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In honor of Daniel Bernoulli's 307th birthday, Flow Research announces a revolutionary new market study. This study will change the way you look at the flowmeter market . . .

... forever.

The World Market for Differential Pressure (DP) Flowmeters and Primary Elements

DP Flowmeters Ride the Wave of Growth in the Oil & Gas Industry

Plus Two Twin Bonus Studies:

The World Market for DP Flow Transmitters

The World Market for Primary Elements

The DP Flowmeter Market is a One Billion Dollar Market. How can it be so Large?

There's no doubt that new-technology flowmeters are displacing traditional meters for many applications. If this is true, how can the DP flowmeter market be valued at one billion dollars plus? This makes the DP flowmeter market the largest flowmeter market – bigger than magnetic, Coriolis, ultrasonic, and vortex.

The answer is that the DP flowmeter market has long been undervalued – and nobody has really understood how large it is. For many years, market research reports have identified the DP flowmeter market with the market for DP flow transmitters. This ignores the critical role of primary elements in this market. But primary elements are an essential part of making a DP flow measurement: without the primary element to create a pressure drop, there can be no differential pressure flow measurement. Primary elements are essential to making DP flow measurements, and their value is part of the value of the DP flowmeter market.

The main reason why the value of primary elements has not previously been included in the value of the DP flowmeter market is **that in many cases primary elements are purchased separately from DP flow transmitters**. This means that the only way to accurately determine the value of the DP flowmeter market is to conduct two separate studies simultaneously:

- A DP Flow Transmitter Study
- A Primary Elements Study

This is what Flow Research has done. **We then took the results of these two separate studies and put them together**

into a single study to reveal the true value of the DP flowmeter market.

Study Findings

This study is nothing short of revolutionary. It will forever change the way the flowmeter market is viewed. Instead of seeing the DP flowmeter market as flat to declining, it is clear from this study that the DP flowmeter market is experiencing significant growth. And instead of a market that is outpaced by magnetic and Coriolis flowmeters, the DP flowmeter market is revealed as the largest flowmeter market in terms of revenues.

Here are just a few of the findings of this new study:

- The value of the worldwide DP flowmeter market, including DP flow transmitters and primary elements, exceeds one billion dollars in 2007.
- Rather than being flat to declining, the DP flowmeter market is actually experiencing annual growth in the six percent range.
- Growth in the DP flowmeter market is particularly driven by the rising worldwide demand for energy and the search for new supplies of oil and natural gas.
- Suppliers are adding new features and product enhancements to their DP flow transmitters, bringing greater accuracy and stability.
- Multivariable transmitters are continuing to show rapid growth,

aided both by new suppliers and by new products in this market.

- While orifice plates are still the dominant type of primary element, averaging Pitot tubes and Venturis are also showing strong growth.
- Primary element suppliers are bringing out innovative and new products to enhance their primary elements product lines.

Why this study is important to you as a decision-maker

This study is vitally important to anyone who is involved in the flowmeter market. Here's why:

1. **For the first time, this study gives the true size of the DP flowmeter market.** This is important whether you are in the DP flowmeter market, or whether you are competing against it. If you are in this market, it tells you market size, projected growth, and market shares for the leading suppliers. If you are competing against this market, it tells you the value of the market you are competing against.
2. **It's hard to ignore a billion dollar market. All of a sudden the DP flowmeter market has become the proverbial "elephant in the room."** Not only is the DP flowmeter market



the largest in terms of sales, it is also the largest in installed base. Anyone who wants to sell into the flowmeter market, regardless of technology, is going to have to take account of the DP flowmeter market.

3. **This study identifies growth in the DP flow transmitter market that has occurred since our last pressure transmitter study, published in January 2004.** There has been substantial growth in the pressure transmitter market since this time, and DP flow transmitters have been part of that growth. Multivariable transmitters have also contributed significantly to this growth.
4. **This study tells you how the different primary elements compare with each other in terms of unit sales and revenues, and which ones are the fastest growing.** While averaging Pitot tubes and Venturis are showing significant growth, orifice plates are maintaining their dominance, due to their large installed base.
5. **This 480 page study provides market shares for DP flow transmitters and for primary elements by type.** It tells you the major and minor players in each market, and does so by geographic region. Along with this are 28 company profiles that provide detailed financial and product information on the main suppliers to this market.

