Chemical
Paint Production

Micro Motion®

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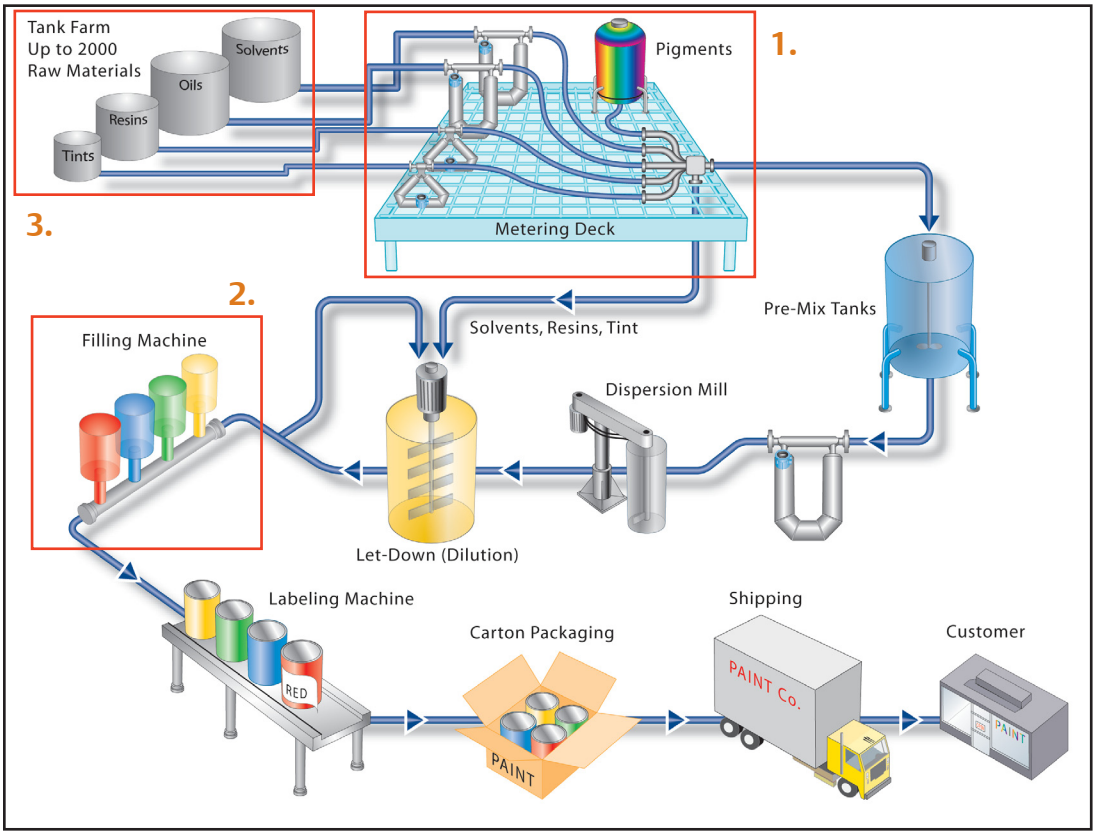
Overview of Paint Production Process

Paint is one major segment of the surface coatings industry, which also includes varnishes, enamels, lacquers printing inks and polishes. The production of paint is a relatively straightforward batch process that requires the mixing of various components such as tints, thinners, resins, oils and pigments. Physical means are used to completely mix the ingredients. The key to producing paint of the correct consistency and color is strict adherence to recipes that are determined through experimentation. Proper paint formulation centers on the specific application (recipe) requirements. These requirements are hiding power, color, weather resistance, washability, gloss, metal anticorrosive properties and consistency, as related to how they are applied (brushing, dipping, spraying, or roller coating). One major feature of these facilities is that they can easily have hundreds of different raw ingredients depending on the specific paint formulation. Thus, the tank farm is a very critical area of the plant.

Depending on the recipe, different combinations of raw materials will be mixed in a premix tank. Historically these tanks were installed on load cells, but most manufacturers have switched to flowmetering and a "meter deck" concept. Each main supply line will generally include a flowmeter; from the deck is another manifold of pipelines that direct the different ingredients to each pre-mix tank. The operator uses flexible hosing with quick disconnects to direct the tank farm ingredient to the proper pre-mix tank.

Dry pigments are also added to the premix tank. Batch masses are conveyed to the floor below where grinding and further mixing take place through a dispersion mill, which grinds down the pigments for proper color characteristics. Mixing is completed by recirculation.

After dispersion, the paint goes to the final letdown, where it is diluted. Tinting and additional thinning with solvents is done in an agitated tank. The liquid paint is strained into a transfer tank or directly into the hopper of the filling machine on the floor below. Centrifuges, screens or pressure filters are used to remove un-dispersed pigments. The paint is then packaged into cans, buckets or drums, labeled, packed, and moved to storage, each step being automated and fairly rapid.



Paint Production Process Diagram

The three key challenges in the Paint Production process are:

1) Consistent Recipe Formulation

2) Consistently Accurate Filling

3) Material Accounting

Details of these customer challenges are on the next page.

