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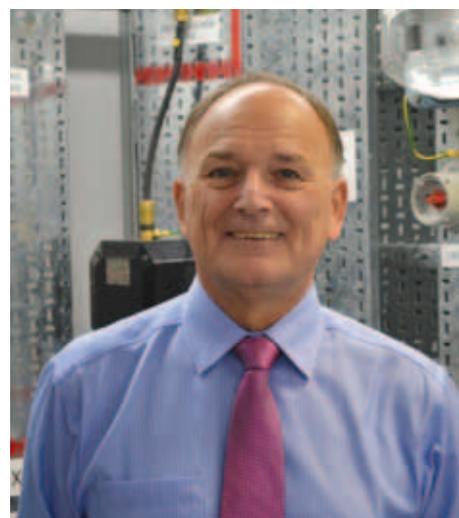
## CompEx training We're open for business!

At Endress+Hauser, we pride ourselves on being process safety experts. We know that true process safety depends on having the right measurement technology applied to the right application and used in the right way. To support this, we offer a range of training to pass on our expertise to managers, engineers and technicians who work in the process industries.

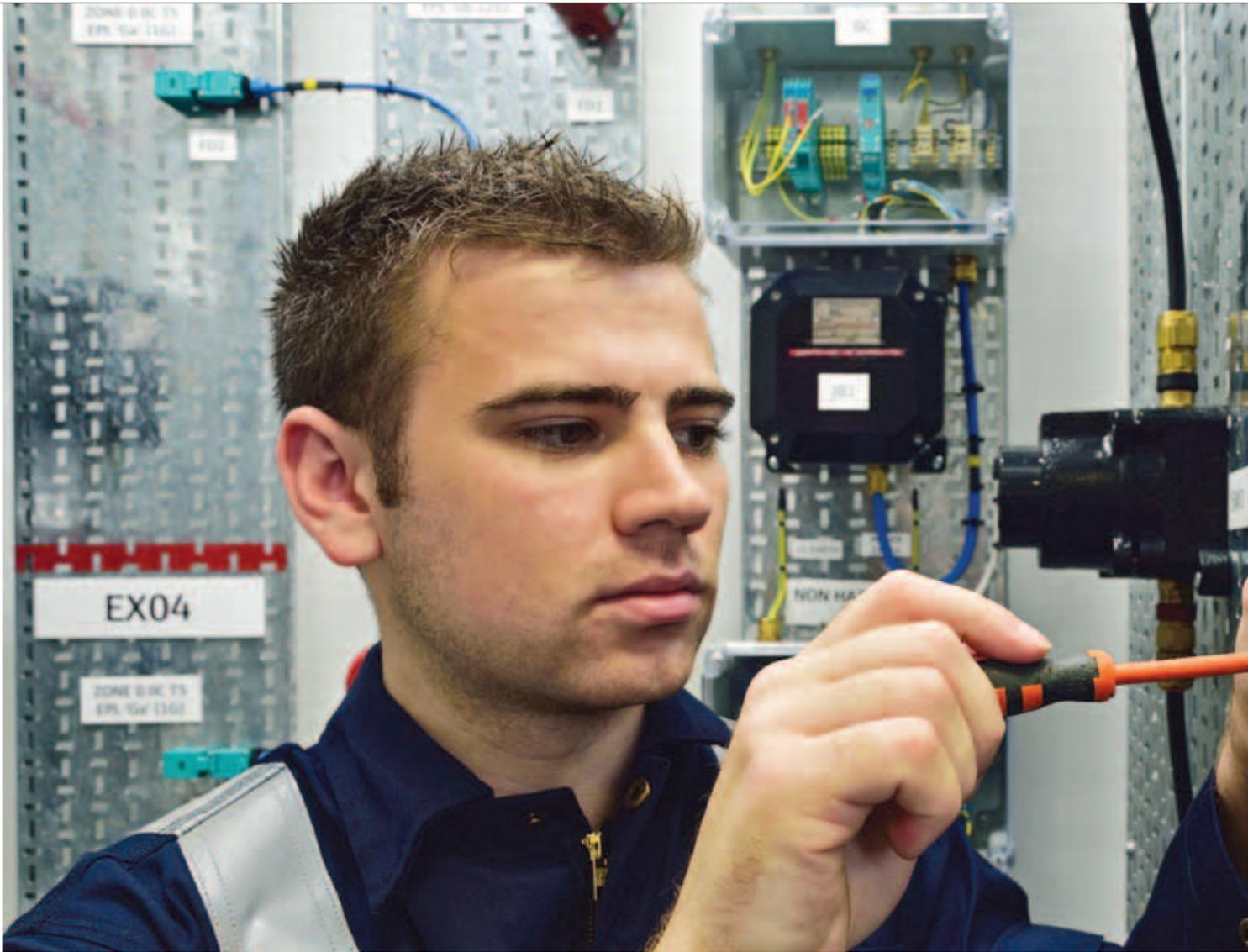
We're very proud to be one of very few process instrument suppliers in the UK with the facilities to offer CompEx training. CompEx is the global solution for validating the core competency of craftpersons working in explosive atmospheres, established in the wake of the Piper Alpha disaster. Based on IEC standards, primarily IEC 60079, parts 10, 14 and 17, the portfolio of practical assessments, theory and examination in the CompEx modules EX01 to EX04 ensures candidates have the knowledge to safely install, inspect and maintain equipment. Successful candidates will receive certification to validate that they are competent to work in explosive atmospheres.