How the Study was Conducted

In conducting this study, Flow Research contacted all known suppliers of pressure transmitters, all of whom have DP flow transmitters. We sent them each a detailed questionnaire asking about their products and their company. We then followed this up with phone calls, interviewing many of these companies by telephone. We then analyzed the data we collected, and created a complete picture of the DP flow transmitter market worldwide and by region.

The analysis of the primary elements market was done separately, but in parallel fashion. We identified and contacted more than 100 companies worldwide that manufacture primary elements. We sent these companies a different questionnaire, asking about their company and the different primary elements they manufacture. We then followed these questionnaires up with phone interviews, obtaining detailed data about the primary elements market.

What is a DP Flowmeter?

What is a DP flowmeter? The short answer is that it is a flowmeter that uses the differential pressure measuring principle to determine flow. This involves a device that combines a DP transmitter together with a primary element to measure flow. The primary element creates a pressure drop, and the DP transmitter calculates flow based on the differential pressure produced. The calculation is performed using Bernoulli's equation. For orifice plate meters, the differential pressure is proportional to the square of the flow through the orifice plate.

DP Transmitters and Primary Elements

While some DP transmitter manufacturers also sell primary elements, such as orifice plates and Venturis, there are many primary element suppliers who do not sell DP transmitters. In this respect, DP flowmeters are different from most other types of flowmeters. A DP transmitter is not a DP flowmeter until it is united with a primary element for the purpose of creating a flow measurement.

Most flowmeters consist of a sensor and a transmitter, and the two components are usually sold together. For example, the flowtube of a magnetic flowmeter is generally sold along with a magnetic flow transmitter. Ultrasonic flowmeters have a device that sends and receives a signal, and this device is typically sold along with a transmitter that uses differences in transit time to compute flow. Vortex meters have a bluff body that generates vortices, and a method of sensing them, along with a transmitter that computes flow based on the number of vortices generated. Similar comments apply to turbine, positive displacement, and Coriolis flowmeters.

The value of the market for these types of flowmeters includes both the transmitter and the sensor components, which are sold together. For DP flowmeters, it is necessary to determine the value of the primary elements market and then add it to the value of the DP flow transmitter market to get an accurate statement of the value of the DP flowmeter market.

There is a trend towards incorporating primary elements with the DP transmitter to create an integrated DP flowmeter. Emerson Rosemount's ProBar and

ProPlate flowmeters, both volumetric and mass, are examples of this. Even though this is an important trend, these devices still represent a relatively small percentage of the total number of DP flowmeters sold.

The following describes the primary elements included in this study.

Orifice Measuring Points

Orifice plates are the most common type of primary element. An orifice plate is a flat, usually round piece of metal, often steel, with an opening or “orifice” in it. The orifice plate needs to be positioned at a correct position in the flowstream for it to function as a primary element for the purpose of making a differential pressure flow measurement. For it to be so positioned, it must be held in place. This is typically done by an orifice assembly, an orifice flange, or a holding element.



Photo courtesy of ABB

This study defines an orifice measuring point as having the following three components:

- An orifice plate
- An orifice assembly, flange, or holding element
- A valve manifold

Pitot Tubes

Pitot tubes are of two types:

- Single port
- Multiport averaging Pitot tubes



Photo courtesy of Veris

A **single port Pitot tube** includes an L-shaped tube measuring impact pressure. This tube is inserted into the flowstream, with the opening facing directly into the flow.

Another tube measuring static pressure has an opening parallel to the direction of flow. Flowrate is proportional to the difference between impact pressure and static pressure.

A **multiport averaging Pitot tube** has multiple ports to measure impact pressure and static pressure at different points. The DP transmitter computes flowrate by taking the average of the differences in pressure readings at different points.

Venturi Tube

A **Venturi tube** is a flow tube that has a tapered inlet and a diverging exit. The DP transmitter measures pressure drop and uses this value to calculate flowrate.



