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For Immediate Release

New Flow Research Study Finds Thermal Flowmeters Capitalize on Growth in Gas Flow Measurement

Wakefield, Massachusetts; July 11, 2023 — Thermal flowmeters are riding the surge of gas flow measurement in both renewable and traditional natural gas applications, according to a new study from Flow Research, *The World Market for Thermal Flowmeters, 3rd Edition* (www.flowthermal.com). The study found that the worldwide thermal flowmeter market totaled $190 million in 2022 and projects that it will increase at a compound annual growth rate (CAGR) of 4.7 percent per year through 2027. The study expects multipoint thermal meter revenues to grow faster than inline and singlepoint insertion types. It identifies landfill gas and biogas recovery as the fastest growing applications for thermal meters, with biomass fermentation and recovery growing second fastest.

"The future of gas measurement is extremely promising," says Dr. Jesse Yoder, president of Flow Research. "Natural gas is no longer just a bridge to renewables, it is a renewable. As biogas and biogenic methane become more and more mainstream, new opportunities in gas flow measurement are multiplying, and thermal technology is well positioned to take advantage of that trend. Thermal meters aren't accurate enough for custody transfer measurement, but there are plenty of other applications in the energy chain where they are cost-effective and useful."

A Wide Range of Applications

Thermal mass flowmeter technology designs vary more by industry and specific fluid applications than most other types of meters. Important selection factors include the type of gas to be measured, low/high flow conditions, sensor material, approvals, measuring accuracy, available diameters, and pressure and temperature tolerances.

Thermal flowmeters, used almost entirely for air and gas flow measurement, are found in a wide range of industries, including oil & gas, chemical, power, and water & wastewater. Applications include flare stacks, nuclear plants, automobile testing lines, natural gas submetering, gasification plants, and compressed air systems. They are used in both traditional and renewable natural gas measurement, including biogas production and creating synthesis gas (syngas).

Frontiers in thermal flowmeter development

Thermal flowmeters are cost-effective and versatile, respond quickly, and excel at measuring flow at low flowrates. They offer value, high turndown ratio, cost-effectiveness in large line sizes, flexibility for a wide range of gases, and high repeatability.

One limitation of thermal flowmeters is that they are used almost entirely for gas flow measurement because of the slow response time involved in using the thermal principle on liquids. Thermal flowmeters need to be calibrated on the type of gas they are measuring, and they need to be calibrated periodically. Condensed moisture in the gas can reduce measurement accuracy, and changes in gas composition can affect measurement accuracy. These limitations are the focus of product development by many thermal suppliers.

A bright spot for thermal meters is multipoint meters, which traditionally have been used to measure flow in large ducts and stacks and are now being used in other applications and smaller line sizes. Greater accuracy can be derived from multiple measuring points. Other enhancements that also improve accuracy include flow conditioners, smart meters, and user-programmable meters that can accommodate changing gas requirements.

Today's thermal meters evolved from hot-wire anemometers

The roots of thermal flowmeters go back to the hot-wire anemometers that were used for velocity profile and turbulence research in airflow measurement in the 1960s. Hot-wire anemometers are

based on the principle that a heated wire cools as wind passes over it. The anemometer calculates the wind speed based on the heat loss of the wire. Hot wire anemometers have a quick response time but are too fragile for industrial environments.

Thermal flowmeters were first introduced for industrial applications in the 1970s after Dr. Jerome Kurz and Dr. John Olin developed an industrialized version of the hot-wire anemometer. Together they formed Sierra Instruments in 1973. Kurz formed Kurz Instruments in April 1977 and it became the first company to bring industrial thermal flowmeters to market. Fluid Components International (FCI), founded in 1964, developed flow switches to detect the flow of oil through pipes in the oil patch. In 1981, FCI created thermal flowmeters for measuring gas flow by adding more electronics to its switches. A second generation of suppliers appeared in the 1980s and 1990s.

Thermal flowmeters compute mass flow by measuring the effects of cooling on the flowstream, based on the principle that higher velocity flows result in greater cooling. Thermal meters introduce heat into the flowstream and measure how much heat dissipates using one heated sensor and a second sensor that measures the temperature of the flowstream.