Please get in touch if you'd like more information about CompEx training or any of the other courses we offer at our training centre in Manchester.

Peter Barlow  
Consultant to the Services Process



➔ For more information on our CompEx training, see pages 4-5.



## Get yourself CompEx competent!

Endress+Hauser now has the facilities and accreditation to deliver CompEx training at its state-of-the-art training centre in Manchester.

**Safety as a top priority** On 6 July 1988 a series of explosions ripped through the Piper Alpha oil rig platform in the North Sea. In the space of two hours, 167 people lost their lives. It remains the world's worst offshore oil disaster. Since that fateful day, the safety of oil rigs and their workforces has been a top priority.

A report into the disaster produced more than 100 recommendations, including that employers shall ensure the competency of their workers. As a result, the CompEx scheme was born to provide high-quality safety training for personnel who are required to work in explosive atmospheres.

CompEx has since become the industry standard for the oil & gas and chemical industries to protect both workers and capital assets. It's also relevant to a whole host of industries including life sciences, food & beverage, distilleries, paint spraying plants, flour mills, woodworking machine plants, power plants and the water industry - indeed anywhere failure to ensure safe working practices could result in the ignition of explosive gases or dust clouds leading to injury or fatalities. As a result, nearly 50,000 candidates have registered for the scheme worldwide.

**New CompEx centre** Now Endress+Hauser has invested in a CompEx centre, incorporating both



### **i** What does CompEx cover?

- General principles: flammable limits - upper explosive limit (UEL)/lower explosive limit (LEL), flashpoint, ignition temperature, relative density, area classification to BS EN 60079, gas grouping, temperature classification and ingress protection.
- Standards, certification and marking, EU Directives 2514/34/EU and ATEX 137, equipment categories and equipment protection levels (EPL).
- Internationally recognised ATEX methods of protection and safety.
- Combined (hybrid) methods of protection.
- Selection and installation of equipment to BS EN 60079-14 including wiring systems, cables, cable glands and cable gland accessories.
- Inspection of equipment to BS EN 60079-17.
- Introduction to competence validation testing.
- Permit to work system and safe isolation.

classroom and hands-on facilities, to offer this training at our base in Manchester. The new facility has been awarded an accreditation certificate by JTL, the UKAS-accredited company that operates the CompEx scheme. From here we offer the first four CompEx units (EX 01 to EX 04) that cover preparation, isolation, inspection and maintenance of equipment in explosive hazardous areas.

The five-day course with classroom and practical hands-on training is designed to challenge candidates and provide a basic set of skills to establish a recognised level of competency for people working in hazardous environments. Successful candidates will be awarded a credit card-style proof of competency, evidencing their ability to work safely in explosive atmospheres. And as candidates are required to update their accreditation every five years, we also offer a two-day refresher course aimed at those who have previously undertaken the main CompEx course.

The CompEx scheme is the latest addition to our training portfolio that includes SIL and ATEX courses, all delivered at our state-of-the-art training centre.

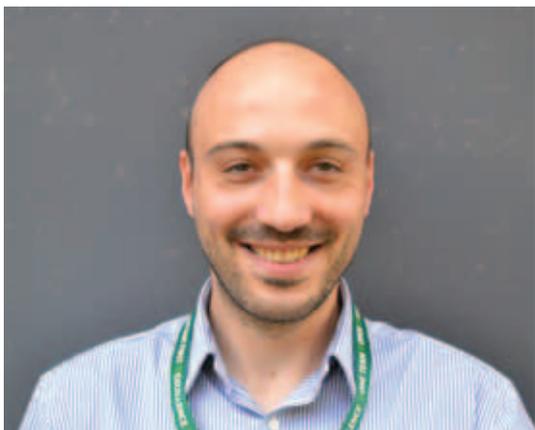


**Mo** For more information on CompEx training, please call 0161 286 5000



## 'Britain's Greenest Hospital' reaps benefits of RHI

University Hospital of South Manchester NHS Foundation Trust (UHSM) is a major acute teaching hospital trust providing services for adults and children at Wythenshawe Hospital and Withington Community Hospital, as well as community services. As a major University Teaching Hospital, UHSM provides many specialist services for patients across Greater Manchester and beyond. Wythenshawe was the first NHS hospital to install biomass boilers; their capacity to reduce carbon emissions by 3,400 tonnes each year is one of the reasons why UHSM has staked a claim to the title 'Britain's Greenest Hospital'.



