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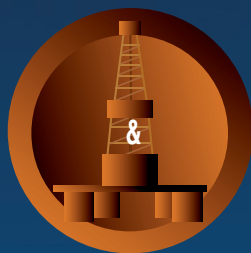
# Extreme Conditions. Critical Fluids. For Your Demanding Oil And Gas Applications...

*Rely On  
**THE FLOW MEASUREMENT**  
Resource.*

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*In the oil and gas industry, measuring the flow of liquids and gases involved in offshore exploration and production demands superior instrument performance. High operating pressures, pulsating flow streams and corrosive environments present difficult flow metering challenges.*

# When Reliability Counts, Turn To Flow Technology

On critical oil and gas processes, Flow Technology's flow measurement systems meet — and exceed — the highest expectations. With proven reliability, superior accuracy and virtually maintenance-free service, they provide unsurpassed total performance.

Our rugged positive displacement flowmeters and precision turbine flowmeters are used to monitor the flow of chemicals critical to maintaining production from offshore oil wells. Indeed, Flow Technology flowmeters routinely perform under conditions that most flowmeters wouldn't even dare to attempt.

## **Installed With Confidence Around The World**

From the North Sea to the Gulf of Mexico, leading oil and gas companies rely on Flow Technology — *The Flow Resource* — to meet their most critical flow measurement requirements. Our flow metering solutions have been deployed on many of the world's largest offshore exploration and production projects, including (partial list):

BP Amoco Marlin	Shell Auger
BP Amoco Nile	Shell Brutus
Chevron Typhoon	Shell Malampaya
Exxon Diana	Shell Mars
Exxon Mica	Texaco Gemini
Exxon Zinc	Texaco MS Canyon
Mobil Zafiro	

## **Proven Performance To Keep The Oil Flowing**

Look for any flow measurement environment with extreme conditions, and demanding performance requirements, and you'll find Flow Technology. Typical oil and gas applications for our flow metering systems include:

### **Well Injection**

In order to avoid costly downtime due to freeze-ups of deep water well systems, chemicals such as Methanol are injected into each well as a preventive countermeasure. This is a critical process requiring verification measurement — should high-pressure pump systems fail or develop an excessive amount of leakage, it is imperative to know at what point lines will freeze.

Flow Technology's positive displacement flowmeters are an effective answer for high-pressure methanol injection, where detection of fluid loss resulting from worn internal pump packings is essential. These flowmeters feature a new, patented "boltless" design which is ideally suited for high-pressure applications, such as methanol injection, where process pressures can reach 15,000 psig.



In well injection applications involving corrosion inhibitors, paraffin inhibitors and other concentrated fluids, offshore producers utilize our low flow positive displacement flowmeters. Capable of measuring flow rates down to seven gallons per day, they offer a reliable, high-resolution flow sensing solution for low- to high-viscosity liquids.

Flow Technology also provides all of the necessary electronic components for a complete deep water flow checking system. In methanol service applications, for example, our flowmeters are typically paired with a magnetic pick-up sensor, and either a loop-powered rate indicator/totalizer housed in a NEMA 7 explosion-proof enclosure, or a smart two-wire rate transmitter.

