



Improve heat exchanger performance without shutdown:

How Panametrics' Clamp-On Flowmeters help identify inefficiencies, leaks and tube damage

Summary

A gas to liquid plant in the Middle East converts natural gas into liquid hydrocarbons, which are then refined into finished products such as gasoil, kerosene, base oil, naphtha and paraffins for the petrochemical industry.

Heat exchangers (mostly shell-and-tube exchangers) are among the most critical pieces of equipment in this process, as it involves significant heat generation and recovery. Key Applications include:

- Feed gas preheating
- Syngas cooling and heat recovery
- Reactor temperature control
- Steam generation
- Product condensation and separation

Benefits:

- Ease of installation with no mechanical modification
- Ability to run a quick and effective survey on dozens of heat exchangers
- No process shutdown required for continuous operation
- Cost effective and accurate
- Capability to measure in complex pipe setup with acceptable accuracy
- Strong local support

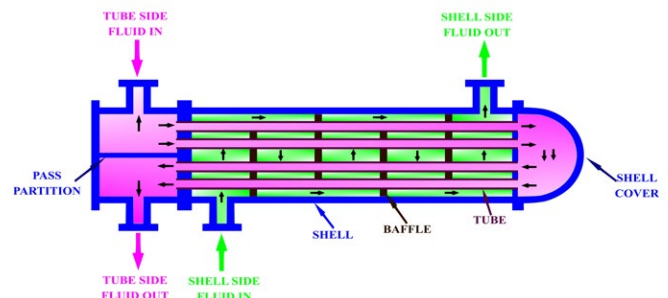


Fig. 1: Typical tube bundle heat exchanger used at site

Application

Medium:	Water
Pipe size and thickness:	4" & 6" sch. STD (DN100 and DN150 with 6.02 mm and 7.11 mm thickness)
Pipe material:	Carbon steel
Temperature:	5 – 30 °C (41 – 86°F)
Requested accuracy:	~2%

Challenges

The plant maintenance team needed to monitor the efficiency and capacity of heat exchangers as part of a transition to a more sustainable operating model. Predictive maintenance was also required to detect any tube bundle ruptures and prevent efficiency losses. In addition, the maintenance team suspected tube damage within the exchangers, along with possible cooling water leakage from shell to tube.

However, the absence of permanent flow measurement presented a major hurdle to reliability and continuous data collection. Compounding this, there were insufficient straight pipe runs available to achieve a fully developed flow profile, limiting the accuracy of flow measurements.

Solution

Panametrics worked closely with the plant management team to evaluate a suitable solution. A demonstration was conducted using the Transport PT900 ultrasonic clamp-on flowmeter with CRS402 1 MHz transducers at accessible locations on the cooling water inlets and outlets.

Despite the short straight pipe runs, the Panametrics Team identified an issue. A clear difference in the measured speed of sound was observed between the water inlet – which was as expected for water – and the water outlet, which showed higher values alongside a reduced flow rate. This contributed to tube damage and cooling water leakage, caused by air pockets and the presence of solid particles in the flow.

While the constrained pipe geometry meant flow rates accuracy was limited, the readings were repeatable, providing confidence in the findings. Importantly, the speed of sound measurements was not affected in the same way, offering reliable insights and supporting the case for maintenance work on the impacted heat exchanger.

The customer was delighted with the outcomes from the survey, with the findings helping to improve plant efficiency and performance. Following the success of the survey, the customer is now considering how Panametrics ultrasonic flow solutions can support other applications.



Fig. 2: Cooling water inlet of one heat exchanger with no straight runs



Fig. 3: Cooling water inlet from another heat exchanger with no straight runs