The World Market for Thermal Flowmeters, 3rd Edition details market shares and the worldwide supplier market size for thermal flowmeters in 2022 and forecasts market growth through 2027. It also outlines the history and development of thermal flowmeters and their principle of operation, analyzes thermal meter technology, profiles significant supplier companies, and suggests market strategies for suppliers. The study also draws on in-person interviews with Dr. Olin, Dr. Kurz, and Bob Deane and Mac McQueen from FCI. This is the third edition of this study, with previous editions published in 2009 and 2017.

About Flow Research

Flow Research (www.flowresearch.com) is the only independent market research company whose primary mission is to research flowmeter and other instrumentation products and markets worldwide. Flow Research, founded in 1998 in Wakefield, Massachusetts, specializes in flow measurement devices, and conducts market research studies in a wide variety of instrumentation areas. These studies are developed through interviews with suppliers, distributors, and end-users.

Topics include all the flowmeter technologies – both new and conventional – as well as temperature sensors, temperature transmitters, level products, and pressure transmitters. The company has a special focus on the energy industries, especially on oil and gas production and measurement.

Dr. Jesse Yoder, founder and president of Flow Research, has written more than 300 articles on flowmeters and other instrumentation for technical publications and has authored four books, including a two-volume set, *Advances in Flowmeter Technology,* published by CRC Press in 2022 and covering *New-Technology Flowmeters* and *Conventional Flowmeters*.

For more information, visit http://www.flowresearch.com or call +1 781 245-3200.
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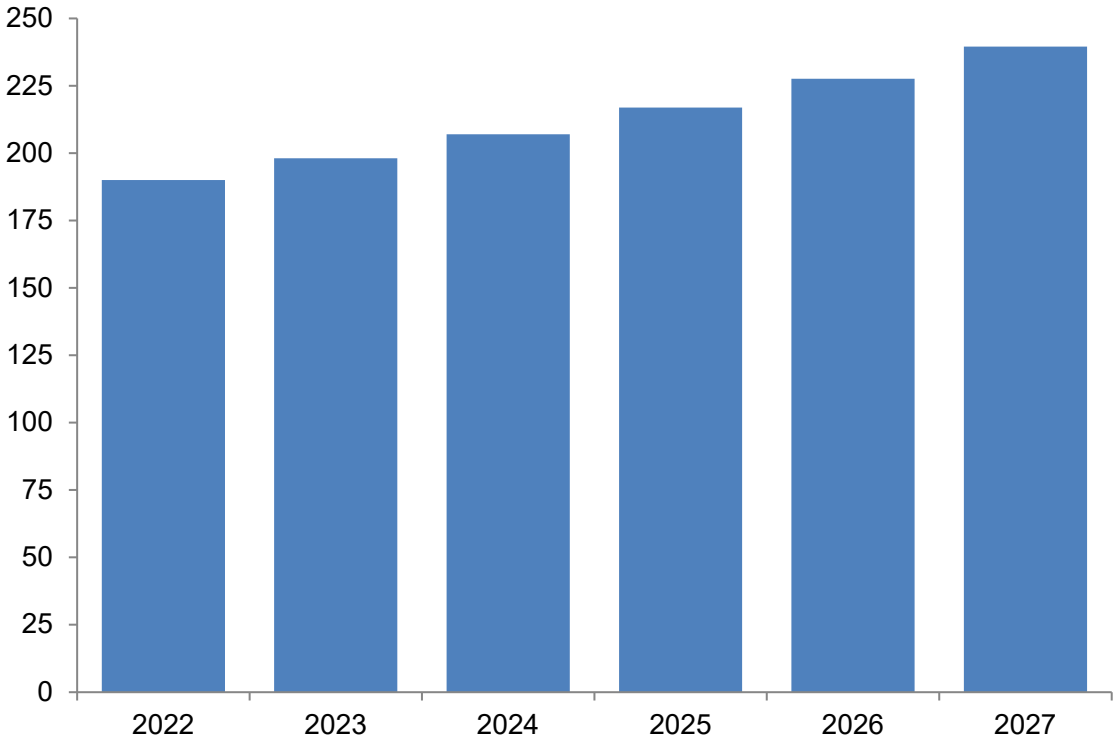
Total Shipments of Thermal Flowmeters Worldwide

(Millions of Dollars)



Compound Annual Growth Rate (CAGR) = 4.7%