Photo courtesy of ABB

Flow Nozzle

A flow nozzle is a flow tube with a smooth entry and a sharp exit. The DP transmitter computes flowrate based on the difference between upstream pressure and downstream pressure. Flow nozzles are mainly used for high-velocity, erosive, non-viscous flows. Flow nozzles are sometimes used as an alternative to orifice plates when erosion or cavitation would damage an orifice plate. They offer excellent long-term accuracy.

Wedge Elements

A wedge element is a flow tube that has a V-shaped flow restriction protruding into the flowstream from at least one side of the



Photo courtesy of Racine Federated

pipe. Wedge elements are designed to measure fluids with high solids content. They are also well-suited for air, viscous flows, and for slurries.

What the Study Contains

The entire study contains ten chapters. The study contains two separate chapters on DP flow transmitters, two chapters on primary elements, and one chapter on the DP flowmeter market that results from putting the two markets together.

DP Flow Transmitters

This study includes market size in dollars and units for DP flow transmitters worldwide and by geographic region. DP flow transmitters are divided into the following types:

- Multivariable DP flow transmitters
- Single variable DP flow transmitters

This study provides the following information about the DP flow transmitter market:

- Shipments of DP flow transmitters in revenues and units worldwide and by region in 2006, with forecasts through 2011
- Shipments of multivariable DP flow transmitters worldwide and by region
- Shipments of single variable DP flow transmitters worldwide and by region
- Average Selling Price of DP flow transmitters worldwide and by region

- Shipments of DP flow transmitters by fluid type worldwide and by region (liquid, steam, and gas)
- Shipments of DP flow transmitters by industry
- DP flow transmitter sales by distribution channels (Direct, Independent Reps, Distributors, E-Business)
- DP flow transmitter sales by customer type (End-users, OEMs, Systems Integrators, Engineers/Consultants)

Primary Elements

Primary elements are segmented as follows:

- Orifice measuring points
- Pitot tubes/Averaging Pitot tubes
- Venturi tubes
- Flow nozzles
- Wedge elements
- Other

The study provides the following information about the primary elements market:

- Shipments of primary elements in revenues and units worldwide and by region in 2006, with forecasts through 2011
- Shipments of primary elements by type worldwide and by region in 2006
- Average Selling Price of primary elements by type worldwide and by region
- Shipments of orifice measuring points worldwide and by region

- Shipments of Pitot tubes worldwide and by region
- Shipments of Venturi tubes worldwide and by region
- Shipments of flow nozzles worldwide and by region
- Shipments of wedge elements worldwide and by region
- Shipments of other primary elements worldwide and by region

DP Flowmeters

The DP flowmeter chapter combines the DP flow transmitter market data together with the primary elements market data to form a consolidated view of the DP flowmeter market. This chapter contains the following:

- Shipments of DP flowmeters worldwide and by region in 2006, with forecasts through 2011
- Shipments of DP flowmeters by component type (DP flow transmitters and primary elements) worldwide and by region

Other Vital Data in this Study

In addition to the above data, this study includes the following:

- Market shares for the leading suppliers of DP flow transmitters worldwide and by geographic region
- Market shares for the leading suppliers of multivariable DP flow transmitters
- Market shares for the leading suppliers of single variable DP flow transmitters

- Market shares for the leading suppliers of primary elements by geographic region
- Market shares for the leading suppliers of primary elements by type (orifice measuring points, Pitot tubes, Venturi tubes, flow nozzles, and wedge elements)
- Detailed product descriptions by supplier
- Strategies for success
- Charts detailing product offerings by type for more than 60 suppliers
- Company profiles of 28 DP flow transmitter and primary elements suppliers

growth in the pressure transmitter market. The pressure transmitter market has grown due to growth in the number of capital projects in Asian and other countries, and especially due to growth in China.

2. There has been a tremendous increase in the amount of activity in oil & gas exploration and production in the past several years, due to increases in the price of oil and natural gas.
3. Suppliers have made significant technological improvements to their pressure transmitters, resulting in more stable and accurate products, and this has given customers a reason to buy into this market, or to upgrade their existing products.

Keys to Growth in this Market



The DP flow transmitter market has grown substantially in the past four years. Several factors account for this growth.

