CASE STUDIES

The Benefits of TIGER® on Offshore Drilling Platforms

INCIDENT #1

A gas turbine on an oil platform was always started on distillate fuel oil. The engineer on site noticed that the gas turbine was unstable during start-up - a problem that had been ongoing. The engineer notified his maintenance support team who, using TIGER, remotely connected to the offshore platform and checked the diagnostic information collected during the start-up. It was quickly determined that the liquid fuel was oscillating between the 0 and 5 MW power levels.

Using the information available via TIGER the problem was diagnosed as a sticking bypass valve. This problem was difficult to diagnose on the platform given the operating environment, particularly for the site engineer who would have had to change a number of components and then attempt another restart to see if the problem was solved. In addition, a variety of replacement components are not always available on the platform, which further curtails this type of effort to resolve the problem. If the turbine failed to start due to these oscillations - a very high possibility - then the platform would have lost this power source.

By being able to diagnose and correct the problem, the use of TIGER's diagnostic analysis helped to avoid a probable future trip and shutdown, which would have caused at least 5 hours downtime on the platform.

INCIDENT #2

The daily check of the TIGER diagnostics detected that both the gas fuel and liquid fuel stop valves were sticking for abnormal lengths of time. The gas fuel stop valve was sticking for 5 seconds and the liquid fuel valves were sticking for 10 seconds. This type of malfunction can cause problems in fuel transfers, including a gas turbine trip when a fuel transfer is attempted and unsuccessful. The site was advised to replace the appropriate fuel valves.

This problem was again detected when, during a fuel transfer to gas fuel, the speed ratio valve did not open until approximately 1 minute after the signal was given by the servo. This caused the fuel transfer to fail and for the system to remain on liquid fuel longer than expected. It was shown that the cause of the problem with the speed ratio valve was the gas fuel stop valve stuck open for approximately 1 minute.

This incident was repeated, whereby the gas fuel stop valve became stuck in the open position, preventing the stop ratio valve from functioning. However the gas control valve continued to open in expectation of a supply of fuel. The gas control valve continued to open to 100%, and then the gas fuel stop valve closed, causing a surge in liquid fuel flow. This quickly led to the exhaust temperature rising to 585ºC, which tripped the unit. The sticking valves were replaced, eliminating the problem.

INCIDENT #3

Platform engineers contacted their maintenance provider and advised that there was a loud 'bang' on run-up of a turbine. A review of the TIGER diagnostics indicated that the bleed valves failed to open properly. The loud bang was attributed to compressor surge occurring.

TIGER helped identify that the bleed valves were not in the correct position leading to compressor surge. As a result, the bleed valves and limit switches were scheduled for replacement at the next overhaul.

Rapid remote diagnosis of a potentially catastrophic situation was possible because of information provided through TIGER. TIGER also helped add to the work scope for the next overhaul, as well as an area of the turbine that required short-term attention.

INCIDENT #4

The customer replaced the flow divider for the liquid fuel and requested that the service provider use TIGER to monitor the gas turbine on the subsequent start-up. The first three attempts to start the turbine failed.

Using TIGER, it was observed that on all three attempts, no fuel flow was achieved through the new flow divider. Through interaction with customer personnel, the customer service provider guided an on-site engineer in determining that the cause was a result of the fuel clutch not engaging due to a faulty relay in the clutch circuit.

This problem was an obscure and uncommon fault, making it likely that the engineer on the platform would not have been able to independently identify it. Through the use of TIGER, the customer was able to get the machine running between 12 to 24 hours quicker.

INCIDENT #5

The customer's gas turbine tripped due to an inlet guide vane problem. The service provider remotely checked the data via TIGER and determined that the inlet guide vane did not close, but instead continued to open. Checking the recent historical data in TIGER, it was shown that the inlet guide vanes were very sluggish in their operation.

After the trip, the machine would not start, forcing the customer to contact the service provider to assist in restarting it. The site engineer was directed to replace the inlet guide vanes servo, and then perform different operational approaches to starting the turbine. By remotely monitoring the activities, it was demonstrated that there was a problem with the mechanical dump for the inlet guide vanes.

Through the use of TIGER diagnostics, the customer was able to solve a difficult problem and get the gas turbine working 1-2 days faster than if they had to identify and solve the problem independently.