



Flow Research, Inc.
27 Water Street
Wakefield, MA 01880
United States
+1 781-245-3200
+1 781-224-7552 (fax)
www.flowresearch.com

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
www.WatercutMeters.com

The World Market for Multiphase Flowmeters, 2nd Edition

— Overview —

Publication Date: July 2016

Flow Research has conducted a new edition of our popular study on the worldwide multiphase flowmeter market. The primary goal was to determine the size of this flowmeter market in 2015. Forecasts through 2020 are included.

This study had 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 focused entirely on multiphase flowmeters in the multiphase study. However, we had 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 have done the first market research study on them.

Oil and gas well operators have been 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 been 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 had since slumped. Multiphase flowmeter manufacturers have been faced with introducing a premium product into a market that had 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 it was 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 are addressed in 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 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 new product and technology developments
- Growth strategies for multiphase flowmeter suppliers

Segmentation

The segmentation for this study is as follows:

Geographic Segmentation

This study provides 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

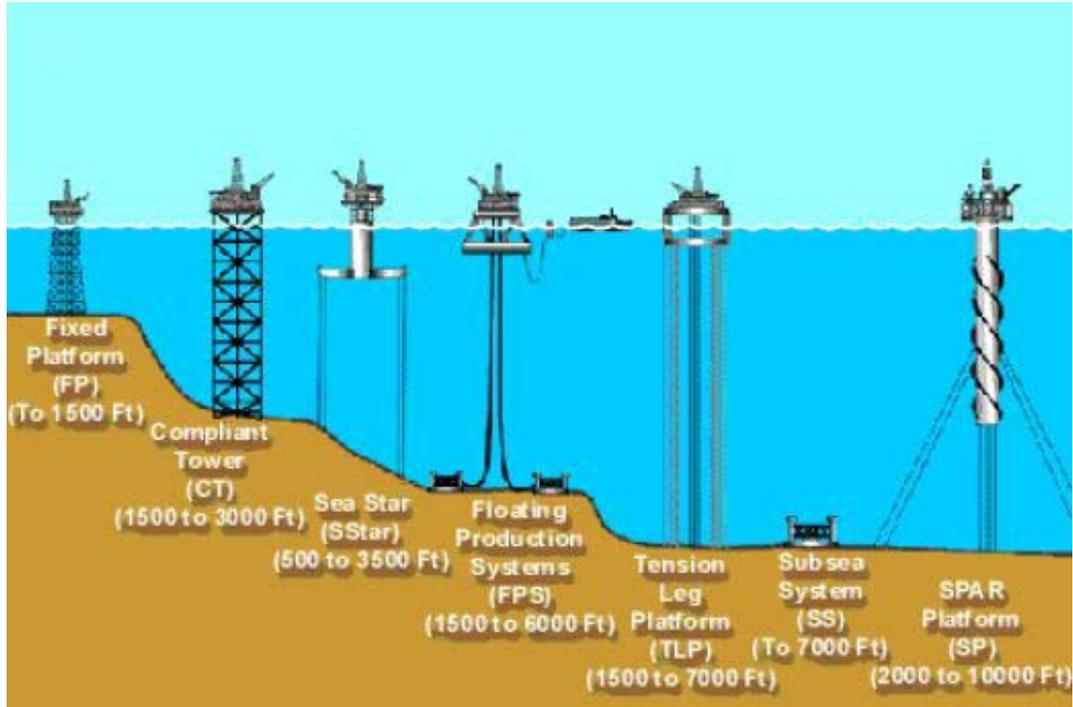
This study will also include data and important discussion of the following subjects:

- **Average pricing worldwide and by region**
- **Quantified growth rates worldwide and by region**
- **Growth factors and limits 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 Date: April 2017



Flow Research has done 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 drilling techniques such as horizontal drilling.

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 recovering oil prices are a reminder of the market volatility and economic peril that can significantly impact well operators.

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.

This study has multiple objectives:

- To determine worldwide 2016 market size for watercut meters
- To determine worldwide 2016 market shares for watercut meter manufacturers
- To forecast market growth for all types of watercut meters through 2021
- 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

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)



AGAR's OW-200 Series
watercut meter

Total Shipments of Watercut Meters

Total revenues and total units, worldwide, and revenues and units by geographic region.

Average Selling Prices of Watercut Meters

Worldwide and by geographic region.

Shipments of Watercut Meters by Technology

Revenues and units, worldwide and for each geographic region.

- Capacitance
- Microwave
- Near Infrared

Shipments of Capacitance Watercut Meters

Revenues and units, worldwide and by geographic region.

Shipments of Microwave Watercut Meters

Revenues and units, worldwide and by geographic region.

Shipments of Near Infrared Watercut Meters

Revenues and units, worldwide and by geographic region.