### Valve Actuation

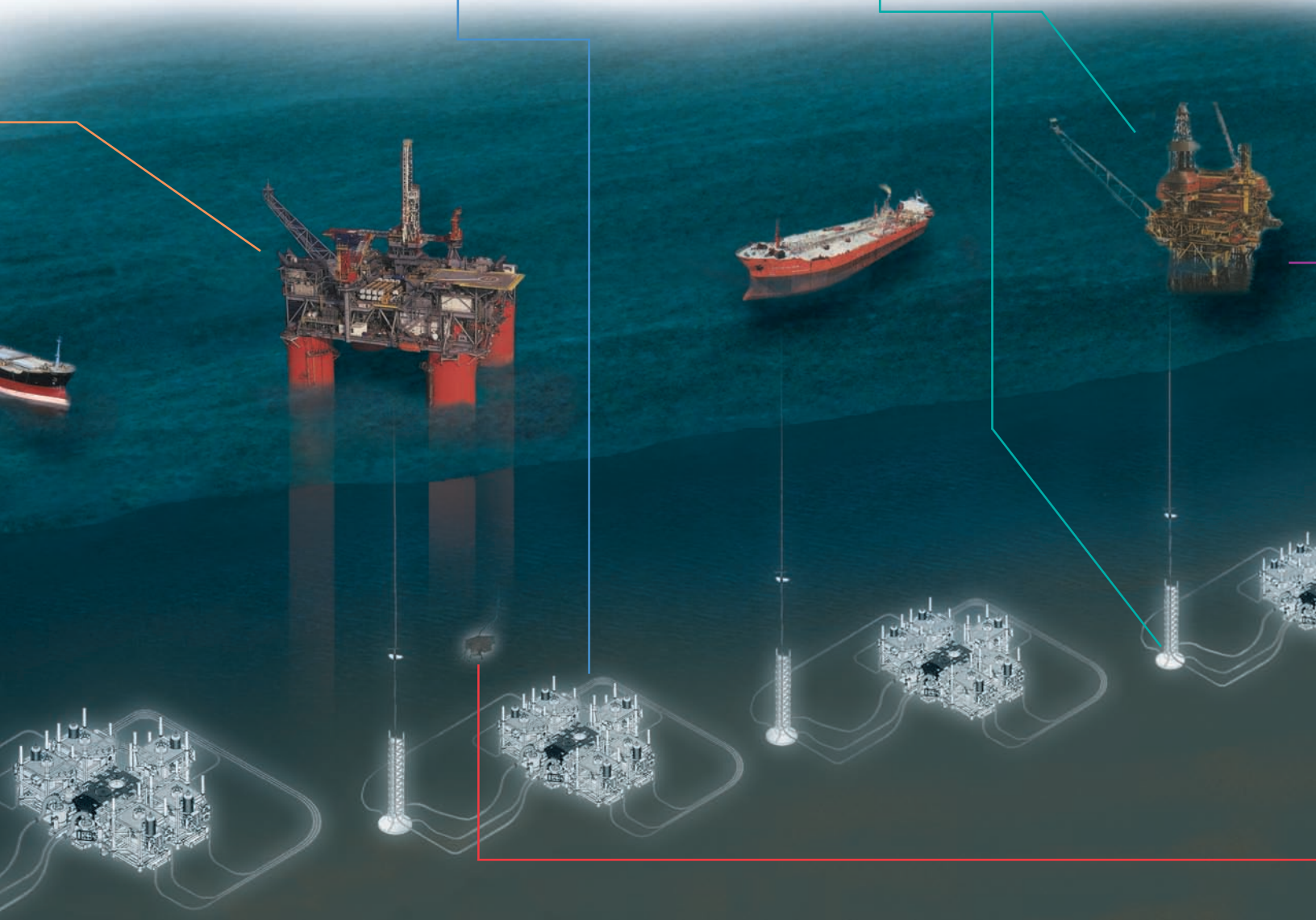
Measuring the flow of hydraulic fluid used in subsea control pods requires the utmost level of instrument performance. The control pods supply hydraulic fluid which activates valves at well heads on the ocean floor. In this process, large surges of hydraulic fluid against very low flow rates can result in abrupt and rapidly changing flow conditions.

Petroleum producers rely on Flow Technology's turbine flowmeters in such challenging hydraulic applications. The meters' exceptional repeatability provides a precise baseline "footprint" to monitor the performance of hydraulic circuits, as well as an accurate total flow reading to verify valve position. Additionally, their wide dynamic range ensures adequate sensitivity to identify leaks, while allowing measurement of the

top flow rate during actuation of the device. By delivering high-resolution flow measurement data, Flow Technology's turbine flowmeters enable early detection of valve-related problems. This eliminates the need to raise well head equipment to the surface in the event of system failure, and minimizes the potential for spilling hydraulic fluid into the environment.