1. The pressure transmitter market as a whole has grown strongly during this period, and the growth in DP flow transmitters is part of the

4. Installed base is probably the single biggest factor that has sustained growth in the DP flow transmitter market in the past four years. Many companies have invested very heavily in pressure transmitter technology, and are not likely to abandon this investment. Changing technologies often requires changing suppliers, and also has additional start-up and educational costs. Many end-users will choose to stay with their DP transmitters unless they have a particular problem with them, or are required to change technologies by regulations or due to a need to move to a higher performance level. Even in this case, technology improvements by pressure transmitter suppliers may persuade

end-users to stick with pressure transmitter technology.

While the DP flow transmitter market has shown substantial growth recently, the primary elements market has also been growing. This is true for several reasons.

1. The use of DP flow transmitters has been increasing for the past several years. DP transmitters are a unique mixture of new-technology flowmeters and traditional flowmeters. Multivariable DP flowmeters are new-technology meters, while single variable DP flowmeters are traditional meters. Multivariable DP transmitters are currently experiencing double-digit growth, and the market for single variable DP transmitters is also expanding. This growth in the DP transmitter market is driving growth in the primary elements market.
2. The markets for primary elements are expanding due to increased exploration and production in the oil & gas industry. The price of a barrel of crude oil increased from \$40 in 2004 to over \$60 in 2006. The result of this surge in the price of crude oil has been a tremendous increase in the amount of oil & gas exploration and production activity worldwide. It is now profitable to drill in many locations where it previously was unprofitable to drill. The price of natural gas has also increased, leading to more efforts to find new natural gas supplies.
3. DP flowmeters, with primary elements, are widely used in oil & gas production, including custody

transfer of natural gas and petroleum liquids. Among their uses is for high pressure subsea applications. Because DP flowmeters have been used for many years in the oil & gas industry, they are being called upon now as exploration and production activity ramps up. Given the current supply and demand equation in the world oil markets, this activity is likely to continue for the foreseeable future, and, if anything, is likely to increase.



This study quantifies in exact numbers the market size and projected growth for both DP flow transmitters and primary elements. It also addresses the following topics, of vital interest to anyone in the DP flowmeter market:

- The causes of growth in the DP flowmeter market
- The growth outlook for DP flowmeters through 2011
- Projected growth in multivariable DP flowmeters through 2011
- The importance of integrated DP flowmeters (those including a primary element integrated with a DP flow transmitter)
- To what extent orifice plates are being displaced by other primary elements

- The product improvements that are occurring in primary elements
- The speed at which e-business is growing as a distribution channel
- The features end-users are looking for in DP flowmeters
- The technological improvements that are occurring in DP flow transmitters, and how these are helping the DP flowmeter market hold its own against competing flow technologies
- What types of flowmeters are displacing DP flowmeters and why

Market Shares of the Leading Suppliers

This study identifies the market shares for the leading suppliers worldwide of DP flow transmitters and primary elements. Some DP flow transmitter suppliers also manufacture primary elements, and these are identified. However, there is another group of primary elements suppliers who do not manufacture DP flow transmitters. Both types of primary element suppliers are included in this study.

List of Companies Profiled

The following companies are profiled in this chapter:

- ABB Ltd.
- Air Monitor
- BIF
- Canalta Controls Ltd.
- Crane Manufacturing
- Den Holder
- Dosch Messapparate
- Emerson Process Management:
 - Bristol Divison
 - Daniel Division
 - Rosemount Division
- Endress+Hauser
- Euromisure
- Foxboro
- Fuji Electric
- Honeywell
- McCrometer
- Preso Meters (Division of Racine Federated)
- Primary Flow Signal
- SAMIL Industry
- Siemens
- Smar
- Solartron ISA
- The Measurement Company
- Thermo Fisher Scientific
- Veris
- Yamatake
- Yokogawa

We Have Divided this Study into Two Separate “Twin” Studies and Added More Segmentation

For those of you who want more segmentation, or who only need market data on DP flow transmitters or primary elements, we have just what you are looking for. We have divided this study into two separate studies, and have added more segmentation to each. The two twin studies are as follows:

- **The World Market for DP Flow Transmitters**
- **The World Market for Primary Elements**

The World Market for DP Flow Transmitters The World Market for Primary Elements

To give you more in-depth analysis, we've taken the original study and divided it in two. We then added even more segmentation to create two additional "twin" studies.

