

POSITIONING FOR THE FUTURE OF **MIDSTREAM OIL & GAS**



RESPONDING

TO DYNAMIC BUSINESS CONDITIONS

In June of 2008, the value of a barrel oil crude WTI reached an all-time high of \$151.72.¹ In 2014, the price dropped to \$40, thanks to the massive surge in shale oil production. Profits fell accordingly and painful yet necessary cuts to exploration, asset investment and personnel were made through the industry.



Recent trends indicate that the cycle is turning in a positive direction. Today, a barrel of oil has stabilized at approximately \$50, encouraging a ramp-up in production. According to the Wall Street Journal, “Many larger oil companies are close to generating enough cash to pay for dividends and new investment. That’s an inflection point that has been closely watched as a barometer for market turnaround.”²

In addition, the drive for profitability at this low price-point leads energy companies to examine operating costs and process inefficiencies in every industry segment. For midstream enterprises, the need for more reliable, safer and higher capacity transportation systems for both gas and liquid energy products is greater than ever before.

Positioning for Today, Tomorrow and the Years Ahead

While massive dips in oil and gas prices are tough on everyone involved, low prices create an urgency to get smarter in production and movement processes. In midstream, that means shifting to technologies that offer new benefits which traditionally haven’t been considered necessary.

In this Trend Report, we’ll point to opportunities for coping with increasing traffic and achieving greater efficiencies in existing as well as future energy projects. We’ll offer technology guidance as well as examples of how Emerson, Daniel, Roxar, and Rosemount solutions can help your company overcome these well-known industry challenges:

- Increase output
- Increasing fiscal measurement accuracy
- Protecting assets
- Reducing cost of ownership
- Improving pipeline leak detection and Loss And Unaccounted For (LAUF)
- Managing regulatory compliance
- Maximizing capacity, throughput and revenue
- Detection of performance degradation and foresight of compromised operations

Midstream enterprises that successfully improve custody data, preserve asset integrity, streamline compliance and minimize losses in transfer will realize the profitability and improved safety they seek. In the following pages, we’ll expand on each challenge and show you how Emerson can position your organization to respond to fluctuations in the market now and for years to come.

1. www.macrotrends.net/1369/crude-oil-price-history-chart
2. www.morningstar.com/news/dow-jones/TDJNDN_20161029138/energy-slump-hits-oil-majors-results-wsj.html

REDUCE OVERS & SHORTS AT CUSTODY TRANSFER POINTS

Fiscal metering has always been important, but never more so than in the context of current business conditions. Coriolis meters, such as the Micro Motion Elite Series, offer $\pm 0.05\%$ accuracy for liquids and $\pm 0.35\%$ accuracy for gases, delivering best-in-class measurement uncertainty over a wide range of operating conditions. Micro Motion Coriolis meters are ideal for both liquid and gas custody transfer, and with no moving parts, the meters have a long life and require little or no maintenance. It is the most reproducible flowmeter in the marketplace, and with only one meter factor needed to cover the entire range of flow rates and fluid properties, measurement errors are drastically reduced.

Daniel ultrasonic meters are also an excellent choice for natural gas custody transfer in line sizes ranging from 4 to 12 inches and bigger. Onboard diagnostics and Condition Based Monitoring detect changing flow and process dynamics in real-time, pinpoint the cause of performance degradation, and reduce calibration and maintenance costs.

BONUS ADVANTAGE: AN ANSWER FOR THE TALENT CRISIS

The complex operation and frequent calibration inherent in legacy measurement technologies (i.e. PD, turbine and orifice plates) require specially trained, experienced personnel — the very resources that are reaching retirement age.

The impending talent crisis can be countered by transitioning to state-of-the-art meters equipped with advanced diagnostics; they can require less expertise and maintenance — while delivering superior accuracy, reliability and data critical in fiscal as well as non-fiscal applications.