### Blowout Prevention

In offshore oil fields, "kicks" or blowouts due to downhole pressure surges can result in an uncontrolled flow of fluids from a well, and may cause serious formation damage. To guard against these events, a Blowout Preventor (BOP) consisting of a set of hydraulically-operated valves or rams is placed at the well opening and is used to safely shut-in the well.



In this application, Flow Technology's turbine flowmeters are used for precise sensing of hydraulic fluid flow during activation of the BOP. Meters monitor flow on the surface at the hydraulic power unit (HPU), and on the sea floor at the BOP. These meters are specifically designed to withstand the extreme water hammer effect within the hydraulic system, as well as the demanding external environment on the ocean floor. This equipment provides accurate flow information which allows leakage or other problems within the hydraulic system to be detected prior to a catastrophic failure.



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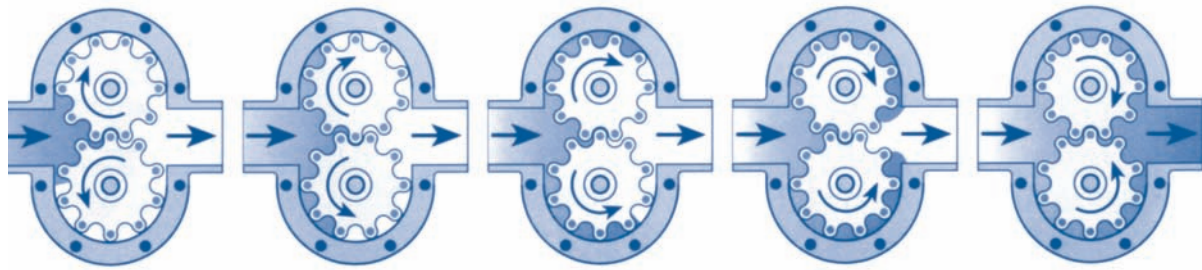
#### **OTHER APPLICATIONS:**

##### **Fuel Measurement**

- **Work Boats**
- **Crew Boats**
- **Package Power Systems**

- **Remote Operated Vehicles (ROVs)**





▲ **PD Meter Operational Diagram**

Flow Technology's positive displacement flowmeters employ an innovative, patented measurement technology which greatly enhances reliability and ease-of-use. The meters incorporate two rotating impellers driven by the liquid flow. The impellers activate a non-intrusive sensor which generates a pulsed output signal. Each pulse represents a known volume of liquid captured in between the lobes of the impellers. A K-Factor converts the pulses into engineering units for remote data collection and digital display.



◀ **BL Series**

Flow Technology's new BL Series high-pressure, stainless steel, positive displacement flowmeter was developed to meet the demanding requirements of deep water flow measurement applications. The BL Series' compact, "boltless" pressure vessel design eliminates the need for high-strength fasteners, and provides utmost reliability. In addition, the flowmeter's bearingless configuration ensures long life.



◀ **TrickleMeter®**

Specifically designed for use in low flow applications in the oil and gas industry, our TrickleMeter® measures flow rates from 0.005 to 0.5 GPM. This innovative meter, which is able to withstand pressures up to 15,000 psig, features a stainless steel case and carbide shafts.

**Specialized Turbine Meters** ▶

Flow Technology is recognized throughout the oil and gas industry for its ability to develop custom flow measurement systems which meet specialized application requirements. For example, a "high shock" design was developed for installations such as monitoring BOP activation where the meter may be subjected to extreme hydraulic shock loading. This design enables the turbine meter to withstand the water hammer effect without sustaining damage. Various other mechanical configurations, including manifold housings and meters with SAE Code 62 end fittings, have been utilized as the applications require.