“When Wes came to site he was much more proactive in working out what it was we needed and not just what he could sell me - it was a breath of fresh air.”

Mark Foden, Energy and Environment Manager, UHSM

**The challenge** In 2010, in an effort to reduce carbon emissions and improve sustainability, UHSM’s Wythenshawe Hospital replaced a 4.2 MW gas boiler with two 2.2 MW capacity biomass boilers. The boilers burn 20 tonnes of wood chip a day, all sustainably sourced from within a 60-mile radius of the hospital. Utilising biomass allowed the hospital to reduce its carbon emissions in line with the Carbon Reduction Commitment (since replaced by the CRC Energy Efficiency Scheme), a mandatory carbon emissions reduction scheme for large energy-intensive organisations in the public and private sectors.

The installation of the biomass boilers was prompted by the introduction of the Renewable Heat Incentive (RHI). Officially launched in November 2011 by the UK’s gas and electricity regulator Ofgem, the RHI aims to further encourage

businesses and public sector organisations to generate heat from renewable technologies. The RHI pays participants of the scheme for generating renewable heat and using it in their buildings and processes. But proving that your organisation meets the requirements of the RHI can be difficult, as eligible heat output has to be determined and verified. “We’ve got quite a complicated site that has developed over the last 100 years or so, resulting in a whole maze of steam pipework delivering heat,” explains UHSM’s Energy and Environment Manager, Mark Foden. “After our eligibility for the scheme was confirmed I spoke to quite a few people to try to determine how to meet the RHI requirements but nobody could give me a definitive answer or really much support. They all just wanted to sell me their meters and lots of them – but they couldn’t necessarily demonstrate how that would meet Ofgem’s requirements and release the payments.”



RHI-compliant steam metering system in the boilerhouse basement comprising Prowirl vortex flowmeters, pressure transmitters and RS33 heat calculators.



RHI-compliant condensate metering system comprising Promag electromagnetic flowmeters, matched pair of temperature sensors and MID-approved RH33 heat calculators (shown below).

**The solution** Two main criteria have to be fulfilled in order to successfully gain RHI accreditation and receive tariff payments for steam boilers. The first is that eligible heat output has to be determined using RHI-compliant metering. Secondly, applicants need to commission an Independent Report on Metering Arrangements (IRMA) in order to verify to Ofgem that they have eligible metering arrangements in place, such as appropriately located and installed meters. Endress+Hauser was able to carry out this consultancy on UHSM's behalf, even accompanying them to a meeting with Ofgem to make their case for accreditation. "Endress+Hauser's Energy Efficiency Manager, Wes Allen, and I put in a lot of work ahead of that meeting," explains Mark Foden. "When Wes came to site he was much more proactive in working out what it was we needed and not just what he could sell me - it was a breath of fresh air."

Endress+Hauser helped UHSM develop a plan to locate and install the necessary metering, including five RHI-compliant steam heat metering systems and three condensate heat metering systems. A series of controlled shutdowns took place on Friday and Saturday nights to clear asbestos from the steam pipework with minimal disruption to patients and hospital staff. After all the work was completed, UHSM was awarded RHI accreditation in February 2015.

Endress+Hauser also supplied a data collection panel and a cloud-based data management software solution that tracks eligible heat output every 15 minutes, removing the need for monthly or quarterly manual readings. Automatic loss of data alarms can also generate warnings of possible equipment fault. "It's really important for us to be able to see what proportion of our heat is being supplied by biomass," confirms Mark Foden. "The software helps me demonstrate how we can increase efficiency and predict payments."



RHI-compliant RH33 heat calculators.

“The guidance, advice and support from Endress+Hauser was instrumental in the success of this scheme.”

Mark Foden, Energy and Environment Manager, UHSM

**The benefits** As well as the obvious benefits to the environment, receiving payments from the RHI scheme has had a huge financial impact for the hospital; it's expected that over a 20-year period the subsidy will be worth in excess of £6 million for the Trust, which will be reinvested. The hospital is now receiving 2p/kWh produced, after the government doubled the tariff for large-scale biomass in April 2014. It now plans to add woodchip biomass consumption and gas meters to the data collection and reporting solution to monitor the cost of steam to

individual buildings and parts of the hospital. Fuel cost analysis and comparisons can be then be determined for woodchip and natural gas fuels. Endress+Hauser is also helping UHSM to determine the fuel economy and fuel-to-steam efficiency of the biomass boilers by adding additional parameters to the data collection system. “The guidance, advice and support from Endress+Hauser was instrumental in the success of this scheme,” says Mark Foden. “Their knowledge of the RHI scheme and how to interpret the regulations made the whole process much more straightforward.”