The World Market for DP Flow Transmitters and Primary Elements

Plus Added Segmentation, including:

Pressure Transmitters by Type
 MV, Absolute and Gage by Application
 Mass vs. Volumetric Flow
 DP Flow Transmitters by Mounting Type
 Smart vs. Conventional
 Smart by Communication Protocol

The World Market for DP Flow Transmitters

Plus Added Segmentation, including:

Orifice Plates by Type
 Pitot Tubes by Type
 Primary Elements by Fluid Type
 Primary Elements by Industry
 Primary Elements by Application
 Primary Elements by Sales Channel
 Primary Elements by Customer Group

The World Market for Primary Elements

The World Market for DP Flow Transmitters

The World Market for DP Flow Transmitters takes an in-depth look at the DP flow transmitter market. It includes previously unpublished segmentation that reveals new details about this market. This study includes the following segmentation:

Pressure Transmitter Shipments Worldwide by Type in Units and Dollars

- Multivariable
- Differential Pressure
- Gage
- Absolute

Multivariable Transmitters by Application

- Flow
- Level
- Process Pressure
- Other

DP Transmitters by Application

- Flow
- Level
- Process Pressure
- Other

Gage Pressure Transmitter by Application

- Flow
- Level
- Process Pressure
- Other

Absolute Pressure Transmitters by Application

- Flow
- Level
- Process Pressure
- Other

DP Flow Transmitters by Fluid Type

- Liquid
- Steam
- Gas

DP Flow Transmitters by Volumetric vs. Mass Flow

- Volumetric Flow
- Mass Flow

DP Flow Transmitters by Mounting Type

- Remote Seals
- Manifolds Only
- Primary Element Assemblies
- Other
- None of the above

DP Flow Transmitters by Industry

- Oil & Gas
- Refining
- Chemical
- Pharmaceutical
- Food & Beverage
- Pulp & Paper
- Metals & Mining
- Electric Power
- Water & Wastewater
- Other

DP Flow Transmitters by Smart vs. Conventional

- Smart
- Conventional

Smart DP Flow Transmitters by Communication Protocol

- HART
- Foundation Fieldbus
- Profibus DP
- Profibus PA
- Modbus
- Proprietary Digital
- Other

DP Flow Transmitters by Sales Channel

- Direct Sales
- Independent Representatives
- Distributors
- E-Business

DP Flow Transmitters by Customer Group

- End-Users
- OEMs
- Systems Integrators
- Engineers/Consultants

Reasons Why Sales of DP Flow Transmitters are Growing or Declining

Barriers to Growth for DP Flow Transmitters

The World Market for Primary Elements

The World Market for Primary Elements takes an in-depth look at the primary elements market. It includes previously unpublished segmentation that reveals new details about this market. This study includes the following segmentation:

Shipments of Primary Elements Worldwide by Type in Units and Dollars

- Orifice Plates
- Venturi Tubes
- Pitot Tubes
- Flow Nozzles
- Wedge Elements
- Other

Shipments of Orifice Plates by Type

- Concentric
- Conical
- Eccentric
- Integral
- Quadrant
- Segmental

Shipments of Pitot Tubes by Type

- Single Port/Single Phase
- Averaging/Multiport
- Annubar

Shipments of Primary Elements by Fluid Type

- Liquid
- Gas
- Steam
- Air

Shipments of Primary Elements by Industry

- Oil Production, Refining, or Distribution
- Gas Production, Refining or Distribution
- Chemicals
- Food & Beverage
- Pharmaceuticals
- Pulp & Paper
- Metals & Mining
- Electric Power
- Water & Wastewater
- Semiconductor
- HVAC
- Other

Shipments of Primary Elements by Application

Steam, cooling water, LNG, Natural gas, Process fluids (many applications listed)

Shipments of Primary Elements by Sales Channel

- Direct to End-Users
- Independent Reps
- Distributors
- E-Business

Shipments of Primary Elements by Customer Group

- End-Users
- OEMs
- Systems Integrators
- Engineers/Consultants

Daniel Bernoulli
says...

**My current theory is that
your business will improve
if you purchase this Flow
Research study today!**



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You have three studies to choose from!

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