Subsea Meter with Amplifier Link™

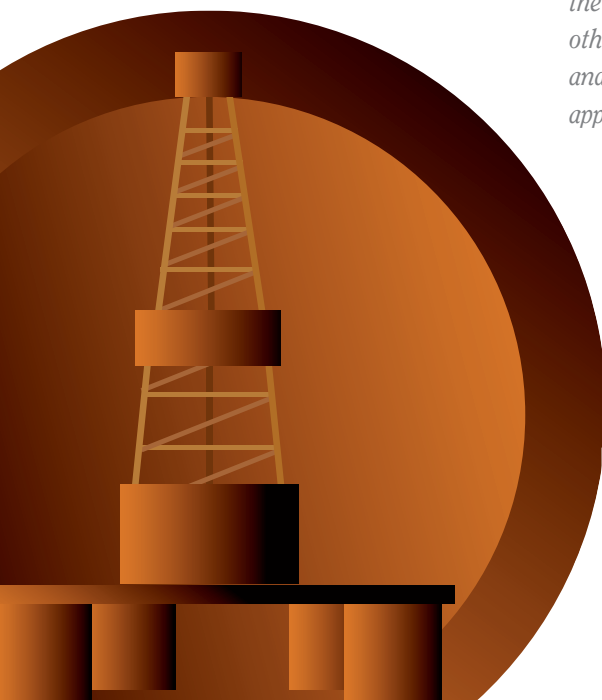


High Shock Meter with Linear Link®

Several different electronic packages have been developed for use in both surface and subsea applications. Watertight packages are available to house a standard pick-off with a low level output, an amplified pick-off with a square-wave pulse output, and linearizing electronics that provide a linear output of  $\pm 0.1\%$  throughout the 100:1 dynamic range of the meter with a frequency and analog output. These subsea packages also have the flexibility to utilize various connector brands, such as SeaCon, D.G. O'Brien, or a connector manufacture as specified by the end user.



Subsea Meter with Manifold Design



# An Unmatched Flow Measurement Resource For Your Industry.

## AEROSPACE

Cryogenic Fluid Metering  
Flight Testing  
Fuel Metering  
Hydraulic Fluid Flow  
OEM Components



## AUTOMOTIVE

R&D  
Production Fluid Fill  
Adhesive Dispensing  
Paint Mix & Recirc  
Coolant & Refrigerant  
Fuel & Lubricants  
Hydraulic/Trans./  
Power Steering Fluids  
Emissions Measurement



## INDUSTRIAL

Additive Batching  
Chemical Dispensing  
Feedback Controls  
Fuel Oil Systems  
Skid Packages  
Turbine Generators/  
Fuel/NOx Water



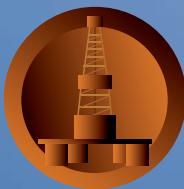
## METROLOGY

Primary Standard Liquid &  
Gas Calibration Systems  
Flow Transfer Standards  
Flowmeter Calibrations  
Service & Repair Programs



## OIL & GAS

Chemical Injection  
Subsea Hydraulics  
Fuel Measurement  
High Pressure Fluids  
Ultra-low Flow Rates  
Custom Solutions



## SANITARY

Batching  
Continuous Blending  
DI Water  
Loading/Unloading  
Mixing  
Water Filtration



## FUEL METERING

Aircraft  
Automobiles  
Diesel Engines  
Gas Turbines  
Power  
Additives



## OEM

Blow-out Preventors (BOPs)  
Dispensing Systems  
Fuel Management Systems  
Hydraulic Test Stands  
Skid Packages  
Subsea Control Pods  
Well Injection Systems  
YOUR System



For solutions to demanding flow measurement applications, there's only one place to go — Flow Technology. With more than 50 years of experience, and one of the widest selections of products and services, we offer an unmatched flow measurement resource for your industry.

## A complete selection of flow measurement products

- ◆ Precision turbine flowmeters
- ◆ High accuracy positive displacement flowmeters
- ◆ Advanced flow controls and electronics
- ◆ Primary standard flow calibrators
- ◆ EPA-approved vehicle emissions measurement systems



## Custom-designed systems for your metering requirements

- ◆ Knowledgeable sales engineering staff
- ◆ Custom meter electronics & packaging
- ◆ Specialized flow measurement systems
- ◆ Solutions for unique OEM applications



## Primary standard calibrations for all types of flowmeters

- ◆ One of the world's largest flow calibration labs
- ◆ More than 20 primary standard calibrators
- ◆ NIST-traceable calibrations for most flowmeter designs
- ◆ Choice of calibration, service and repair programs

At Flow Technology, quality isn't just a slogan — it's our way of doing business.

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