IN THE U.S. ALONE, many large oil & gas employers risk losing 50-80% of their retirement-eligible population in the next five years.³



3. www.businesswire.com/news/home/20140506006268/en/Retirement-Wave-Technical-Skills-Gap-Threaten-Oil





PROTECTING ASSETS

Protecting assets during process upsets when flow conditions surge or the integrity of the system is jeopardized will have a positive impact on profitability. Coriolis meters, by design, are immune from the common types of damage that affect other types of meters. Emerson multiphase, Coriolis, ultrasonic, magnetic, orifice, and vortex meters can all provide advanced diagnostics and asset management tools to help protect assets. With Emerson Flow Solutions:

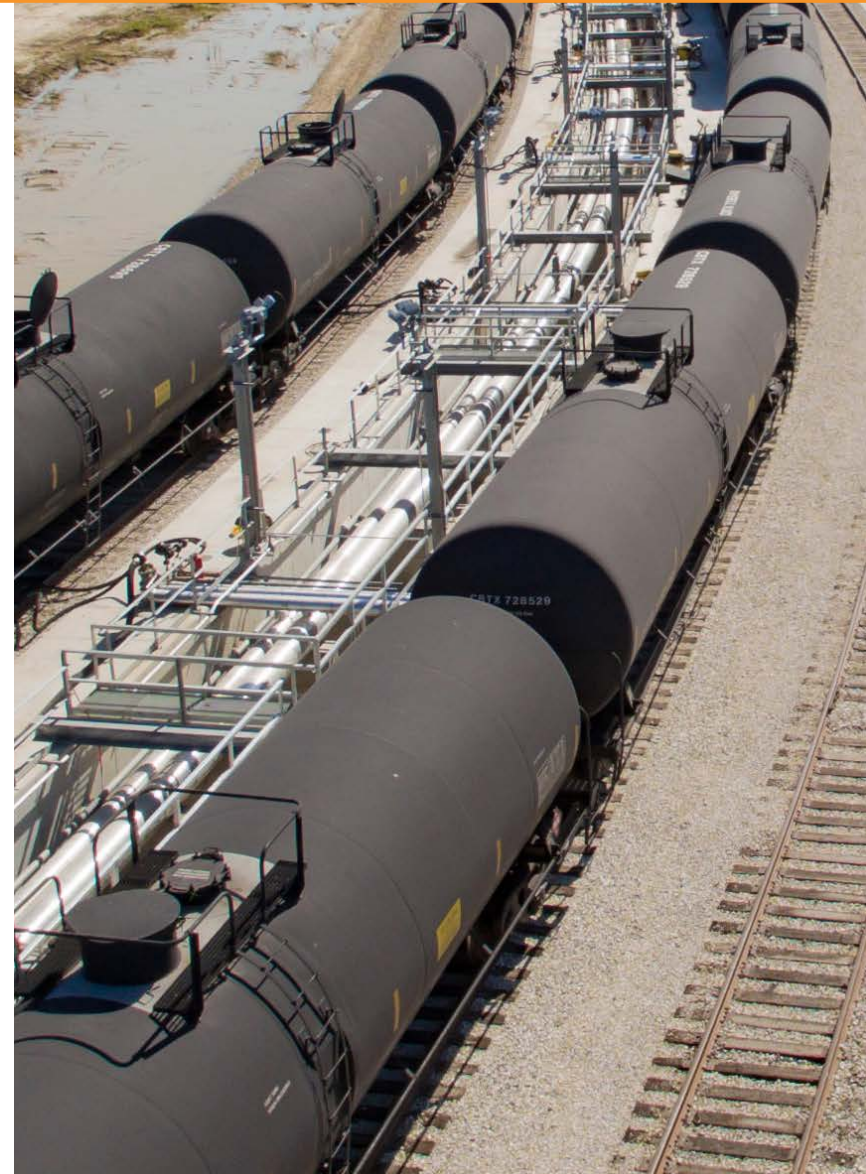
- Corrosion probes, sand and erosion sensors, and chemical injection provide accurate monitoring and protection against potential corrosion and erosion problems
- Hydraulic analysis and software, pressure control/regulation devices and turn-key systems enable effective pressure control and surge detection
- Control room management and SCADA give you real-time monitoring and control

REDUCING COST OF OWNERSHIP

Reducing total cost of ownership (TCO) is key for increasing profitability. Maintenance has always been a “necessary evil,” interrupting throughput and adding to lifetime TCO – whether that maintenance is scheduled or forced by a process failure. Emerson’s Smart Meter Verification technology, which is built into many Emerson Flow Solutions, provides data to predict the need for maintenance, minimize unplanned shut-downs and optimize asset ROI. The advanced diagnostics and troubleshooting, machinery health monitoring and management, and corrosion and erosion monitoring all provide sophisticated and actionable process insight.

In addition to reducing maintenance, lowering TCO includes better planning from the start of any project. Emerson’s Project Certainty can help you eliminate 20% - 30% of project costs.

EMERSON’S PROJECT CERTAINTY can help you reduce costs by collaborating with us early in projects to reduce engineering, piping and installation costs as well as schedule risk.