For more information on the RHI, call us on 0161 286 5000



One of two 2.2 MW capacity biomass boilers supplying renewable heat to UHSM.

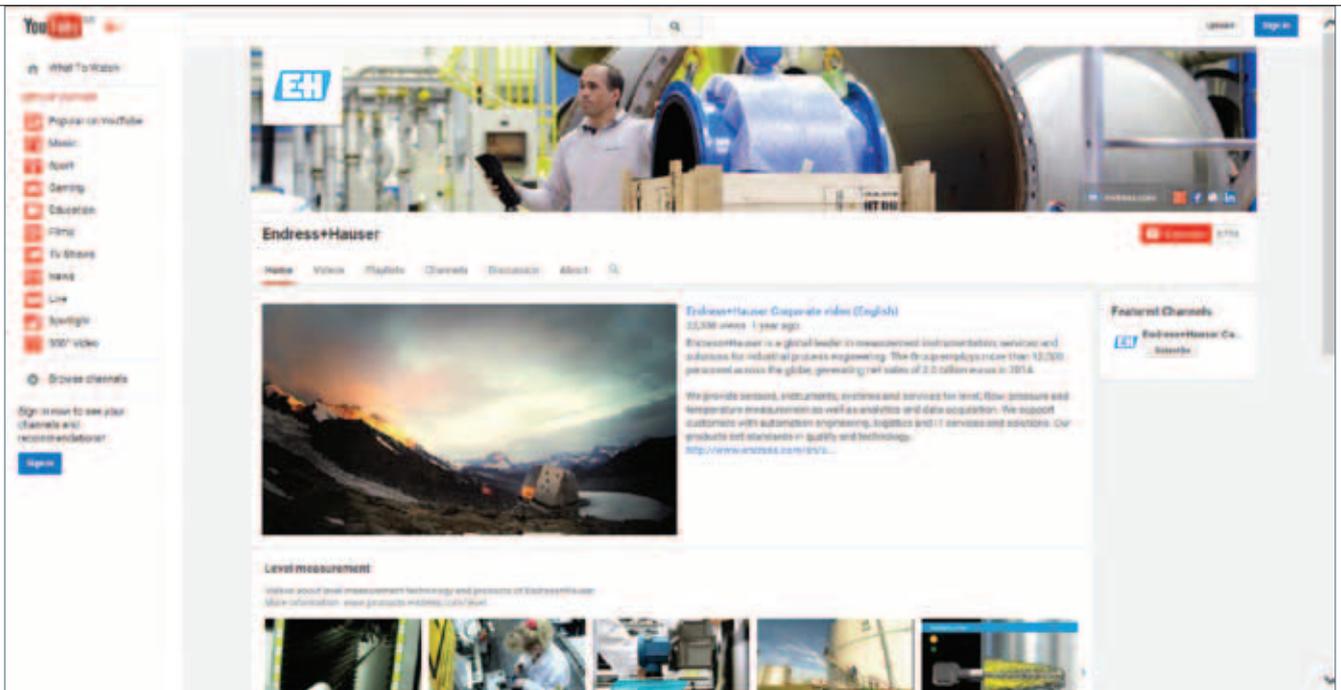


## Quality calibration that won't break the bank!

Keeping your instruments from drifting is key to maintaining the optimum quality and plant yield. Regular calibration helps to keep your instruments at their best and ensure you dose, measure or store just the right amount. However, we know that you need quality calibration at a price that won't blow your budget. That's why we're offering you the chance to put us to the test with our fantastic price offer.

For a limited period, we're offering calibration of any flowmeter for just £149 with a fast 5-day turnaround! Simply call 0161 286 5150 and quote **'CAL149'** to book your flowmeter in.

As soon as calibration is complete, we'll email you the certificate and get your meter returned to you ASAP. Offer ends 18 December 2015. Terms and conditions apply: please visit [www.uk.endress.com/cal149](http://www.uk.endress.com/cal149)



# Find us on YouTube!

Need some information on a particular technology? Perhaps you want to know how to get the most out of our Online Shop? You might even simply be interested in our company in general? All this information and more can be found on our YouTube channel!

**Subscribe to the Endress+Hauser channel** Our Endress+Hauser channel on YouTube is home to a wealth of company, product and solution information.

