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CORE STUDY:
The World Market for Multiphase Flowmeters,
2nd Edition

Module A:
The World Market for Watercut Meters

-- Overview --



Bergen, Norway (Photo by Flow Research)

www.FlowMultiphase.com

The World Market for Multiphase Flowmeters, 2nd Edition

-- Overview --

Publication Date: July 2016

Flow Research is conducting a new edition of our popular study on the worldwide multiphase flowmeter market. The primary goal is to determine the size of this flowmeter market in 2015. Forecasts through 2020 will be included.

This study has multiple objectives:

- To determine worldwide 2015 market size for multiphase measurement devices
- To determine worldwide 2015 market shares for multiphase measurement suppliers
- To forecast market growth for all types of multiphase flowmeters through 2020
- To identify the industries and applications where multiphase flowmeters are used, and to identify market growth sectors
- To provide a product analysis for the main companies selling into the multiphase flowmeter market
- To provide strategies to manufacturers for selling into the multiphase flowmeter market
- To provide company profiles of the main suppliers of multiphase flowmeters.

Rationale for Study

We did the 1st Edition of this study in 2012. This study was very popular, especially since it was the first study of its type and many people were eager to know about the market. Today, the situation is still very similar, since there have been many changes in the market. Some companies have dropped out of the market, but more companies have entered it. Multiphase flowmeters make a very critical measurement for anyone involved in oil and gas drilling, whether topside (on land), offshore, or subsea.

In our 1st Edition study, we included both dual phase and multiphase flowmeters. This time we are focusing entirely on multiphase flowmeters in the multiphase study. However, we have also been asked by suppliers to do a separate study on watercut meters. Watercut meters are an integral part of the oil and gas measurement business, and we believe that we are doing the first market research study on them.

Oil and gas well operators are discovering the economic and flow management benefits of technologies that provide reliable real time data on oil and gas flows. Increasingly, the complex demands of managing oil and gas production and storage require more sophisticated tools so that producers can improve operating margins in the highly competitive and volatile energy market.

Today's exploration and production environment is filled with potential investment, environmental, and personnel risks suppliers use new methods to drill in new areas, and to

profitably continue production in wells and fields once considered near depletion. This is particularly true in the offshore and subsea environments where much of today's exploration and production activity is occurring.

At the same time, suppliers have improved the accuracy and reliability of single and dual phase flowmeters through research and development. Multiphase flowmeters have promised improved well operation by eliminating the need for test separators and by providing diagnostic information on the wells. While many of these meters have delivered on their promise, others have fallen short. This is due mainly to the difficulty in making the measurement and to the early phase of product development.

There has been significant R&D investment in multiphase metering as companies compete within this ever-enlarging market. Important technical developments have taken place in the use of both radioactive materials and non-radioactive measurement technologies. Much development has focused on the elimination of radioactive materials from integrated design technologies as a way to reduce initial capital costs and ongoing safety concerns.

Meanwhile, world economies have essentially recovered from the depths of the 2009-2010 recession, but world oil and gas prices have since slumped. Multiphase flowmeter manufacturers are faced with introducing a premium product into a market that has demanded the product and its several operational benefits, but is also wary of its high cost and uncertain of its utility in the field. And, remarkably, some of the most promising product innovations have resulted from collaborations between well operators and multiphase flowmeter suppliers – a truly rare combination.

For these reasons and more we believe that this is an optimal time to report on multiphase metering.

Background of Study

The accurate measurement of three-phase fluids in the oil and gas industry has never been more important. There are profits to be made in efficiently depleting an existing well as opposed to exploring for new sources of oil and gas. The decision facing well operators here is in determining how and when to ramp up investments in time, personnel, and capital goods to extend an existing well's production.

Complicating matters is the fact that the acquisition of data to make intelligent assessments of well performance has often been difficult, while secondary recovery methods are costly. Multiphase flowmeters are designed to provide this data in real time, but have traditionally not been reliable enough to fulfill their role as sole data source.



*Weatherford's VSRD
Multiphase Meter*

Multiphase flowmeters are also designed to perform measurement functions traditionally provided by multiple equipment types (e.g., separators, watercut meters), and in a smaller footprint – a real value in the expanding offshore market. Furthermore, multiphase flowmeters can also be designed to be deployed on a portable basis or in use with manifolds where they can dynamically measure multiple wellheads. Increasingly, the complex demands of managing oil and gas reservoir assets require more sophisticated tools so that producers can improve operating margins in the highly competitive energy market.