TECHNOLOGY FOCUS: SMART METER VERIFICATION

Smart Meter Verification (SMV) technology enables critical meter health insight. SMV is our patented, automatic, on-board diagnostics tool that verifies meter performance and integrity under flowing conditions. With it, you can prove flowmeter performance in-line, on your schedule, in just seconds and without interrupting the process or the flow measurement. SMV is another solution from Emerson that helps control total installed cost.

CASE STUDY

GRASSROOTS LNG PLANT INCREASED AVAILABILITY AND OPTIMIZED PROJECT COST WITH VORTEX TECHNOLOGY

Achieving production targets and maximizing profitability are major concerns of gas processing facilities. For this turnkey plant builder, a global EPC Company constructing a grassroots LNG facility, any downtime during the initial operating period is detrimental to meeting their targets. They need to ensure that they design and manage the LNG plant as efficiently as possible. Measurement systems need to be accurate and reliable.

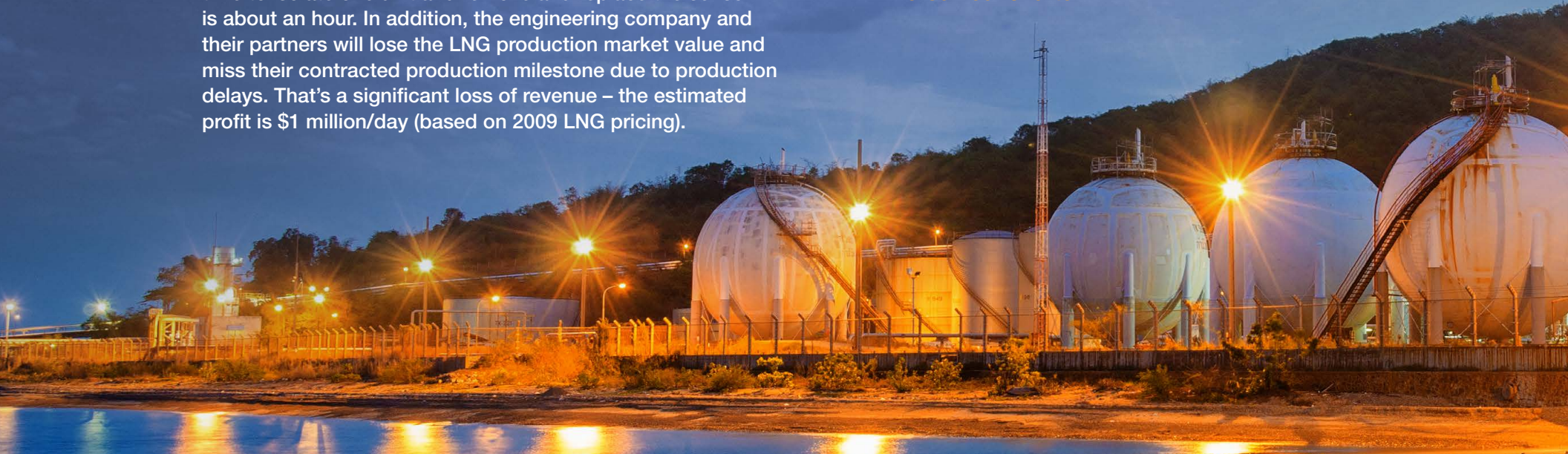
Traditional vortex flowmeters have wetted sensors and require process shutdown or removal of the flow meter from the process to perform maintenance. The best practice is to provide critical (non-intermittent) meters with isolation valves or bypass piping to execute in-line repairs.

If a traditional Vortex flowmeter were to have an on-line sensor failure, the plant needed to close isolation valves upstream and downstream of the unit, effectively losing production of LNG at a rate of more than \$40,000/hr., which doesn't include maintenance cost and material cost for the repair; the average time to isolate one unit and remove and replace the sensor is about an hour. In addition, the engineering company and their partners will lose the LNG production market value and miss their contracted production milestone due to production delays. That's a significant loss of revenue – the estimated profit is \$1 million/day (based on 2009 LNG pricing).

With the unique non-wetted sensor design of the Rosemount 8800 Vortex flowmeter combined with the CriticalProcess™ Vortex (CPA) option, sensor repair could be done online without requiring process isolation of the unit. This allowed for savings in all material, engineering, and installation costs of the upstream/downstream isolation valves as well as LNG production value. Emerson's AMS Suite software was used to enable the Smart Meter Verification audit trail, which assured reliable documentation for the EPA.

