
- 37 gas turbine already equipped
- 18 currently under operation
- 1.2 Million hours cumulated
- 699 starts



Technical application of long-life thermocouples

The gas turbine frames market is a challenging business. On the one hand, the frames are more and more high-tech and expensive and on the other hand, the energy producer is driven by low electricity production prices. To make them both compatible, gas turbine frames have to be reliable to minimize operation disruption and to offer longer periods without maintenance. Therefore, providing thermocouples with an increased lifespan decreases the downtime of the turbine, thereby significantly reducing the maintenance costs.

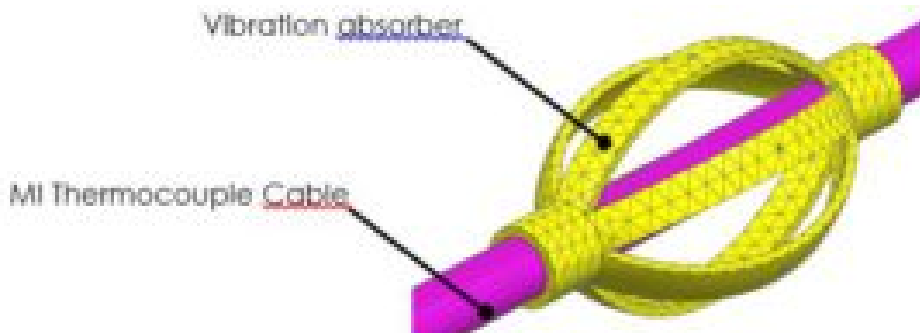
Required Benefits

One of the key aims of the OEM GT is to find high-accuracy thermocouples on the market that are able to perform in harsh environments and work for 24,000 operating hours without failing.

Thermocouples installed in exhaust gas lines are exposed to corrosion, vibration, thermal expansion and much more.

Thermocoax's Solution: Design a thermocouple that is out of the excitation bandwidth

Based on the capitalized cumulative return of experience in several fields, such as aeronautical, nuclear and oil & gas, THERMOCOAX has developed a vibration absorber that is secured to the thermocouple to avoid premature breaking when the thermocouple is subject to vibrations and thermal expansion. This solution is protected by a patent.



The invention with the patent number 63638FR/CZ/BB – 17 58061 is a vibration absorber that is secured to the thermocouple cable and is made to fit inside the screen/thermowell.

The number and size of the absorbers depend on the gas turbine specification in terms of vibration, acceleration and thermal cycles.

To demonstrate the advantage of this new design and its ability to reach 24,000 operating hours, THERMOCOAX has undertaken simulation and experimental testing:

1.1 Simulation: Comparison between a thermocouple with and without a vibration absorber

Input data:

- Ø ? 3mm Type K thermocouple with 316L SS sheath
- Length ? 500mm insertion length in SS316L thermowell
- Temperature 870°C
- Frequency range: 0 to 250Hz, mean value 100Hz

	Long-Life TC	Standard TC
Resonant Frequency of the TC	174Hz	68 Hz
Stress produced by the Resonant Frequency of the TC	11.1MPa	450MPa
Number of cycles made before Breaking of TC at its Resonant Frequency	9x10 ⁹	40
Life-span at the Resonant Frequency of the TC	2.1x10 ⁹ days	10 days

1.2) Field test results: Comparison between a thermocouple with and without a vibration absorber

- Ø ? 3mm Type K thermocouple with 316L SS sheath
- Length ? 300mm insertion length in SS316L thermowell
- Temperature 900°C
- Frequency range: 0 to 1000Hz,

	Long-Life TC	Standard TC
Resonant Frequency of the TC	68Hz	174Hz
Life-span during the Endurance Test		