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Mastering Liquid Metering: Overcoming the Challenges of Precision Batching

Titan Enterprises shares key insights to help engineers and operators navigate challenges of precision batching to ensure accurate measurements and smooth process operations.

Metering batches of liquids may seem straightforward at first glance - install a flowmeter in the product line, connect it to an instrument, control the measurement with on-board software, wire in a valve, enter your required volume, press a button and the right amount of liquid is dispensed into your vessel. However, real-world applications reveal a host of complexities that must be addressed to achieve precise and repeatable results.

Today's advanced process and liquid handling systems demand highly precise flow measurement. From adding water to food production mixers, dispensing flavourings to beer or cider at point of sale, to handling aggressive chemicals, even slight inconsistencies in system design can lead to inaccuracies, wasted product, or disrupted processes.

For batching systems, the critical factor is repeatability – ensuring the required volume is delivered consistently every time. To achieve this, ideally the system should maintain consistent process conditions, however, this is not always feasible. For instance, temperature fluctuations throughout the day can alter fluid viscosity and volumetric flow measurements. Similarly, a decrease in the feed liquid tank level supplying the process



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pump can reduce the dispensing rate, impacting the accuracy of the flow meter and the flow control valve. Therefore, as a starting point, batching system designs should aim to minimise as many variables as possible within a reasonable cost. Once this foundation is established, equipment such as flow meters, pumps, and valves can be selected to effectively compensate for any parameter variations.

Titan's [NSF-Approved Beverage Flowmeter](#) is designed specifically as a flow measurement solution for the drink dispensing market. With its exceptional repeatability, this low-cost device is installed around the world enabling industries to unlock higher yields, whether in beverage processing equipment or a bar tap wall in a restaurant.

Applications of Liquid Flow Measurement and Control in Batch Processes

1. Batching Ingredients in Juice Processing

Fruit juice production relies on accurate flow measurement of small quantities of ingredients to maintain product quality. Liquid flow meters monitor and control the dispense of water, flavourings, sweeteners, and other ingredients, ensuring the right proportions for optimal flavour and shelf life. High-precision flowmeters provide repeatable measurements, indispensable for maintaining product consistency.

2. Liquid Batch Dispensing in Beer Walls



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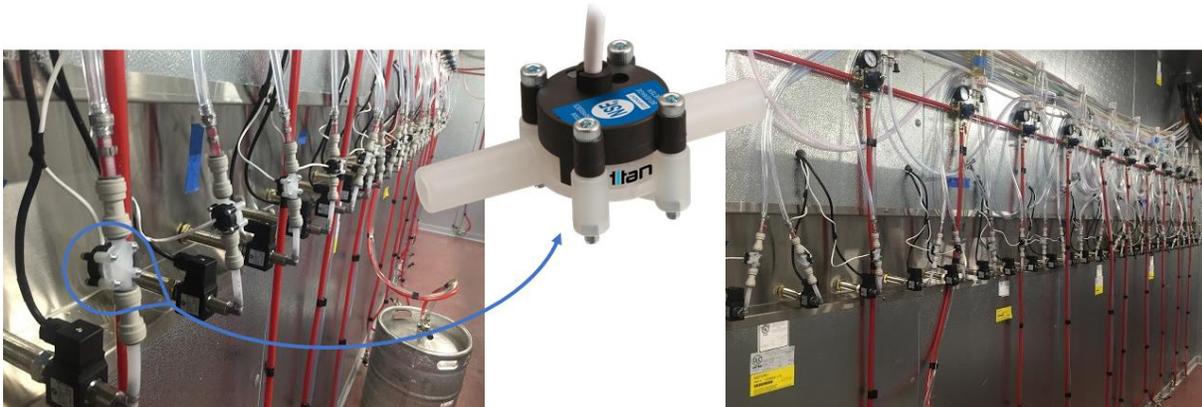
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Incorporated as part of an installed beer wall, the valves and flowmeters count and control the dispensing of beer at the bar taps. Titan's low-cost [NSF-Approved beverage turbine meters](#) are used by long-term American customer, a self-pour technology company, in their self-pour beverage walls, to accurately measure and control dispensed beer at self-serve counters.



3. Flow Switching in Bottling Operations

In bottling operations, reliable liquid flow indication prevents costly disruptions. Inline flow switches detect and manage critical scenarios such as product flow loss, ensuring efficient operations. Several food and drink manufacturers use Titan's [mini turbine flowmeters](#) as low-cost alternative flow switches. Flow switches also control carbon dioxide addition, halt bottling lines when necessary, and prevent refrigerant or chiller shutdowns, enabling maximum process efficiency.



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Critical Considerations for Liquid Batching Systems

1. System Repeatability:

Hydraulic stability is essential. Air pockets in the line can lead to dynamic flow situations, causing volumetric errors in delivery. Ensuring a hydraulically locked system eliminates such variability and enhances repeatability.

2. Stable Process Conditions:

Changes in pressure, temperature, or flow rate can push flowmeters into unpredictable operational zones, affecting calibration and accuracy. Maintaining consistent conditions is vital for reliable performance.

3. Pulsating Flow Management:

Selection of the pump type is important to avoid pulsating flow. Pulsation from certain pumps can disrupt flow rates, especially in aggressive chemical applications. Pressure regulators and pulsation dampers should be incorporated into flow systems to achieve a smooth and constant flow.

4. Strategic Placement of Flowmeters:

Positioning the flowmeter just before the dispense valve minimises fluid inertia and improves measurement accuracy.



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5. Understanding Flowmeter Resolution:

Low-resolution meters, such as those with one pulse per litre, may lack precision in small batch applications. However, going too high in resolution is an unnecessary expense when choosing equipment. Selecting the appropriate resolution for the task is critical for reliable performance.

6. Valve Selection and Calibration:

The type of shut-off valve used can impact delivery accuracy. Fast-acting solenoids are ideal for smaller pipelines, while larger setups benefit from solutions like multi-stage shut-off systems or “batch overrun compensation” programming to fine-tune results.

7. Optimising Electronic Flowmeters:

High-performance batching meters (such as [Titan’s ultrasonic Atrato® flowmeter](#)) can predict stop signals in advance, ensuring consistent delivery even at high speeds.

Enhancing Process Efficiency

By accounting for these factors during system design and commissioning, engineers can eliminate common pitfalls in liquid metering and achieve extremely good accuracy. And investing in the appropriate flow measurement technology that suits the application requirements will ensure that the batching system performs with precision and consistency.



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For further information on advanced flow measurement solutions for batch processes and control, visit www.flowmeters.co.uk or email sales@flowmeters.co.uk.

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