Keep up to date with all the latest video releases from Endress+Hauser. There's a range of videos showcasing the technologies we employ to provide accurate and reliable measurement across level, pressure, flow, temperature and liquid and gas analysis.

For those looking for some immediate practical help, there's also a range of technical support videos to answer an array of queries regarding how to operate our devices or find a quick fix to a problem e.g. how to set up empty pipe detection on a Promass 83 Coriolis flowmeter or the basic set-up of a Micropilot radar level device. It's all there in one place on our dedicated channel... so take a look!



See us in action on YouTube!

[www.youtube.com/EndressHauserAG](http://www.youtube.com/EndressHauserAG)



Technical support: setting up empty pipe detection on a Promass flowmeter.

# An effective way to meter steam

Steam is used in a variety of applications including power transfer, cleaning, sterilising and heating. It's important to keep track of how much steam is being used, both for billing purposes and energy monitoring. Steam quality is also a key parameter to monitor as it can have an impact on efficiency and operating costs. Endress+Hauser's Prowirl F 200 vortex flowmeter has been developed to address the traditional problems associated with metering steam.



## **i** Prowirl F 200 vortex flowmeter

The Prowirl F vortex flowmeter is the first choice in heavy duty applications. The proven and patented differential switch capacitance (DSC) sensor ensures high precision measured values even under the toughest process conditions. Prowirl F 200 offers wet steam detection and industry-compliant two-wire technology for seamless integration into existing infrastructures and control systems, as well as high operational safety in hazardous areas thanks to an intrinsically safe design and simple installation.

- Integrated verification – Heartbeat Technology.
- High availability – proven robustness, resistance to vibrations, temperature shocks and water hammer.
- Highest process safety – dualsens version enables redundant measurement
- Safe operation – no need to open the device due to display with touch control and background lighting.



**What does 'steam quality' mean?** Steam quality refers to the percentage mass of the steam/condensate mix that is saturated steam. Steam with a quality of 80% means that 20% of the total mass is made up of condensate. As the condensate has a much higher density than the steam, even a small amount of condensate can mean a significantly lower steam quality. Steam quality can also be described as a dryness fraction which is expressed as a decimal rather than percentage, for example 0.8 instead of 80%.

**Why is it important?** The wetter the steam, the less enthalpy (useful heat) it has to transfer to the process. This means reduced efficiency and, as a result, higher operating costs. When calculating the mass flow or energy content of steam, it is often assumed that the steam is completely saturated i.e. 100% dry saturated steam. However, this is very rarely the case in steam applications and steam is usually either wet or superheated.

Even more crucially, there is a safety aspect to measuring steam quality. Water hammer can occur when the condensate from the wet steam is carried along the pipe at very high velocities. This can damage or even destroy pipework when the fast-moving condensate impacts against bends or fittings in the pipe.

#### **How can I measure steam quality in my process?**

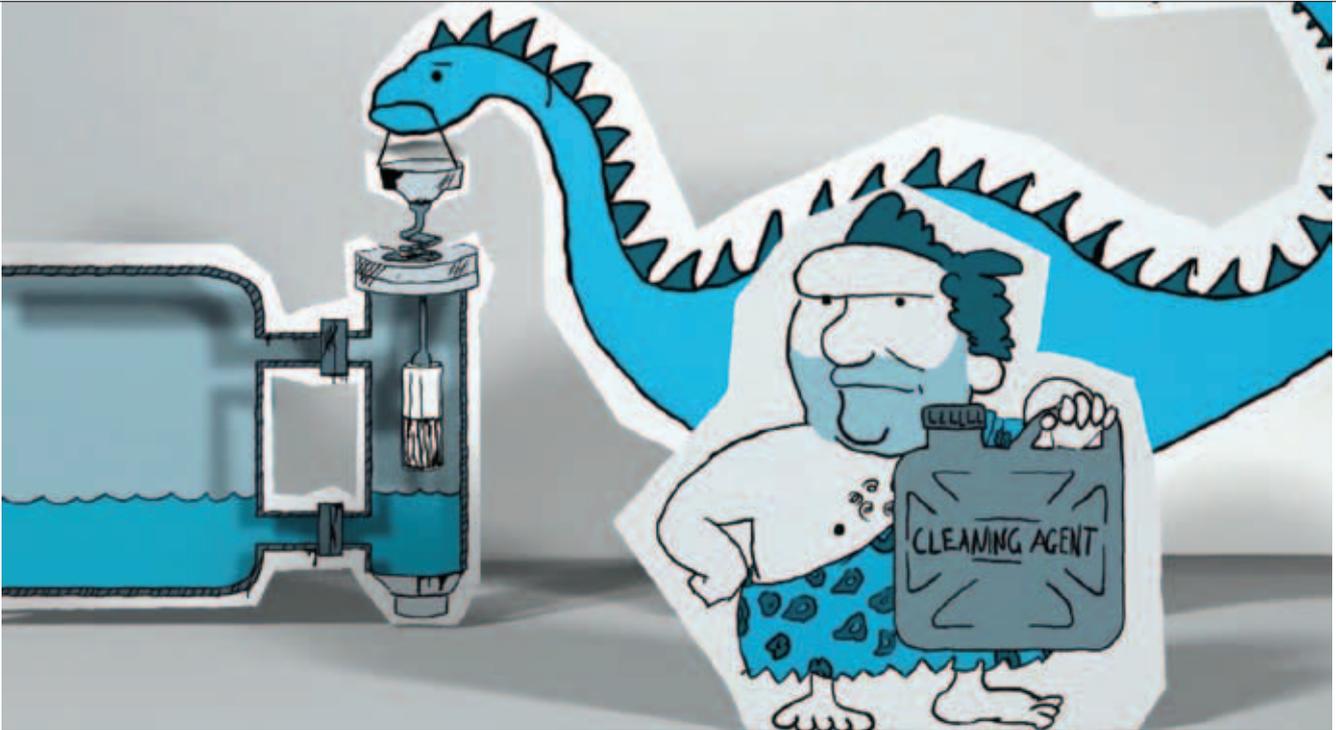
Until recently, this has been a notoriously difficult task. Boiler manufacturers sometimes offer a steam quality value, typically between 95% and 100%. However, this is usually measured at the optimum point of the boiler – the crown valve. As soon as the steam leaves the boiler, it cools down as it travels through pipes and fittings, giving rise to wet steam.

