

Problem Statement/Title: Low cost non-intrusive solutions to measure steam flow and compressed air pressure

Desired Outcomes:

Non-intrusive low-cost methods to measure steam flow and compressed air pressure

Background of Problem:

Measurement and verification (M&V) process is critical to the evaluation of any energy efficiency project. However, the M&V process can be challenging for the existing stock of industrial manufacturing companies which do not have the necessary monitoring and metering devices installed in their facilities.

Currently, companies will need to stop their production operations to install steam flow meters.

To measure the pressure of compressed air systems, companies may need to do “hot-tapping”. However, companies do not permit “hot-tapping” as there are concerns that it will affect the quality of the compressed air that is supplied to their process machines.

In the absences of actual monitoring and metering, the actual energy performance improvement cannot be ascertained.

Hence, proposed solutions are required to help companies measure the aforementioned process parameters in a low cost, non-intrusive way and with reasonable uncertainty level.

Technical Requirements:

General Requirements

Proposers are to come out with two different solutions to each measure the steam flow and air pressure.

The proposed solutions for measuring steam flow and air pressure should meet the following general requirements.

1. Low maintenance and operational costs
2. Convenient installation
3. Small, lightweight, easy to deploy for measurement
4. Weatherproof, flameproof and explosion-proof*
5. Provides output of 4 – 20mA
6. Uncertainty of up to $\pm 2\%$ over full scale
7. Operating temperature limit of at least 55°C
8. Non-intrusive measurement

* Proposers should come out with two solutions: (i) designed for general purpose areas, and (ii) designed for weatherproof, flameproof and explosion-proof areas.

Specific Requirements

The proposed solution for measuring steam flow should meet the specific requirements below.

1. Has a turndown of at least 100:1

2. Able to measure wet steam, saturated steam and superheated steam
3. Does not require long straight pipe lengths to perform measurements
4. Able to measure a wide range of pipe sizes up to diameter of 0.5m (including insulation)
5. Able to measure on carbon steel piping material
6. Process temperature limit of at least up to 500°C
7. Pressure limit of at least up to 100 bar
8. Repeatability of up to $\pm 0.5\%$ of reading
9. Memory capacity to log at least 100,000 flow points if meter comes with in-built data storage capability
10. Meets the requirements stated in ISO 11631:1998, "Measurement of fluid flow – Methods of specifying flowmeter performance"

The proposed solution for measuring air pressure should meet the specific requirements below.

1. Measurement type: gauge and absolute
2. Process temperature limit of up to at least 100°C
3. Pressure limit of at least up to 20 barG
4. Not be adversely affected by vibrations
5. Able to measure on plastic hose and metal pipes

What solutions you are not interested in (if any)?

Intrusive and expensive analogue solutions which require companies to stop their operations or perform "hot-tapping".

Timeframe for development of proposed solution/product

1. Completion of working prototype for evaluation within 6 months from start of project
2. Provide reports and findings on data collated during trial phase
3. Completion of full functional end product ready for pilot deployment 12 months from start of project

Requirements of prototype

The prototype should minimally meet the technical requirements listed above for agency to make a decision on whether to award a contract for pilot procurement.

Market Potential for proposed solution/product

The proposed solutions may be adopted by Energy Services Companies and majority of the industrial companies which use steam and compressed air in their operations.