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WHITE PAPER

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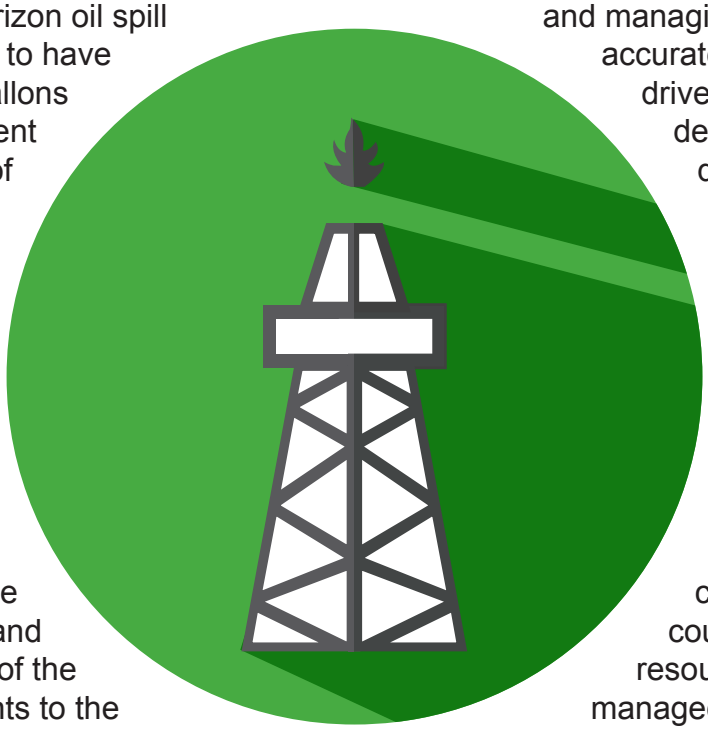
How big are your flares?

Accurate measurement is critical to safety and profitability in the oil & gas industry. Adam Chapman outlines some of the key considerations for industry parties in ensuring that monitoring and measurement is accurate, effective and meaningful.

The Deepwater Horizon oil spill of 2010 is estimated to have released 210 million gallons of oil into the environment around the Gulf of Mexico. The cost of the tragedy was measured in human lives, environmental damage, broken businesses and reputational disaster, aside from the billions in compensation paid.

Oil exploration can be a risky business and reducing risk is one of the most critical elements to the industry. Central to understanding and managing risk is access to accurate information, which drives better business decisions, as BP discovered during a tortuous three months in 2010.



Accurate information in the oil & gas industry is driven by measurement technology. In an industry where explosive and highly combustible (and of course extremely valuable) resources are being managed, accuracy takes on a completely new level of importance.

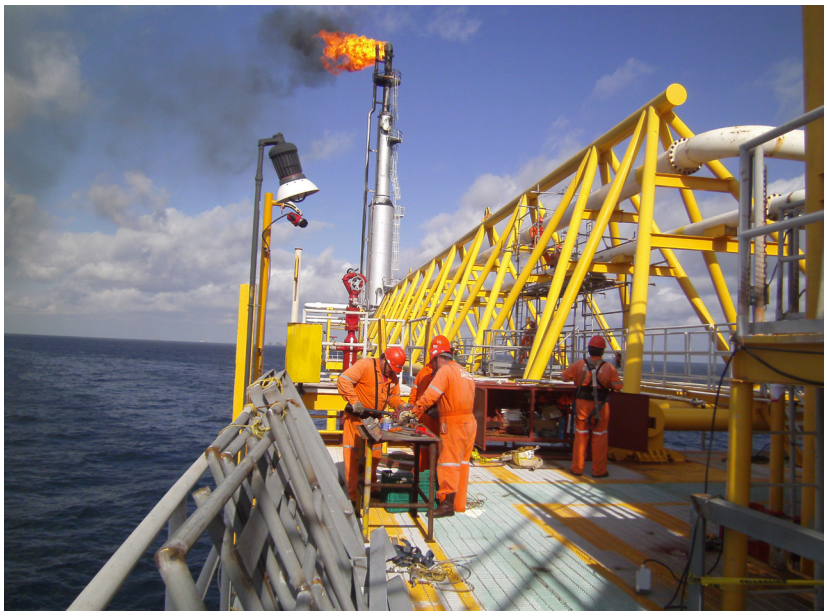
The difference between delivering success 99.9 per cent of the time and 99.999 per cent of the time may not be important in many industries but for oil and gas that difference could be a matter of life and death.