The next few pages provide an outline of the essential issues that will be addressed upon the completion of this study, and how the results of this study may benefit you and your company.

Operating Principle

Multiphase flowmeters are generally found to have highest utility in the oil & gas industry. This value is largely based on their ability to simultaneously measure the proportional content of oil, water, and gas streaming at the wellhead. There are multiple technologies presently employed by manufacturers to satisfy this application, and this study explores all of them. The instrumentation is at present costly on a per unit basis, but much in demand due to its multiple benefits such as equipment displacement and real-time data availability. Suppliers today are concentrating their efforts to develop improved multiphase measurement techniques at a lower cost to end-users.

Key issues to be addressed in this study

This study addresses the following key issues in the multiphase flowmeter market:

- Factors causing the market to grow
- Growth in the use of multiphase flowmeters
- The future of multiphase in custody transfer applications
- The use of multiphase flowmeters in oil and gas applications
- The increased number of suppliers in the multiphase flowmeter market
- The history of supplier consolidations
- The importance of electromagnetic radiation technology and its future in this market
- New product and technology developments
- Growth strategies for multiphase flowmeter suppliers

Segmentation

The segmentation for this study is as follows:

Geographic Segmentation

*This study will provide **market size, market forecast and supplier market share** data worldwide and for the following geographic regions:*

- North America (United States and Canada)
- Western Europe
- Eastern Europe/FSU (Former Soviet Union)
- Mideast/Africa
- China
- Asia/Pacific (including India and Japan)
- Latin America (Mexico, Central and South America)

Multiphase Flowmeters by Well Location

- Topside (land-based)
- Offshore (platform of any type, ship-based)
- Subsea

Multiphase Flowmeters by Meter Location

- Wellhead (single wellhead)
- Manifold-mounted (for multiple wells)
- Mobile test/test trailer
- Clamp-on

Multiphase Flowmeters by Well Type

- New (initial installation)
- Existing (retrofit installation)

Multiphase Flowmeters by Configuration

- Integrated as a single unit
- A system of components (e.g., skid-mounted)

Multiphase Flowmeters by Application

- Fiscal monitoring (Custody Transfer)
- Allocation monitoring
- Reservoir/oil field monitoring
- Well testing
- Other applications



Norway has been a primary source of multiphase flowmeter research and development.



ABB's Vega Isokinetic Sampling (VIS) multiphase flowmeter

Strategies for Success

- Discussion of market forces at work
- Technical developments
- Strategic action perspectives
- Acquisitions and product partnerships
- Forming alliances to enhance product offerings



Market Size and Market Shares

- Worldwide
- By Region

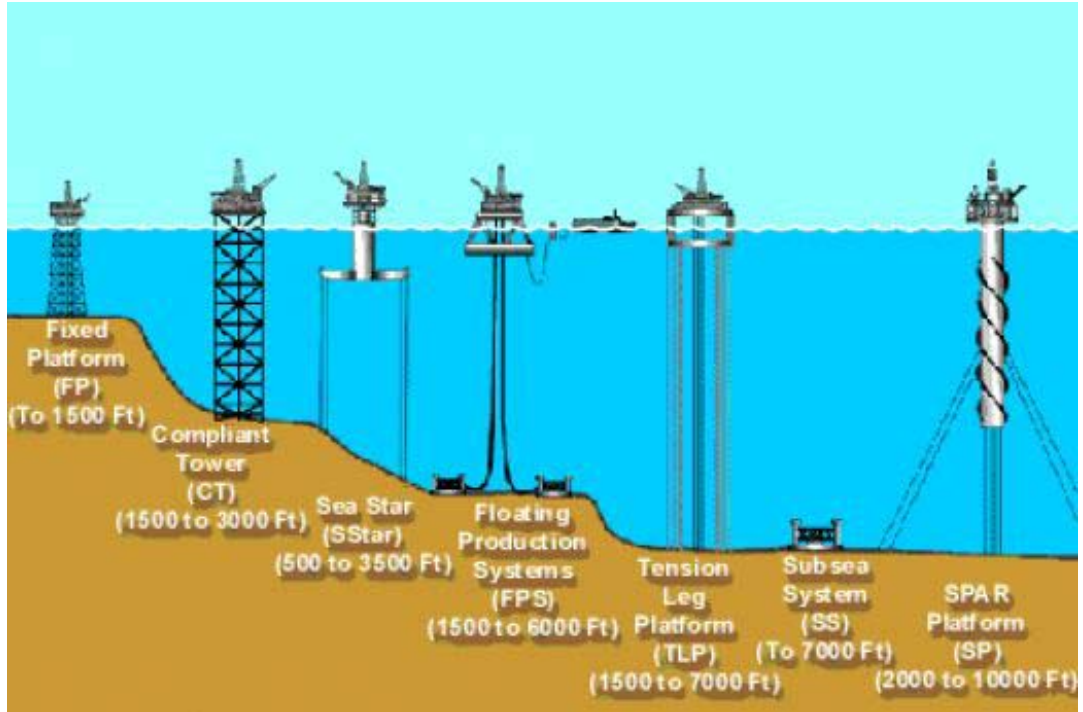
This study will also include data and important discussion of the following subjects:

- **Average pricing worldwide and by region**
- **Quantified growth rates worldwide and by region**
- **Positive growth factors and obstacles to growth**
- **Comprehensive product and technology analyses**

Company Profiles

Complete company profiles of the leading multiphase flowmeter suppliers are included. Below is a partial list of the companies profiled in this study:

- ABB
- Agar Corporation
- Emerson Process Management (Roxar)
- FMC Technologies (MPM)
- Haimo
- KROHNE
- Medeng
- OneSubsea
- Pietro Fiorentini
- Schlumberger
- Weatherford



Examples of offshore drilling platforms and where production equipment may be located



*Tønsberg, Norway, venue of North Sea Flow Measurement Workshop
photo by Flow Research*

Module A:

The World Market for Watercut Meters

-- Overview --

Publication: Q4 2016

Flow Research is doing a companion study to *The World Market for Multiphase Flowmeters, 2nd Edition*. The study is entitled, *The World Market for Watercut Meters*.

Watercut meters have been a mainstay within the oil & gas industry for decades. Well operators have always considered it essential to know the percentage of water in total liquids produced at the wellhead, and watercut meters have traditionally been their means to acquire that data.

The demand for better accuracy in the measurement of this critical ratio has been driven by three primary factors: 1) the need to have reliable data to effectively manage each well; 2) the need for predictive information to plan for secondary recovery investments; and, 3) the emergence of and growth in new field drilling techniques such as directional drilling and line pooling.

The three drivers cited above all exist within the context of an increase in more difficult offshore and subsea exploration & production, as well as the new plays in shale/sand oil and gas production. Today's depressed oil and gas prices – while not likely a long term concern – are evidence of the market volatility and economic peril that well operators will encounter in the short and medium terms.

And, in addition to user demands for improved product performance, watercut meter manufacturers are also beginning to see the encroachment of alternative technologies such as multiphase flowmeters. Multiphase flowmeters have held the promise of reducing the total number of components an operator needs to properly evaluate wellhead flows, and are closer than ever to fulfilling that promise.

Flow Research believes – for all of the reasons described above and more – that this is an optimal time to take a close look at the worldwide watercut meter market.

This study has multiple objectives:

- To determine worldwide 2015 market size for watercut meters
- To determine worldwide 2015 market shares for watercut meter manufacturers
- To forecast market growth for all types of watercut meters through 2020
- To identify the industries and applications where watercut meters are used
- To identify market growth sectors for watercut meters
- To provide a product analysis of the main companies selling into the watercut meter market
- To provide strategies to manufacturers for selling into the watercut meter market
- To provide company profiles of the main suppliers of watercut meters

Proposed Segmentation

The segmentation for this study is as follows:

Geographic Segmentation

*This study will provide **market size, market forecast and company market share** data worldwide and for the following geographic regions:*

- North America (United States and Canada)
- Western Europe
- Eastern Europe/FSU (Former Soviet Union)
- Mideast/Africa
- China
- Asia/Pacific (including India and Japan)
- Latin America (Mexico, Central and South America)

Use by Well Type

- New (initial installation)
- Existing (retrofit installation)

Use by Measurement Location

- Topside (land-based)
- Offshore (platform of any type, ship-based)
- Subsea

Watercut Meters by Technology Type

- Radio frequency
- Microwave frequency
- Infrared/Near Infrared Spectroscopy (NIR)
- Gamma ray
- Other