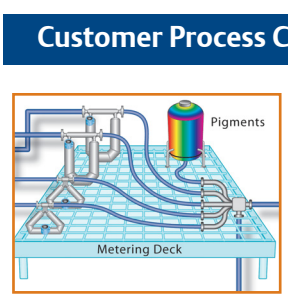
Customer Challenges Overview

Accurate, repeatable control of each recipe is the main challenge in a modern paint plant. Custom formulations require frequent draining and flushing of lines, created entrained air situations. Since most plants no longer use expensive and maintenance intensive load-cells, this adversely affects the ability to meter ingredients. Positive Dispacement (PD) meters have historically been used. Their volumetric measurements often do not adequately handle changes in viscosity or density, adversely affecting the batch recipe. Also, some additives are erosive, causing undue PD meter maintenance and unavailability.

Processing time in batch operations is another challenge, with 'time being money'. The faster the batch can be formulated, on-spec and the system readied for the next formulation, the greater the output of the facility.

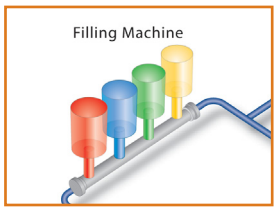
Finally, effectively batching the final product into containers (cans, buckets, drums) is a critical step. Paint is sold on a volume basis with legal quantities governed by national authorities. Slight over-filling results in product "giveaway" while under-filling violates legal requirements.

Customer Process Challenge #1 – Consistent Recipe Formulation



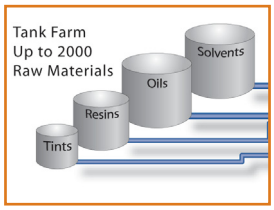
Challenge: Repeatable, consistent batches of paint - every batch must be like last year's batch. With a high degree of product customization, numerous ingredients, and process challenges such as "batch from empty" applications, every paint manufacturer faces these challenges. Reworking off-spec batches is both expensive and lowers output of the plant by needlessly tying up equipment. Mistakes in paint formulation can lead to expensive disposal and high costs, as well as trigger Environmental reporting.

Customer Process Challenge #2 – Consistently Accurate Filling



Challenge: While not as high volume as Personal Care products such as laundry soap (where millions of containers are filled per year), the accurate filling of paint containers is still a critical manufacturing step. Slight product giveaway is desired so as to avoid under-filling containers and incurring expensive rework. Due to the tendency of paint to entrain air, fast-fill operations face challenges in optimizing fill operations, especially in small containers (e.g. gallon or liter size).

Customer Process Challenge #3 – Material Accounting



Challenge: Many of the ingredients used in the manufacturing of paint are expensive, and wholesale prices of paint can exceed $10 per gallon (2€ per liter). Plant and tank-farm accounting for material usage and inventory is critical to determining both profitability as well as yield and process efficiencies.

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Improving Process Efficiency	Recommended Product Solution
Challenge #1 – Consistent Recipe Formulation **Customer Challenge:** Accurate, reproducible batching assures consistent paint formulation and minimizes waste and rework, increases equipment availability. **Solution:** Micro Motion meters can accurately and repeatably measure the various ingredients in any paint formulation. Variations in density, viscosity and erosiveness have no effect on modern Coriolis meters. As well, dramatically improved ability to "batch from empty" and handle greater amounts of entrained air in continuous processes boosts meter performance. Sensors such as F-Series, optimized for self-drainability improve any process where the line cannot remain full of fluid. Spare parts and spare meters required by the use of Positive Displacement (PD) meters become a thing of the past by switching to Coriolis. Resources can be better applied to optimizing the process, rather than maintaining meters with expensive moving parts. Spurious meter counts are not a concern with Micro Motion "no need to adjust the factory zero" meters, further boosting batch performance. In-situ meter verification has high value for the metering deck as operations do not need to be interrupted to verify meter accuracy.	**Micro Motion ELITE, F-Series, and T-Series Flow and Density**  **F-Series**  **Elite**  **T-Series**
Challenge #2 – Consistently Accurate Filling **Customer Challenge:** Maximizing efficiency of fill operations boosts profitability and increases throughput. **Solution:** Current Micro Motion meters offer enhanced "fast fill" capability, with up to 20 msec response time. Ideal for filling machines, they are also available with an automatic overshoot compensation (AOC) circuit. This AOC feature optimizes meter performance in filling service. Product giveaway can be reduced simultaneously with preventing waste and rework caused by under-filling the paint container and violating legal requirements	**Micro Motion F-Series with 1500 Filling & Dosing Transmitter and AOC** 

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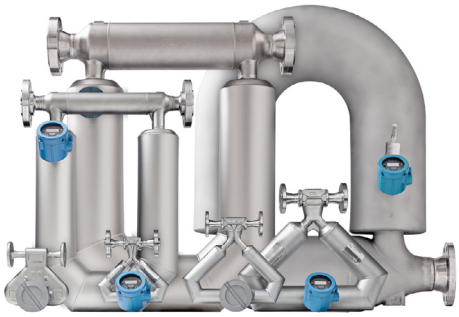
Improving Process Efficiency	Recommended Product Solution
Challenge #3 – Material Accounting	**Micro Motion ELITE**
Customer Challenge: Accounting for material usage facilitates process improvement and reduces environmental reporting.	
Solution: Micro Motion meters can accurately account for material flows, whether to the meter deck for final product, rework, or disposal. Paint ingredients vary in their rheological properties: Coriolis can accurately measure the true mass of fluid processed. As well, best-in-class density accuracy can provide information on ingredient purity or concentration.	

Resources and References:

White Paper (WP-00494) Load Cells versus Coriolis Mass Flowmeters in Batch Applications.

Shreve's Chemical Process Industries, Fifth Edition, George T. Austin, McGraw-Hill, pp 424-443.

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