An example: flare gas measurement
Take one single example. In many parts of the world gas that is extracted with oil is flared. There may be many reasons for the seemingly insane process of burning a valuable and rare fossil fuel. These include the inability to store the gas locally or the risk associated with storing gas at too high a pressure. What is certain is that burning the gas – though still not great – is better environmentally than simply venting it. What is also needed is the ability to accurately measure how much gas is being flared.

Why is the volume important?
Flaring gas is subject to regulation in many parts of the world. In the US the Environmental Protection Agency regulates this area whilst the 2008 Climate Change Act in the UK also sets out a framework for North Sea Oil. Penalties, taxes and fines for flaring are commonplace around the globe and flaring itself is an issue that is being addressed by the European Union, the United Nations and the World Bank. Even the leading oil companies have committed to reducing or virtually eliminating flaring, hardly surprising considering that more than 300 million tonnes of carbon dioxide are estimated to be created by flaring every year.

How to measure accurately?
Where taxes are imposed accurate measurement is intrinsically required to demonstrate both good practice and accurate payment. Accuracy provides reassurance that a business is not paying more in dues than needed but also demonstrates compliance with regulation.

There are a number of considerations around accurate measurement. It goes without saying that measurement tools need to be reliable in some of the most extreme environments on earth, where exposure to temperature and environmental conditions cannot impact accuracy. Reliability is also critical as servicing equipment in the middle of the sea can be expensive. Measurement tools cannot impact safety requirements, which is more of a challenge than it sounds when you are measuring resistance to force without creating heat!


Fluenta Service Engineers working offshore

Another consideration is the turndown ratio of equipment. The turndown ratio indicates the range of flow that a meter is able to measure with acceptable accuracy. If, for example, gas flow varies from 100,000m^3 per day to 1,000,000m^3 per day, a meter would require a turndown ratio of at least 10 to be accurate in such an environment.

There are four primary technologies around gas measurement:
Differential pressure (DP) devices: These devices were used in the earliest 66 days of flow measurement and are often deployed for transmission and distribution of gas. DP devices have a limited turndown ratio and often need a

long, straight line of piping to be effective. That piping, and the space it requires, is expensive.

Thermal mass measurement: These meters use two sensors to determine flow rate: one of the sensors is constantly heated and flow is measured by monitoring the cooling effects of gas on the temperature of the sensor – the faster the flow, the cooler the sensor will become. With turndown ratios of up to 600, these meters are suitable for the unpredictable nature of flare measurement but require constant correction when gas composition changes.

> In oil and gas, the difference between delivering success 99.9% or 99.99% of the time can be a matter of life and death.

Photo/optical technology: This method of measurement uses particles in the gas stream to reflect laser beams. The volume and velocity of gas is proportionate to the time it takes particles to travel between the laser beams. With a turndown ratio of 1500, this method of measurement is flexible enough for flow monitoring but it does not work with clean gas (where there are few or no particles) and is susceptible to degradation caused by moisture and condensation meaning there are high maintenance costs.

Ultrasonic: The most reliable measurement tool for gas is ultrasonic. This method measures the time it takes for ultrasonic waves to travel across a pipe both upstream and downstream. The difference between these two values provides accurate measurement of flow. Ultrasonic measurement is not impacted by the composition or cleanliness of gas and with no mechanical parts within the line, maintenance and support requirements are low while safety is increased (nothing impeding the flow of gas in a high velocity flaring event). Finally, ultrasonic technology has the highest level of turndown ratios at 3000.

Increasing regulation, increasing accuracy, increasing profitability

With increasing global regulation around the emission of flare gas, accurate information will become more important to the industry. Indeed there is already a body of opinion that believes that the current industry standard or +/- 5 per cent accuracy is too high and should be reduced. The industry should not shy away from this but embrace it. A global and industry-wide commitment to the reduction of flaring is critical to ensuring that limited natural resources are used optimally and that profits are maximised. Accurate measurement is a cornerstone of this. After all, it might as well be dollars that are being burned.

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