For line sizes up to 4", Endress+Hauser's new Prowirl F 200 vortex flowmeter can be equipped with wet steam measurement to determine the steam quality, offering improved safety and accuracy. This inline measurement is available as an output and does not require any additional equipment.

**How can I improve my steam quality?** To improve the steam quality, it is important to ensure the boiler is operating efficiently. The pipes must be lagged or heat traced to minimise any heat loss and any leaks should be sealed. It is also essential to install and maintain condensate traps. This will not only reduce the risk of water hammer but also prevents the condensate from further cooling the steam.



More information: [www.uk.endress.com/7F2B](http://www.uk.endress.com/7F2B)



## Don't get stuck in the Stone Age!

If you're thinking about upgrading your plant, we'll show you how we can save you time and money! Traditional mechanical flow and level transmitters have been superseded by modern transmitters with no moving parts for the majority of applications. Guided wave radar level transmitters, vibronic level switches and the array of modern flow technologies on offer from Endress+Hauser have a number of significant advantages both on new installations and as a direct replacement for equipment on your existing plant, reducing costs while increasing safety.



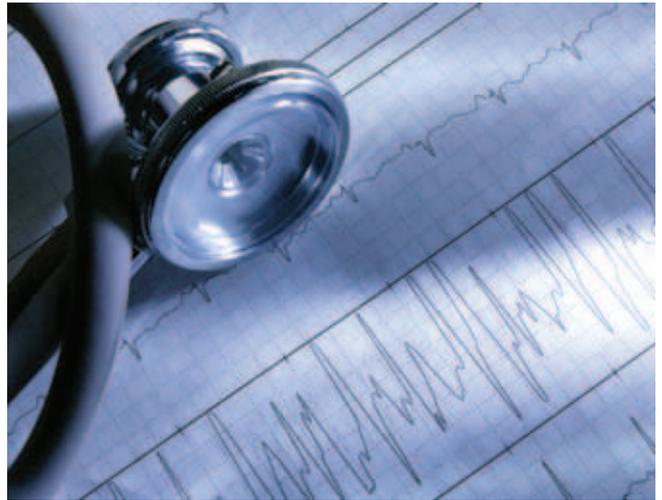
**Time to replace your old turbine, PD and dp flowmeters?** Modern flow technologies offer huge benefits over older mechanical devices, not only from reduced maintenance costs and increased safety but also by providing much more process data to allow more efficient running of your plant.

For example, Coriolis meters provide up to 10 process measurements, including mass flow, volume flow, temperature, viscosity, density and concentration. Endress+Hauser also supplies vortex, electromagnetic, ultrasonic and thermal flowmeters for almost any application.

Promass F 200 (left): offers up to 10 different process measurements!

**Diagnosis in a heartbeat** With the introduction of Heartbeat Technology on our latest range of flowmeters, you're able to maximise yield and productivity. Heartbeat Technology offers a continuous healthcheck of your flowmeters ensuring key parameters are performing within specification at all times. Deviation from the reference values will trigger warnings as per NAMUR NE 107.

