



Bangladesh, Floating Dual-Fuel Power Barge

Root Cause Investigation of Multiple Failures of a Large Dual-Fuel Engine

CHALLENGE

MPR received a request from the plant owner of the world's largest floating dual-fuel power barge in Bangladesh to conduct an independent root cause investigation into successive failures of one engine. The owner was concerned that the engine, which had been rebuilt one week earlier, had failed again. The 18-cylinder, 20,000 bhp engine is the prime mover for one of eight 15-MWe units, and electrical power already in short supply in the country had become even more scarce. This failure was a more serious break down involving two pistons and connecting rods being ejected from the dual-fuel engine's crankcase. One connecting rod was bent more than 45 degrees and the second connecting rod, along with several pistons and cylinder liners, was fractured.

SOLUTION

MPR flew to Bangladesh on short notice and inspected the damaged engine. MPR reviewed the engine operating and maintenance history, and examined all signs of fatigue and overstress conditions. Working with plant personnel and the OEM's service representative, MPR developed a root cause matrix to consider all the possible explanations for why the engine failed. In addition, the assessment would determine whether this failure was related to the event that occurred one week earlier. The process included collecting information and materials associated with the sequence of events of the first failure to determine if there was a connection between the episodes. A number of the failed parts were provided to MPR, who sent the materials to a laboratory for examination and testing to confirm they complied with the OEM's design requirements.

RESULTS

MPR completed the detailed root cause investigation that determined the engine did not fail due to improper operator action or faulty maintenance. The common link found between the two failures was a cracked exhaust valve seat in one cylinder head that allowed cooling water to leak into the cylinder while the engine was shut down. When restarted, some of the water in one cylinder was pumped into the adjoining cylinder via the common exhaust manifold. A number of hydraulic lock impacts weakened one connecting rod to the point of fracture. As a result of MPR findings during the root cause investigation, MPR was asked to serve the role of technical expert for the owner's engineer at mediation meetings in London with the power barge's insurance company and the diesel engine manufacturer.

