THE INSTITUTE OF PETROLEUM

Research Project

Evaluation of the performance of meters in loading gantries

Phase 2 — Tests on Products Other than Gas Oil

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SGS Redwood Services

The Institute of Petroleum

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Evaluation of the Performance Of Meters in Loading Gantries

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Summary

This report describes the second phase of a project undertaken by SGS Redwood under the sponsorship of The Institute of Petroleum. The project is concerned with the performance of various types of meters in loading gantry installations. During the first phase, a PD meter, a straight-bladed turbine meter, a helically bladed turbine meter and a Coriolis meter were tested on gas oil. During the second phase the same meters were tested on motor spirit, kerosene and ULSD.

The test programme was designed to evaluate the performance of each of the meters under the following conditions:

1. In an "ideal" installation with 20 diameters of straight pipe upstream and 10 diameters downstream of the meter.
2. In a simulated gantry installation with the bends and components copied from a real gantry.

The results of this phase of the project confirmed previous experience and reinforced the conclusions of phase 1, indicating that a conventional straight-bladed turbine meter does not give satisfactory performance in a typical gantry installation. Its performance was severely affected by the installation and its linearity, although better on the lower viscosity products, was not acceptable.

The three other meters were all affected by the installation but to a much smaller extent than the turbine meter. In contrast to the results on gas oil, the installation effects on these meters were apparent across a wide range of flow rates. The helical turbine meter showed poor linearity on motor spirit, a feature that will be discussed with the manufacturer. Subject to the resolution of this point and a similar matter with the Coriolis meter from the phase 1 tests, both the helical turbine and the Coriolis meters should be considered for gantry metering applications.

Analysis of the data derived in this project, together with the calibration data from six PD reference meters, showed that the practice of calibrating a reference meter on gas oil and applying a fixed meter factor "correction" to determine its performance on ULSD, could lead to significant errors. A similar situation was identified with the motor spirit substitutes, where the use of a fixed meter factor "correction" is sometimes used to establish a reference meter's performance on motor spirit. This practice can also lead to significant errors.

It has been suggested that progressive changes in the specification of motor spirit over the past ten years might have affected the behaviour and performance of the PD meters employed as reference and gantry meters. On the evidence of the performance of one such reference meter, the changes in motor spirit specification since 1993 have had no significant effect on the meter's performance