Material Balance and Product Quality in Polypropylene Manufacturing Improved with Micro Motion Meters

RESULTS

- Improved product consistency
- Monitored feed rate and solids content with a single device
- Enhanced process control
- Minimized unusable product

APPLICATION

In the manufacturing of polypropylene, solid catalyst is mixed with solvent and injected into a polymerization reactor, where it is combined with propylene feed stock. The solvent is then extracted and recycled. The “dry” polymer is turned into pellets and injected with hot additives to produce the end product.

CHALLENGE

The primary reaction requires a precise mass balance between the catalyst and the propylene feedstock. If this balance is not maintained continuously as the components are combined, the polymer will be out of specification. Since the balance cannot be adjusted after the reaction occurs, an entire batch might have to be rejected. To achieve the correct continuous mass balance, it’s critical that the feed rate of the catalyst slurry and its solids content are consistent and accurate.

Most traditional flowmeter technologies are not well suited to this application. The metal-based solid catalyst can create maintenance difficulties with turbine or positive displacement flowmeters. The catalyst can also be damaged in some types of positive displacement meters. For these reasons, it is imperative to use a non-intrusive type of flowmeter in the application. A magnetic flowmeter is generally not suitable because the solvent carrier is not conductive.

Another challenge is controlling the injection of hot additives, which are combined with the polymer to meet customer requirements. Additives represent a very small quantity in proportion to the total process output, but injection rates must be properly controlled in order to maintain specification on the end product. The additives are typically maintained at temperatures between 100 °C and 150 °C and are viscous materials even at those temperatures, so they tend to coat the piping system.

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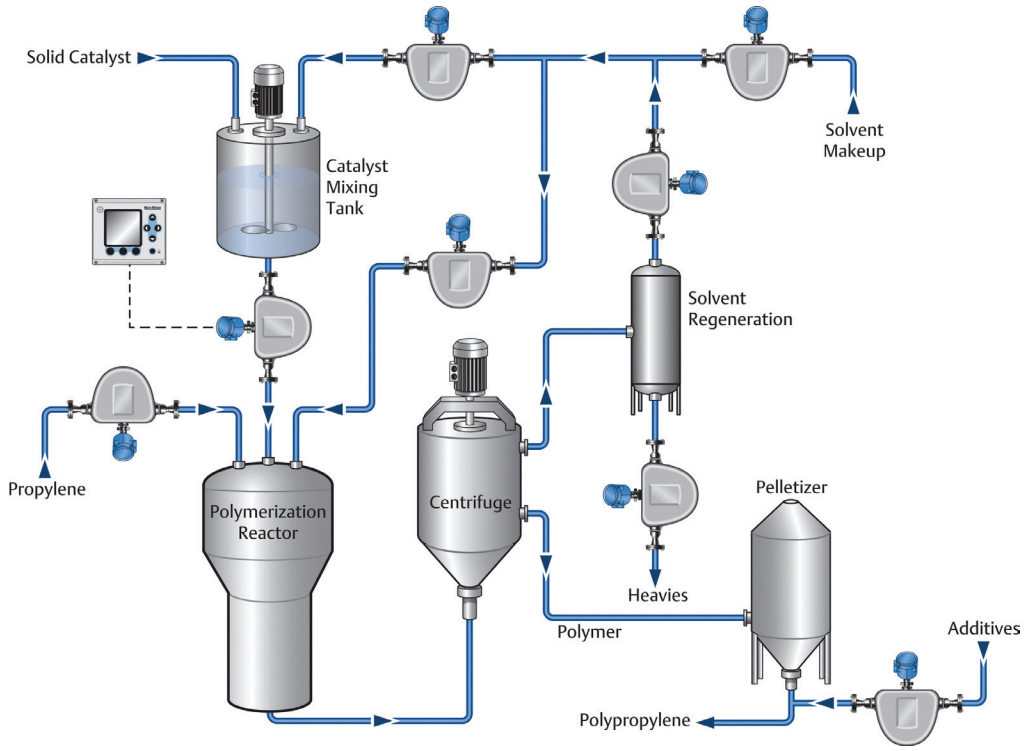
Positive displacement and turbine meters are not suitable to this application due to the interior coating of additives, especially since the material tends to solidify if the high temperature is not maintained. Velocity sensing devices, such as differential pressure meters will not give proper information when the tube walls become coated.

SOLUTION

Micro Motion® Coriolis flowmeters are ideally suited to this application for several reasons. Since they measure mass flow and density directly, critical process information on both the feed rate and solids content of the catalyst slurry can be monitored and controlled using a single device. The Coriolis sensor is non-intrusive and has no moving parts, so it is less affected by erosive properties of the solid catalyst. If erosion is a concern in the tubes, Smart Meter Verification can be scheduled to run routinely to monitor the health of the tubes and to verify that the flow calibration has not changed. Furthermore, because the measurement is mass-based moderate coating of the sensor walls will not impair precise control of additive feed rates.

Micro Motion meters can provide accurate mass flow rate data on the solvent makeup and regeneration, as well as the propylene feedstock. Resulting improvements in process control and evaluation capabilities represent a significant benefit in today's economic environment.



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