

Offshore Gas Platform Increases Production Through More Effective Piping Erosion Management

RESULTS

- Platform increased production by 50 BPD with no additional risk
- Wireless thickness monitoring probes were installed with no wiring necessary
- Operators were able to characterize erosion characteristics related to operating conditions

APPLICATION

Rosemount™ Wireless Permasense™ Corrosion and Erosion Monitoring applied to natural gas piping on an offshore platform helps manage sand erosion inside valves and pipes.

CUSTOMER

Global energy company in Asia

CHALLENGE

Sandblasting—shooting grains of sand in a compressed air stream—is a very effective way to remove rust and paint from metal surfaces due to its abrasive characteristics. At natural gas wellheads, an equally effective but highly undesirable form of sandblasting takes place when the stream coming out of the well carries sand. These sand flows can erode the interior of pipes, fittings and valves—resulting in high wear rates and short service life.

Unfortunately, the amount of sand and particle size is variable and cannot be controlled or even predicted. The only mechanism to determine its extent at any given time is adding acoustic monitoring to the relevant piping to listen for the characteristic sounds of sand entrained in the gas stream. This gives a rough indication of what is going through the pipe but does not determine the amount of metal lost to the abrasive grains.

The areas particularly vulnerable are where gas velocity increases, such as after the choke, and where sand rubs against the wall on the outside radius of an elbow or just downstream from an elbow. Operators can use computational fluid dynamics to predict where erosion is most likely to happen, but this does not help manage the problem or predict its effects in real situation.

The only tool operators have to control erosion is adjusting throughput to avoid high gas velocities during times when acoustic sensors indicate entrained sand is elevated. While this reduces the abrasive effects, it also reduces throughput and therefore production. Maintenance engineers can try to determine the amount of actual metal loss using handheld metal thickness gauges, but these readings are not



Operators know when flow can be increased beyond levels previously considered maximums. As a result, the platform has realized a production increase of 50 BPD with no incremental risk of erosion in the main natural gas flowline.



Operators now have HMI graphics indicating thickness measurement trends correlated with the current choke opening and production rate. By watching the historical data, it is possible to see changes in thickness corresponding to sand content and gas velocity.

continuous measurement as it is a remote platform and required a man to be onboard for measurement, while the sand erosion can happen in an extremely short period.

SOLUTION

Platform operators understand the nature of sand erosion well enough to expect that it will happen and make allowance for an acceptable amount of metal loss before safety boundaries are crossed. The solution requires knowing just when this has happened and determining how high production can run while not drastically shortening equipment life. Making this determination depends on having an accurate and continuous measurement of metal loss in strategic locations.

The operator addressed this issue by installing eight Rosemount Wireless Permasense Corrosion and Erosion Monitoring sensors, at valve and piping strategic locations. Since the sensors use a self-contained power module, they were installed with no wiring of any kind required for signal or power. The piping positions selected represented areas where flow patterns create high levels of erosion and should therefore indicate the worst case.

These ultrasonic metal thickness sensors are permanently mounted and provide a pipe wall thickness reading updated every 15 minutes. This data is sent to the control room and maintenance department via *WirelessHART*[®]. Operators now have HMI graphics in the control room indicating the status of the probes and their measurement trends correlated with the current choke opening and production rate.

By monitoring this historical data, it is possible to see changes in thickness corresponding to sand content and gas velocity. The probes are capable of repeatability of 10 µm, which is the equivalent of 0.000394 inches, so it is possible to detect very small changes over time. It is also possible to identify the variability of the rate of loss, a major improvement over shutdowns for periodic inspections with pipe disassembly.

Operators can now see the effects of various operating conditions in real time, which has allowed them to characterize situations where metal loss is minimal, average, or severe. While it is still not possible to predict the amount of sand entrained in the natural gas, it is possible to determine when corrective action must be taken. Operators also know when flow can be increased beyond levels that were previously considered maximums. As a result, the platform has realized a production increase of 50 BPD with no incremental risk of erosion in the flowline.

Operators now know the condition of the flowline piping and optimize production at higher levels while predicting the remaining equipment life with a high degree of confidence.

RESOURCES

Rosemount Wireless Permasense Corrosion & Erosion Monitoring

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