As an additional feature, verification and monitoring can be added to the diagnostics to provide trend analysis, live quantitative performance data and on-demand reporting. The verification enables documented proof that the flowmeter is functional and can be used as part of the proof testing procedure for SIL instruments.



**Modern level transmitters to replace mechanical devices** Traditional displacer level transmitters and float switches have been superseded by guided wave radar devices for a majority of level measurement applications. While the concept of a displacer or float is simple, the moving parts they rely on make them subject to the same issues that affect all mechanical systems, thereby reducing reliability. Fitting modern level transmitters that have no moving parts gives increased confidence in the measurement by removing the most common causes of failure.

With all the production, maintenance and safety improvements to be gained from upgrading your installed base, isn't it time to upgrade?

Levelflex FMP5x guided radar range offers reliable continuous level monitoring in a wide range of applications.



Micropilot FMR5x radar range offers outstanding accuracy and performance for reliable continuous level monitoring.



There are a number of videos on our measurement products and technology on the Endress+Hauser YouTube channel: [www.youtube.com/EndressHauser](http://www.youtube.com/EndressHauser)

# Cost control in the \$50 barrel world

In a world of falling global oil prices and sharp reductions in profits, operators are examining every area of business in order to reduce costs. Attention has turned to operating expenditure, which inevitably means managing device obsolescence, criticality and standardisation.

**CRINE** The current low price of oil being experienced by the UK oil & gas industry is a regular cyclic occurrence. It was a similar situation in the early 1990s that initiated the CRINE (Cost Reduction in New Era) initiative with the objective of reducing costs by 30% and helping to simplify the industry's procedures. North Sea operations have experienced increasing costs over many years, to the point that several operators are now facing the fact that over half of their assets are operating at a standard cost that exceeds the current \$50 per barrel. Having delayed or cancelled capital expenditure and reduced headcount, operators are now attempting to reduce operating costs wherever possible.

Plants designed during the initial CRINE period are now reaching the end of their design life and operators are facing the difficult task of

maintaining production with increasingly obsolete equipment. For this reason, several oil & gas operators have recently engaged Endress+Hauser to help with lifecycle extension projects.

**Criticality and standardisation** Plants designed and installed under CRINE frequently suffer from a lack of standardisation. Package plant and skids were generally procured from multiple sources under lowest cost terms, which lead to operators having to maintain instruments from a very wide variety of suppliers, many of which are no longer in business. Endress+Hauser engineers initially worked with operations teams to understand the criticality of these package plants in order to prioritise and minimise any instrument replacements. This involved taking time to understand the individual processes and the cost impact of unscheduled downtime – key metrics used to determine the Overall Equipment Effectiveness of a process line. The plants in question





Above left and right: Highlights the difficulty of determining replacements with worn-out nameplates.

have several thousand instruments, many of which are powered pneumatically, with the associated high costs of providing instrument compressed air.

Endress+Hauser engineers, operating in multiple teams, used Web-enabled Asset Management (W@M) tools to gather information about the installed base in a structured manner, as well as critical installation information; replacing an instrument is rarely a flange-to-flange exercise, it often involves changes to local pipework, mounting brackets and wiring. In an ideal world this information would be readily available in a computerised maintenance management system (CMMS). However, in reality, this is rarely the case and the situation is compounded by the installed instruments not matching the original piping and instrumentation drawings or process information sheets.

Detailed information relating to over 26 million Endress+Hauser instruments is immediately available in W@M. However, detective skills are often at a premium when trying to determine the exact replacement for a 30-year-old instrument with a corroded nameplate. Should information be available from the CMMS, this can be exported into W@M directly. However, our engineers found numerous inconsistencies between the CMMS system and the 'as installed' situation.

The output from the installed base audit can be used in many ways. Firstly, plant criticality is mapped with instrument obsolescence to help prioritise the order of instrument replacement. An added benefit of this approach is that replacing some obsolete instruments in critical process areas will often release spares for similar instruments in non-critical areas. This sounds counterintuitive when trying to improve standardisation of instrumentation, but the cost benefits of standardisation are often only truly realised over the

medium term, and in the current economic climate short-term expenditure needs to be minimised. However, even in non-critical process areas the true cost of replacing or repairing an obsolete instrument is dominated by labour overheads. Consider what happens when an instrument fails: a modern Endress+Hauser equivalent has the benefit of common electronic modules across a wide range of instruments, with reduced capital cost of parts sitting in stores. Our HistoROM data management system can be used to load the process setup information from one instrument into its replacement, avoiding the costly exercise of decommissioning the instrument from the control system, physically replacing it, downloading the configuration and then recommissioning the instrument at the control system. Installation, calibration and all associated documents and drawings are immediately available in W@M. Standardising on Endress+Hauser instruments also helps minimise instrument driver compatibility issues which occur when trying to replace obsolete instruments connected to modern control systems.