By implementing the Critical Process™ Vortex (CPA) option, this global EPC Company has reduced the project cost induced from isolation valves or bypass piping by greater than \$120,000 USD per LNG train. It also gave them the ability to troubleshoot and perform maintenance on the Vortex flow point without shutting down the process, leading to maximum profitability, process efficiency and operational cost savings.

LEARN MORE ABOUT ROSEMONT VORTEX FLOWMETERS:
www.Emerson.com/vortex





IMPROVING PIPELINE LEAK DETECTION AND “LOSS AND UNACCOUNTED FOR” (LAUF)

As part of the energy industry, you know that there are risks associated with product transport. Leak detection solutions aren't just good business — they are also potential life-saving measures. An enterprise can't afford to make this anything less than a #1 priority.

With the option for direct mass flow measurement and with superior accuracy for either mass and/or volume

measurement, **Micro Motion CMF ELITE Coriolis meters**, often combined with **PipelineManager® software**, deliver outstanding custody transfer measurements, batch management and leak detection. Batch interface detection is further enhanced with **Emerson Fork Viscosity Meters** and **Fork Density Meters**, facilitating smooth transitions, ideal cuts, and minimum transmix, even when the inevitable changes in scheduling occur.



MORE THAN 6 MILLION metric tons of fugitive methane leaked from natural gas systems in 2011.⁴

4. www.wri.org/blog/2013/04/close-look-fugitive-emissions-natural-gas



MANAGING REGULATORY COMPLIANCE

Government regulations aimed at reducing greenhouse gasses and preventing environmental disasters are top of mind for energy industry enterprises. Rising pressure on accountability adds to the regulatory playing field. On top of that, regulations continue to change.

Establishing deeper visibility into your processes and capturing valuable data logs that create the traceability for compliance are step one in addressing compliance. Micro Motion Smart Meter Verification (SMV) and Daniel Continuous Flow Analysis (CFA) reporting as well as other diagnostic, process logging, and calibration reports are very helpful tools for cutting the time and expense of making that happen. Consider:

- Emerson solutions are manufactured to be compliant by design
- You can take advantage of operator training and simulation, gap and uncertainty analysis and reliability programs for full operational assurance
- Electronic shift and maintenance logs, leak detection system performance analysis and audit trail, and operator training records all inform data collection activities for compliance audits

Emerson is a key contributor to consensus standards development for multiple industries. That puts us into a somewhat unique position of being able to proactively align our technology development with established and emerging regulations.



The EPA, ERCB and ISO SAS have approved SMV for its ability to provide traceability.



MAXIMIZING CAPACITY, THROUGHPUT AND REVENUE

Unconventional oil and gas exploration has led to unprecedented levels of production, which has made capacity management one of the critical elements of the business. A complete capacity management solution incorporates several technologies.

- Micro Motion ELITE CMF Coriolis and Fork Viscosity Meters (FVMs) help to automate managing viscosity over a range of temperatures, detecting slack line and two-phase flow and monitoring for condensation or misting in pipelines.
- Daniel ultrasonic meters offer advanced diagnostics that overcome the challenge of continuous validation of measurement accuracy essential to maximizing transport capacity while maintaining good measurement.

Your Partner for Success, Today and Tomorrow

The global intelligent flow meter market is expected to surpass \$7 billion by 2022.⁵ This is a testament to the fact that, as turbulent as the energy business can be, with its massive swings in production and pricing, the belief that better technologies can not only provide the flow measurements that you count on, but that these technologies create a new platform to gain better insight and control for maximizing revenue today and going forward.

All the solutions in this Trend Report have been developed to take production, safety, efficiencies, and revenue to new levels. Emerson Flow Solutions products, along with the technology expertise we've accumulated working with processes of all kinds and in many industries, surely can deliver the comprehensive solution to the challenges you face in every part of your business.

5. <https://globenewswire.com/news-release/2016/06/07/846550/0/en/Global-Intelligent-Flow-Meter-Market-2016-Trends-Forecasts-to-2022-for-the-7-7-Billion-Market.html>



CONFIDENCE IN MEASUREMENT IS KEY TO YOUR PROCESS.

That's why we believe that the integrity behind your measurement is critical.

With the largest team of technology experts around the world, Emerson is your partner for flow measurement solutions. From consultation to solution to optimization and beyond, we're dedicated to helping you find the right flow technology for your application and business needs.

We measure what matters, so you can focus on what matters to your business.

Get the full story at www.Emerson.com/FlowMeasurement

