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**Demanding Applications.  
Essential Fluids.**

**For Your Challenging  
Automotive Applications...**

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

A U T O M O T I V E





*In the automotive industry, measuring the flow of liquids and gases used onboard vehicles, in test cells, and on the production floor demands superior instrument performance. From research and development measurements, production component test stands and motor sport vehicles, to production floor dispensing and assembly line fluid fill, automotive applications present difficult flow metering challenges.*

# When Reliability Counts, Turn To Flow Technology

In critical automotive applications, Flow Technology's flow measurement systems meet — and exceed — the highest expectations. With proven reliability, superior accuracy and a low cost-of-ownership, they provide unsurpassed total performance.

Our rugged positive displacement flowmeters and precision turbine flowmeters can be used to measure the flow of fuel, engine oil, coolants, transmission fluid, refrigerants, adhesives and other fluids essential to optimum vehicle performance. 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 research labs of major OEMs, to assembly lines and test tracks around the world, automotive industry leaders rely on Flow Technology — *The Flow Resource* — to meet their most critical flow measurement requirements. Our Mil-Standard and ANSI-approved flow metering solutions have been utilized by a host of major automotive-related companies, including (partial list):

|                 |            |
|-----------------|------------|
| BMW             | John Deere |
| Caterpillar     | Komatsu    |
| DaimlerChrysler | Mitsubishi |
| Ferrari         | Nissan     |
| Ford            | Rousch     |
| General Motors  | Toyota     |
| Honda           | Volkswagen |

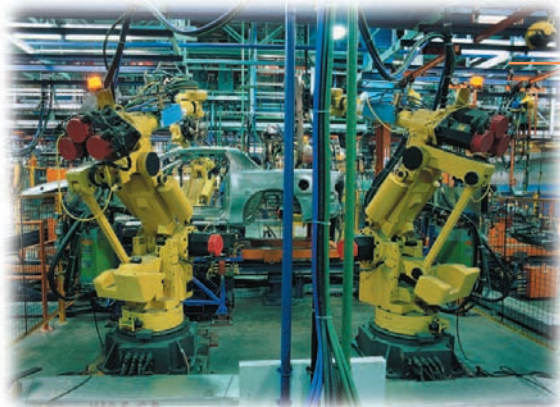
## **Proven Performance In Assembly And Testing**

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

### **Sealant/Adhesive Dispensing**

Sealant and adhesive dispensing is required in the automotive industry for affixing or sealing door panels, windows and other interior/exterior components. These materials are typically dispensed in the body shop using robotic arms.

Sealants and adhesives are generally very abrasive, viscous substances with high solid content. They are dispensed in very small quantities under high pressure conditions up to 6,000 psig. In these applications, which can either be automated or manual, pulses from a flowmeter are supplied to the control system in order to precisely dispense the correct amount of material.



In order for a flowmeter to be effectively used in sealant and adhesive dispensing, it must provide fast speed-of-response, high resolution and excellent repeatability. Flow Technology's innovative positive displacement flowmeters meet these requirements and more. The rugged thermoplastic impellers can be serviced in-line for easier maintenance and less frequent downtime. Additionally, our PD meters have much lower pressure drop than competitive designs, and provide more precise measurements.

### • **Vehicle Development**

During the research and development process for new vehicles, specifically work involving drivetrain and auxiliary components, one parameter of particular importance is fluid flow. For engine R&D programs, typical measurements include: coolant flow for heat balance studies, oil flow to ensure proper lubrication, fuel and intake air flow to optimize the efficiency of the engine, and exhaust gas flow to assure the engine and catalytic converter system complies with clean air guidelines.

In addition, two parameters vital to the longevity and operation of transmissions and power steering systems are the flow of lubrication/hydraulic fluid and the temperature of the fluid. In order to optimize the efficiency of climate control equipment, flows of coolant and refrigerant also need to be measured.