Watercut Meters by Application

- Well testing/well monitoring
- Reservoir monitoring
- Fiscal monitoring (associated with custody transfer)
- Allocation monitoring
- Tank testing
- Other



ZelenTech's ZT-100 I-Series insertion watercut meter



AGAR's OW-200 Series watercut meter

Watercut Meters by Line Size

- >0 - ≤2 inches
- >2 inches - ≤4 inches
- >4 inches - ≤6 inches
- >6 inches - ≤10 inches
- >10 inches

Watercut Meters by Sales Channel

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

Watercut Meters by Customer Type

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

Strategies for Success

- Discussion of market forces at work
- Technical developments
- Strategic action perspectives
- Acquisitions and product partnerships
- Forming alliances to enhance product offerings

Market Size and Market Shares

- Worldwide
- By Region



Weatherford's Red Eye subsea watercut meter



Cameron's NUFLO Series 1000 Watercut Monitor

Company Profiles

Complete company profiles of the leading watercut meter manufacturers are included. Below is a partial list of the companies profiled in this study:

- Agar Corporation
- Cameron Measurement Systems (NUFLO)
- Emerson Process Management (Roxar)
- EESIFLO International
- FMC Technologies
- M-Flow Technologies Ltd.
- Phase Dynamics
- Weatherford International

Founding Sponsorships

We offered the opportunity for companies to become Founding Sponsors of this study. Benefits of being a Founding Sponsor include being able to participate in determining study scope and direction, being sent regular updates on study progress, and receiving a favorable discount pricing package. The Founding Sponsor program is explained for your consideration later in this document.

Research Team Background

Dr. Jesse Yoder is President of Flow Research Inc., a company he founded in 1998. Dr. Yoder has 28 years of experience as a writer and an analyst in process control and instrumentation. Since 1990, he has written more than 180 market research studies, most of them regarding flow and instrumentation. Dr. Yoder has also written more than 250 articles on flow and instrumentation for trade journals. Links to many of these can be found at www.flowarticles.com.

Belinda Burum, Vice President, worked in journalism and advertising before entering high tech 18 years ago as a writer, marketing communications manager, and customer references consultant. She joined Flow Research in 2002, and has worked on many projects, studies and publications.

Norm Weeks, Senior Market Analyst, joined Flow Research in 2004 after a 24-year stint with Verizon. Norm's previous experiences include serving as Director of the Urban Fellows Institute in New York, and being a Customer Services manager at Automatic Data Processing. At Verizon, Norm specialized in creating innovative solutions for national and international enterprises, introducing new products and lifecycle management, and product marketing. At Flow Research, his contributions in development, research and writing have been significant to studies, custom projects, White Papers, and Worldflow's *Energy Monitor* and *Market Barometer*.

Leslie Buchanan, Research Associate, joined Flow Research in March 2010. She assists with research and writing for Flow Research studies and publications, develops and implements standards for publication formats, serves as a customer liaison, and manages the contacts database.

Nicole Riordan, Executive and Marketing Assitant, joined Flow Research in 2009. She provides valuable assistance with many functions in the office, and heads our marketing and direct outreach efforts.

Vicki Tuck, Administrative Assistant, joined Flow Research in June, 2012. She has experience in both the fast-paced law firms of Boston, and in various nonprofit organizations. In addition to administrative support, she also collects news for Flow Research publications.

Christina Glaser, a Research Analyst, is a seasoned software programmer, systems architect, and developer with significant website experience. In addition to her technical talent, she brings significant customer savvy, with clients that have ranged from Staples to Microsoft.

Rich West, Research Associate, joined Flow Research in 2014 and has had an immediate impact in customer service relations and media administration. He also provides updates and input to manufacturer databases that are maintained for a variety of research purposes.