Shipments of Watercut Meters by Application

Revenues worldwide and for each geographic region.

- Well testing / Well monitoring
- Allocation Monitoring
- Custody Transfer
- Truck / Rail / Marine loading / unloading
- Other



Weatherford's Red Eye subsea watercut meter

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

- **Average pricing worldwide and by region**
- **Growth rates worldwide and by region**
- **Growth factors and limits to growth**
- **Product and technology analyses**

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

Company Profiles

Complete company profiles of the leading watercut meter manufacturers are included.

- | | |
|-----------------------|---------------------------------|
| • Agar Corporation | • FMC Technologies: Invalco |
| • AMETEK: Drexelbrook | • Phase Dynamics |
| • Argosy Technologies | • Pietro Fiorentini |
| • Emerson: Roxar | • Weatherford International Ltd |

Flow Research Team

Dr. Jesse Yoder is President of Flow Research Inc., a company he founded in 1998. Dr. Yoder has 30 years' experience as a writer and an analyst in process control and instrumentation. Since 1990, he has written more than 200 market research studies, most of them regarding flow and instrumentation. Dr. Yoder has also written more than 280 articles on flow and instrumentation for trade journals. Links to many of these articles can be found at www.flowarticles.com. He has also written two books, and holds a patent for a flowmeter.

Belinda Burum, Vice President, worked in journalism and advertising, then in high tech 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 November 2004 after 24-years with Verizon specializing in innovative solutions for major enterprises, introducing new products and lifecycle management strategies, and product marketing. He also served as Director of the Urban Fellows Institute in New York. At Flow Research, he is involved in project development, research, analysis and writing. In addition to working on studies, custom projects are a specialty. He also contributes to White Papers, Worldflow and other publications.

Harry Lund, Sales Director, joined Flow Research in October 2016. He has 45 years experience in the flow measurement industry with several US and international corporations. From beginning as a technical writer, he advanced through communication systems, application engineering, and product management to VP Sales, Service, and Marketing. At Flow Research, his experience and skills with people, products and the flow measurement business world are a valuable resource for our customers and us. Harry also has a forte for formulating strategies to enable companies to compete more effectively in the marketplace.

Leslie Buchanan, Publication Production Associate, and Research Assistant, joined Flow Research in March 2010, with skills from a variety of work and life experiences. Early on, she worked on the database, customer contact, and publication formats. She became increasingly involved in many capacities with Flow Research studies, Worldflow and other publications.

David Goldstein, Business Analyst, joined Flow Research in September 2016. He has an MBA from Boston University and 30 years of professional experience including various management positions in Sales and Marketing with consumer product companies. David developed products and programs for customers as large as Wal-Mart and as small as independent corner drug stores. At Flow Research, he combines his market research and business analyst skills with his astuteness and organizational abilities to assist with research and writing for studies and projects.

Victoria 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. She handles a variety of office functions – essential to keep any business running – as well as assisting in other ways, including the contacts database and news for the Worldflow publications.

Christina Glaser, Website Design & Maintenance, joined Flow Research in October 2010. She is a seasoned software programmer, systems architect, and developer with significant website

experience. At Flow Research, she took on the major role of refreshing, improving, organizing and maintaining our many company websites, also gathering news content for some.

Recent and Currently Scheduled Flow Research Studies

Websites

These studies and others can also be found at www.flowstudies.com

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, 2 nd Edition	www.flowthermal.com

Traditional Technology Flowmeter Studies

The World Market for Pressure Transmitters, 4 th Edition	www.pressureresearch.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
Module A: The World Market for Watercut Meters	www.watercutmeters.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

Flow 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

Temperature Sensors Studies

The Market for Temperature Sensors in the Americas, 3 rd Edition	www.tempresearch.com
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Level Measurement Devices Studies

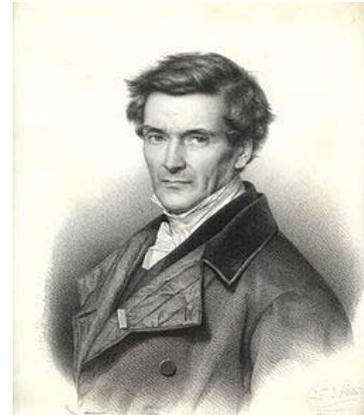
The World Market for Level Measurement Devices	www.levelresearch.com
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Besides writing and publishing studies of this type, Flow Research specializes in user surveys that include a detailed analysis of customer perceptions. In addition, Flow Research 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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 27 Water Street
 Wakefield, MA 01880
 United States
 [1] 781 245-3200
 [1] 781 224-7552 (fax)
www.flowresearch.com



Gaspard-Gustave de Coriolis

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
www.WatercutMeters.com