Engineers performing these and other flow measurements critical to the development of future vehicles rely on precision turbine flowmeters and advanced flow electronics from Flow Technology. When utilizing an FT Series turbine meter with the advanced Linear Link® flow linearization system, accuracy of  $\pm 0.2\%$  of reading over a flow range up to 100:1 can be achieved. The system also provides speed-of-response up to 7.5 mS.

For measurements where temperature changes during the test, the Linear Link® Temperature Compensated Interface (TCI) electronics package can be used. The Linear Link® TCI measures temperature, performs real-time correction for viscosity and density changes, and provides a corrected output for both flow and temperature.

### • **Component R&D**

Manufacturers of components, much like OEMs, have found the accuracy, repeatability and speed-of-response of Flow Technology's turbine meter systems vital in obtaining the data required for component R&D work. Among these applications are oil and air filters, PEM fuel cells, fuel pumps, fuel injectors, head gaskets, transmission valves and superchargers.

By offering a wide selection of flowmeter sizes and bearing types/materials, as well as a NIST-traceable calibration capability, experienced Flow Technology application engineers can provide the proper flow metering solution for the most demanding application.

### • **Fluid Fill**

Fluid fill applications associated with automobile production require precise flow metering performance. That's why leading automakers rely on accurate, reliable positive displacement flowmeters from Flow Technology.

Automated or semi-automated systems utilize our PD meters for measuring the amount of reservoir fluid being dispensed on the assembly line. These

fluids include windshield washer fluid, transmission fluid, brake fluid, axle grease and radiator fluid.

Our PD meters, which have the flexibility to be employed on dedicated low- or high-viscosity applications, are chosen for their rugged, low maintenance design, exceptional repeatability and low cost-of-ownership.

