

Preventing Fugitive Emissions with Vortex Flowmeters

Industry: Refining
Product: Vortex Flowmeter

Background

The oil refining industry today faces increasingly strict regulations that dictate both the quality of its products and the diligence of its production processes. While refineries around the world are stepping up efforts to further improve the efficiency of their operations and maximize the return on their plant assets, they are taking extra care to keep their production processes fully compliant with all regulations.

In a daring move to maximize operation efficiency, one of the largest refineries recently completed a project that deployed the vortex flowmeter technology in all possible applications. The initiative was also designed to help the refinery conform to the ISO 14000 standard and prevent fugitive emissions, fully complying with strict local air pollution control statutes.

The Challenges

Accurate flow measurement

Accurate flow measurement is one of the key elements that can sway the productivity of an entire refinery. Various types of flow meters are deployed throughout a refining facility, but by far the largest in number are the ubiquitous orifice plates and differential pressure transmitters. Some of these orifice flowmeter applications, however, have innate limitations and recurrent maintenance issues.

Periodic check-up and freeze-prevention measurement

The orifice flowmeter is not suitable for low-flow measurement, and can develop zero drift and span drift when the temperature/pressure conditions fluctuate beyond the design specifications. The inevitable impulse lines that come with the orifice flowmeter require periodic check-up and freeze-prevention measures, which translate to additional installation, operation, and maintenance costs.

To overcome these limitations of the orifice flowmeter, the customer investigated various alternatives and finally decided to introduce the vortex flowmeter technology. A vortex flowmeter can measure both low flow and high flow, and requires very little maintenance. The challenge, however, was to find a supplier that was willing to go the extra mile to help the customer meet both its stringent safety policy and all the external regulations. Due to the very ambitious nature of the project, the supplier would have to be able to deliver a variety of special-purpose vortex flowmeters not yet readily available on the market.

The Solutions

To fully conform to the ISO14000 standard and local air pollution control laws, the customer was looking for an alternative flow measurement technology that minimized the number of potential leakage points. The vortex flowmeter is an in-line flowmeter that does not require impulse lines and is free of moving parts, two significant improvements over the orifice flowmeter. While the traditional orifice flowmeter has approximately 30 potential leakage points, the vortex technology has only three.

In addition to the external regulations, the customer had a very stringent safety policy in place for a number of critical applications which demanded full redundancy in both process and alarm signals. Yokogawa experts designed special dual sensor type vortex flowmeters that ensured the required redundancy at the very points of measurement.



Dual Sensor Vortex Flowmeter

Extra care was taken at Yokogawa to meet various other safety standards implemented by the customer, including material certification, welding certification, non destructive testing, casing quality certification, and a number of factory acceptance tests conducted with Lloyds of London as the witness.

To improve safety and stability in measuring and reduce installation cost, some refineries tend to introduce reducer vortex flowmeters, which have a reduced diameter in the centre of the pipe. This not only simplifies vortex flowmeter installation, but also improves the ability of vortex flowmeters to accurately measure fluids at low flowrates.

To meet the customers' needs, Yokogawa provides the reduced bore type of vortex flowmeter that features welded reducers on both sides of the detector. This expands the range of measurements that can be performed in low-flow conditions, which is normally difficult for vortex flowmeters, and ensures stable and accurate flowrate output.



Reduced Bore Type
Vortex Flowmeter

The Results

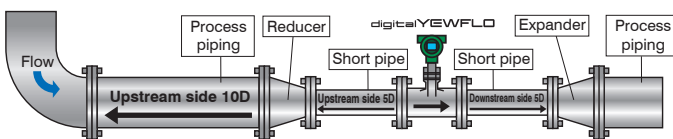
Operating and maintenance costs reductions and Production process's quality and safety improvements

Since the completion of this ambitious project in the mid 1990s, the refinery has been successful in extending the duration of the periods in which these critical production facilities can operate in complete non-stop mode to well over three years. The vortex flowmeter technology, which is now used in nearly 60% of all flowmeter applications in this refinery, has proven itself in the field.

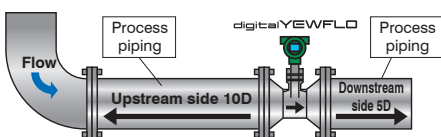
The customer has since deployed Yokogawa YEWFLO vortex flowmeters to its refineries at various other locations around the world, successfully reducing operating/maintenance costs while simultaneously improving both the quality and safety of its production processes.

As the pioneer of the vortex flowmeter technology, Yokogawa's challenge in bringing innovative flow measurement solutions to users in various process industries continues to this day. As was the case with this project, this will always be a joint effort with the customer, yielding a productive synthesis of the customer's passion for improvement and Yokogawa vigilance.

Traditional instrumentation



New instrumentation using Reduced Bore Type



The features of reduced bore type vortex flowmeter

- No need for reducers/expanders or short pipes to achieve the required straight pipe length.
- Improves safety and reduces installation costs.
- Increases the space for installation of additional instrumentation.

Yokogawa also designed and supplied a number of special vortex flowmeters, including high-pressure types that can withstand up to an ANSI/Class 2,500 psi environment and special corrosion-proof types with a Hastelloy C flow tube.