Chiyoda Saved $1M in a Mega LNG Project with the Rosemount™ Conditioning Orifice Plate

RESULTS

- Saved $1M in cost (including piping material, support structure, and construction costs)
- Saved engineering man-hours to redesign the piping
- Saved space around the pumps

The Rosemount Conditioning Orifice Plate allowed Chiyoda to install the measurement point in the originally designed location with no piping modifications.

APPLICATION

To measure the discharge flow rate of 3150 kW pumps (three pumps in each LNG Train, 12 pumps in total)

CHARACTERISTICS

20-in. pipe with two diameters of upstream straight pipe run after an elbow and centrifugal pump

CUSTOMER

Chiyoda Corporation Designing four LNG trains as an EPC Contractor for a large gas company in the Middle East

CHALLENGE

Chiyoda was engineering a mega LNG project for a major gas company in the Middle East. Chiyoda's piping engineers had designed the LNG train to require a measurement point after a centrifugal pump and a single elbow – the straight run after the elbow is only two diameters. This measurement was being made to monitor the discharge flow of the pump. It was a critical measurement because it was used to shut down the pump if the flow rate is near the minimum flow rate of the pump. The pump would be damaged if it was not shut down in time. If it was shut off too early then the production would be affected unnecessarily.

The short straight run posed a challenge for the Instrumentation Engineers to select a flow measurement technology that would produce an accurate and repeatable measurement. In this application, ISO 5167 Section 2 requires 75 pipe diameters before the measurement point for accurate measurement. For this application, 75 pipe diameters is equal to 125 ft. (38.1 m).

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Chiyoda had considered two options to get the needed straight piping for accurate measurement. The first option was to move the pump 125 ft. (38.1 m) away from the measurement point to accommodate the needed straight piping. The second option was to leave the pump in its original position but install “trombone piping” which routed the piping away from the measurement point. This option required an additional 250 ft. (76.2 m) of piping for each of the twelve applications. Both options would be very costly due to the amount of additional piping and support structures. The additional piping would also occupy space that was needed for maintenance access to the pump and other equipment in the area.

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SOLUTION

Chiyoda chose to install Rosemount Conditioning Orifice Plates with a 0.65 Beta as they only required two pipe diameters from the flow disturbance. This enabled them to install the flow meter in the location that was specified in the original design with no engineering changes needed. The use of two pipe diameters saved Chiyoda plant space as well as saving crucial engineering man-hours, since a redesign of the flow meter installation was not needed. Chiyoda saved $1M USD in total on the 12 installations.

In addition, it was important for Chiyoda to complete the required testing for this installation. To guarantee the necessary results, Emerson™ and Chiyoda tested the Rosemount Conditioning Orifice Plate at the Utah State University Water Research Lab. Tests were completed with 2, 5, and 12.5 diameters downstream of a pump and an elbow with two different beta ratios. The Rosemount Conditioning Orifice Plate was determined to have an uncertainty of one percent over the flow range for a 0.65 Beta with two upstream pipe diameters. The 0.4 Beta conditioning orifice plate was determined to have an uncertainty of 0.5 percent in the same conditions.

RESOURCES

Emerson Oil & Gas Industry

Emerson.com/Industries/Oil-Gas

Rosemount 1595 Conditioning Orifice Plate

Emerson.com/Rosemount/Rosemount-1595-Conditioning-Orifice-Plate

- Linkedin.com/company/Emerson-Automation-Solutions
- Twitter.com/Rosemount_News
- Facebook.com/Rosemount
- Youtube.com/user/RosemountMeasurement
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