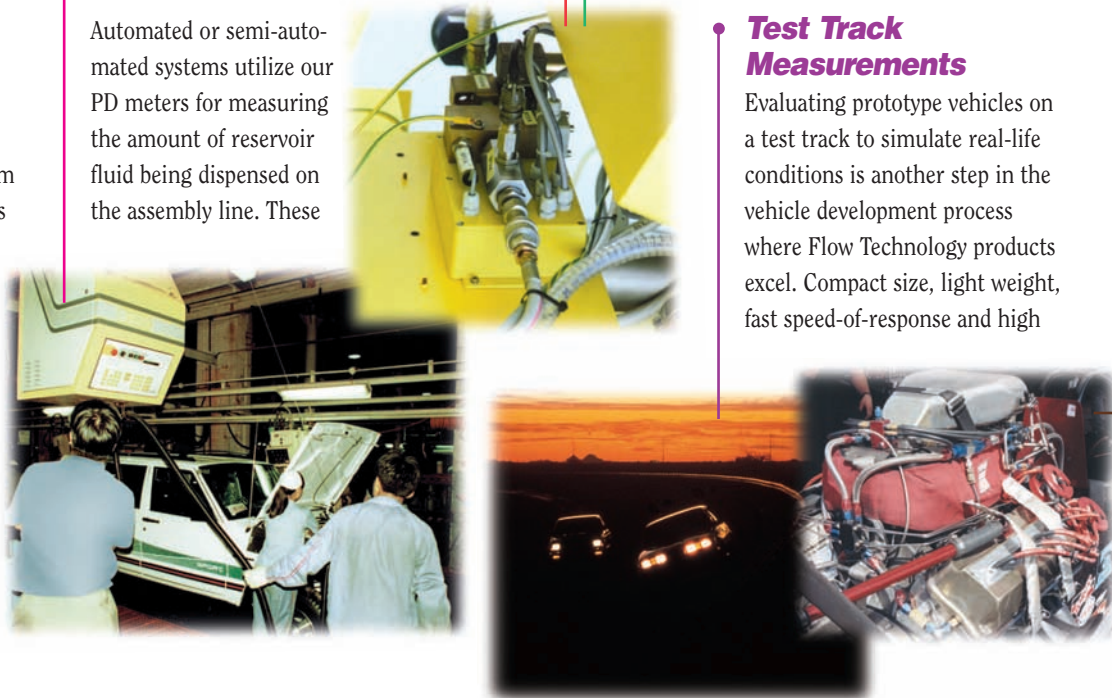
### • **Production Testing**

Manufacturers of automotive components have found the superior accuracy, repeatability, corrosion-resistance, and extended bearing life of Flow Technology's turbine flowmeters and electronics ideal for use in production test stands. Manufacturers of power steering systems, transmissions, gaskets, filters, fuel pumps and compressors utilize our equipment on production test stands to confirm that their components comply with stated specifications.

Flow Technology turbine meters can be configured with ball bearings for use with lubrication fluids, or with ceramic journal bearings for use with non-lubricating fluids such as coolant or refrigerant. With a meter operating temperature range of  $-430^{\circ}\text{F}$  to  $750^{\circ}\text{F}$  ( $-257^{\circ}\text{C}$  to  $399^{\circ}\text{C}$ ) and a choice of mating electronics, Flow Technology can meet users' stringent fluid metering requirements.

### • **Test Track Measurements**

Evaluating prototype vehicles on a test track to simulate real-life conditions is another step in the vehicle development process where Flow Technology products excel. Compact size, light weight, fast speed-of-response and high



accuracy make our turbine meters ideal for installation onboard vehicles.

In most installations, including coolant and transmission lines, the flowmeter can be installed without major alterations to the vehicle's original plumbing configuration. When paired with an Amplified Pickoff, Linear Link® or Linear Link® TCI, the complete system can be powered directly from the vehicle's 12 VDC power source. Depending upon the electronics selected, outputs available are raw frequency, linearized and temperature-compensated frequency, and fully-compensated 0-10 VDC analog signals for direct input into onboard data acquisition equipment.

**Onboard Race Applications**

Flow Technology's turbine flowmeters have proven their accuracy and durability on the race track as well. Winning Top Fuel and Alcohol teams in the NHRA™ use our equipment to record fuel usage during runs in order to dial-in engines for optimum horsepower.

Even though NASCAR™ teams cannot instrument their cars during a race, they have found track testing with an instrumented vehicle utilizing our turbine meters invaluable for tuning various onboard systems. Measurements include fuel, engine oil, coolant, air intake and gear oil used to lubricate and cool the rear differential.

In unlimited hydroplane boat racing, our turbine meters are combined with temperature-compensating electronics to monitor fuel usage in units of mass flow. This equipment is used on the boats during races, as well as by the sanctioning body to check and calibrate flow valves distributed to the teams prior to each race to limit the maximum fuel flow rate.

In the physically-demanding series of off-road racing, teams have found they can maximize efficiency and reduce failures by employing Flow Technology's equipment. Our systems monitor coolant, engine oil, transmission fluid, gear oil and shock absorber hydraulic fluid.

**Automotive Paint**

Automotive production plants utilize anywhere from 10 to 20 different paint colors, as well as solvent and/or DI water flows. The paints, which are stored in large kettles in a paint "kitchen," are pumped throughout the plant to paint booths and then back to the kettles. This process is measured in a continuous loop, with one supply flowmeter measuring the flow from the kitchen on each paint color, and another meter measuring the flow on the return lines to the kettles. In addition, the total consumption can be measured. Accurate measurement of these flow rates is critical, as changes may indicate a system problem.

Flow Technology's PD meters are well-suited for "mix and circ" applications. Supplied with sanitary clamp end-fittings, they feature abrasion-resistant components and only two moving parts for exceptional reliability. Plus, the meters can withstand solvent rinses and are easy to install and maintain.