Having a clear picture of your installed base is a vital first step when looking to cut operating costs. But it needn't be a time-consuming or labour-intensive process. With Endress+Hauser as your partner you will start to reap the rewards of good asset information including preventing unscheduled downtime, reducing device expenditure and lowering routine maintenance costs. In a \$50 barrel world, can you afford not to?



For more information on how Endress+Hauser can help you with issues surrounding criticality, obsolescence and standardisation, contact us on 0161 286 5050.



## How to get the most from your vortex flowmeter

Vortex technology is one of the most commonly used flowmeter principles that measures steam, gas and liquids by volume. As with any technology, the fluid viscosity, flow rate and pipe size have an impact on the flowmeter's ability to perform correctly and accurately. Therefore it is important to understand exactly how the vortex principle works in order to be able to counter any problems.

Vortex flowmeters have a bluff body mounted in the middle of the pipe, causing an obstruction that disturbs the flow. As the fluid being measured flows past the bluff body, alternate vortices form on either side. These vortices create areas of low pressure downstream of the bluff body - a phenomenon known as the Karman vortex street. The frequency of the passing vortices are registered by an integrated sensor within the flowmeter tube and used to calculate the flow.

To ensure fully developed and regular vortices are produced, a minimum flow velocity is required. This velocity is dependent on the density and viscosity

of the fluid being measured as well as the pipe diameter, and is described by the Reynolds number. For a typical vortex flowmeter, a minimum Reynolds number (Re) of 20,000 is required. Whilst this minimum value ensures a repeatable measurement, the accuracy is not optimum - a Reynolds number of approximately 30,000 or more is generally required to achieve optimum performance. In order to improve this, our Prowirl F 200 vortex flowmeter has increased sensitivity, improving flow measurement and accuracy with a Reynolds numbers as low as Re 20,000 - a significant benefit to processes with lower flow rates.

In addition to the Reynolds number, it is also important to ensure the flow profile is fully formed to represent the whole cross-section of the pipe. This requires sufficient straight pipe lengths upstream of the meter or a flow conditioning plate installed after major disturbances, such as elbows, reducers or valves, allowing the flow profile to reform. However, in tight installations, the Prowirl F 200 is able to electronically compensate for certain pipe disturbances, reducing the straight pipe length required and thereby saving time, effort and money!

The ability of a vortex flowmeter to measure flow is totally dependent upon the ability to produce vortices around the bluff body. A flow that is too low to produce regular and consistent vortices will cause the vortex flowmeter to stall and be unable to provide a flow measurement. This is important when you consider that approximately 70% of vortex flowmeters in use today are oversized due to reasons that include the overestimation of the required flow rate, the need to conform to existing pipe installations, downsizing of steam generating capacity or reduced flow requirements. All of these factors result in a lower than ideal flow velocity, reducing the Reynolds number and the ability of the bluff body to produce distinct vortices. This creates impaired measurement, unacceptable measurement errors and, in some instances, leaves the meter unable to measure the flow.



Prowirl R 200 vortex flowmeter with a reduced internal bore.

To combat such issues, Endress+Hauser developed the Prowirl R 200 vortex flowmeter with a reduced internal bore (diameter). The reduced internal bore increases the flow velocity through the meter allowing it to deliver a reliable flow measurement at lower flow rates - a measurement that may not have been possible with a full-sized flowmeter. However, due to the reduced bore, it is important to check that the maximum flow rate can also be achieved.

As always with flowmeter sizing, consideration should be given to the pressure loss due to the installation. Significant pressure loss can create additional problems, particularly for steam applications where the quality of the steam is an important factor for the end product quality. (See page 12 on metering steam for further information.)

Our Applicator sizing tool is designed to help you to account for these process and plant changes. Available online, Applicator allows you to manipulate the process variables such as pressure, temperature, viscosity and flowmeter style and size. It will then calculate the Reynolds number, the flow measurement accuracy, the potential lowest flow rate achievable and the pressure losses due to the flowmeter type and size, guiding you to the right choice for your particular installation. It's that easy to get it right!



Access our free Applicator tool:  
[www.uk.endress.com/applicator](http://www.uk.endress.com/applicator)



Applicator: The easy-to-use tool for saturated steam flowmeter sizing.



UK

Endress+Hauser Ltd  
Floats Road  
Manchester  
M23 9NF  
Tel: 0161 286 5000  
Fax: 0161 998 1841  
info@uk.endress.com  
www.uk.endress.com

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