Recent and Currently Scheduled Flow Research Studies

Websites

New-Technology Flowmeter Studies

The World Market for Coriolis Flowmeters, 5 th Edition	www.flowcoriolis.com
The World Market for Magnetic Flowmeters, 6 th Edition	www.flowmags.com
The World Market for Ultrasonic Flowmeters, 5 th Edition	www.flowultrasonic.com
The World Market for Vortex Flowmeters, 5 th Edition	www.flowvortex.com
The World Market for Thermal Flowmeters	www.flowthermal.com
The World Market for Mass Flow Controllers, 2 nd Edition	www.flowmfc.com

Traditional Technology Flowmeter Studies

The World Market for Pressure Transmitters, 4 th Edition	www.worldpressure.com
The World Market for Positive Displacement Flowmeters, 2 nd Edition	www.flowpd.com
The World Market for Turbine Flowmeters, 2 nd Edition	www.flowturbine.com

Emerging Technology

The World Market for Multiphase Flowmeters, 2 nd Edition	www.flowmultiphase.com
Multiphase: Module A: The World Market for Watercut Meters	www.flowmultiphase.com

Mass Flow Controllers

The World Market for Mass Flow Controllers, 2 nd Edition	www.flowmfc.com
The World Market Update for Mass Flow Controllers	www.flowmfc.com

Cross-Technology Flowmeter Studies

Volume X: The World Market for Flowmeters, 6 th Edition	www.flowvolumex.com
Volume X: Module A: Strategies, Industries, and Applications	www.flowvolumex.com
The World Market for Natural Gas and Gas Flow Measurement, 3 rd Edition	www.gasflows.com
The World Market for Liquefied Natural Gas (LNG)	www.flowlng.com
The World Market for Oil and Oil Flow Measurement	www.oilflows.com

Calibration

Core Study: Worldwide Gas Flow Calibration Facilities and Markets	www.flowcalibration.org
Module A: Worldwide Liquid Flow Calibration Facilities and Markets	www.flowcalibration.org

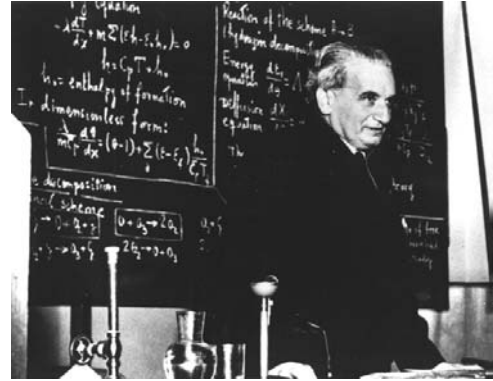
The above flow studies and others are described at www.flowstudies.com

Besides writing and publishing studies of this type, Flow Research specializes in user surveys that include a detailed analysis of customer perceptions. In addition, Flow Research provides quarterly updates on the flow and energy industries in the **Market Barometer** and the **Energy Monitor**. The **Energy Monitor** analyzes the current state of the oil & gas, refining, power, and renewables industries, and the implications for instrumentation suppliers. Both publications are part of the Worldflow Monitoring Service. More details are available at www.worldflow.com.

For more information on Flow Research, please visit our website at www.flowresearch.com.



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Theodore von Karman

The Flow Research Founding Sponsor Program

To produce studies that most closely match our clients' needs, Flow Research instituted the Founding Sponsor Program. This program enables companies who wish to participate at a high level in a study's research to influence its scope and segmentation. In addition, Founding Sponsors receive regular updates from Flow Research on study progress, and receive a significant discount on the regular price of the study.

Procedure: Early in the planning phase of a study, Founding Sponsors receive a proposal that includes the proposed segmentation. Founding Sponsors can propose additional segmentation, and can also suggest changes to the proposed segmentation. While the decision to adopt particular segmentation ultimately lies with Flow Research, and is based on input from all contributors, we will do our best to accommodate the specific needs of each of our clients.

During the research phase of a study, Flow Research will issue regular reports that provide updates on the progress of the research. These reports will be sent to Founding Sponsors, who are then invited to provide any additional input or comments into the study.

Being a Founding Sponsor requires making an early commitment to purchase the study. However, in return, Founding Sponsors receive a significant discount off the regular price of the study. Payment can be made either in one amount at the beginning of the study, or split into two, with the second payment due upon delivery of the study.

For additional details, or to find out how the Founding Sponsor program applies to any particular study, please contact Flow Research. We look forward to working with you!

If you have any questions about the Founding Sponsor program, please contact Norm Weeks at +1 781 245-3200, or norm@flowresearch.com.

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Why Flow Research?

- We specialize in flowmeter markets and technologies
- We have researched all flowmeter types
- We study suppliers, distributors, and end-users
- Our worldwide network of contacts provides a unique perspective
- Our mission is to supply the data to help your business succeed

www.FlowMultiphase.com