**OTHER APPLICATIONS:**

- **Heavy Equipment Systems Development**
- **Marine Diesel Fuel Measurement**
- **Watercraft, Snowmobile, ATV and Outboard Motor Development and Testing**



### ▼ FT and FTO Series Turbine Flowmeters



Flow Technology's turbine flowmeters feature high accuracy and repeatability, compact size, fast speed-of-response, low pressure drop and low cost when compared with other metering technologies. Standard materials of construction are a corrosion-resistant 316 SS with a 430F SS or 17-4PH SS rotor. A wide variety of end-fittings are available, including NPT, MS, Hose Barb and SAE. For installations where high hydraulic shock loads are encountered, a high-shock meter design (designated the HS Series) is available.

### ▶ Linear Link®

The Linear Link® is capable of linearizing flowmeter outputs so that accurate results can be obtained throughout the meter's full extended flow range up to 100:1 turndown. The unit provides fast, 7.5 mS speed-of-response and smooth linear outputs via an advanced "blade averaging" capability. It is designed to operate from 9–32 VDC for applications in the test cell or onboard vehicles. Additionally, the Linear Link® provides frequency and analog outputs, and is available in a meter-mounted pickoff style or remote enclosures with MS connectors.



### ◀ Linear Link® TCI

The Linear Link® TCI, such as the remote-mounted unit shown here, has the ability to measure temperature through a pickoff-mounted RTD and perform real-time correction for viscosity and density changes. The unit provides fast, 20 mS speed-of-response and is designed to operate from 9–32 VDC for use in the test cell or onboard vehicles. Its corrected frequency and

analog outputs for flow rate and temperature can be scaled in volumetric and mass units. Additionally, user-friendly, Windows™-based programming software allows for reprogramming if operating parameters change.



### ◀ Amplifier Link™

The Amplifier Link™, one of the newest products from Flow Technology, combines a pick-off and signal conditioner in one compact, low-weight design. The unit can be paired with most popular turbine flowmeter models. It is powered from 9–32 VDC and produces a 0–5 VDC pulse output which can be transmitted over long distances.



### ▶ Decathlon Series

The patented Decathlon Series industrial flowmeter is ideal for a wide variety of liquid flow sensing applications in the automotive industry, including those involving paints, lubricants, fuels, polyurethanes and adhesives. These meters are both rugged and highly accurate, and can be installed in 1/8" to 4" line sizes. They are designed to withstand up to 1,000 psig operating pressure.



### ▶ EO System with HP-I Series Flowmeter

Flow Technology's specialized Electro-Optic (EO) System delivers a high-resolution output when used with our HP-I Series high-pressure PD meter. Resolutions as high as 630,000 pulses per gallon (166.45 pulses/cc) can be obtained when the system is paired with a PD meter equipped with an optical interface option. The EO System provides accurate monitoring of high-viscosity fluid dispensing where the fluid is traveling at low flow rates.



### ▶ BR3000 Series

Battery power and a compact size make the BR3000 Series rate/totalizer a versatile local indicator. Available with explosion-proof, waterproof and panel-mount enclosure options, it accepts magnetic pickup, DC pulse and switch enclosure inputs. Rate and total are shown simultaneously on the easy-to-read, two-line LCD display. The BR3000 Series utilizes either an internal battery, external DC, or 4–20 mA loop power supply.



# An Unmatched Flow Measurement Resource For Your Industry.

## AEROSPACE

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



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.

## Custom-designed systems for your metering requirements

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

## AUTOMOTIVE

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



## 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



## 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.

**1-800-356-9328**  
**www.ftimeters.com**



8930 S. Beck Avenue, Ste 107  
Tempe, Arizona 85284 USA  
Tel: (480) 240-3400  
Fax: (480) 240-3401  
E-mail: ftimarket@ftimeters.com



## INDUSTRIAL

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



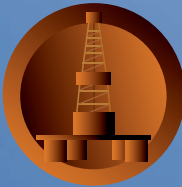
## METROLOGY

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

