

asktheexperts**Controlling coating thickness: The case for investing in automation**

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Continuous coil coating lines consist of several independent and interrelated processes designed to take raw coils of steel or aluminum substrate through cleaning, chemical pretreatment, painting, baking and quenching. The net result is a transformation from an oily and dirty coil to a beautifully painted coil that will be used for appliances, building products or automotive applications.

At the heart of any coil coating line are the roll coaters that apply the various pretreatments, primers and paints. Roll coaters can be designed and manufactured for vertical or horizontal strip passage. Vast arrays of configurations are available, but the most common include the S-type, T-type, vertical and horizontal.

Maintaining a specific coating thickness is key to ensuring the end product displays the same color, gloss and luster from one coil to the next. Additionally, it ensures that the product will perform as it should when subjected to subsequent operations such as roll forming, bending and drawing. Controlling the coating thickness as close to the minimum allowable tolerance is another significant advantage, because it can greatly improve cost competitiveness and provide savings in raw material costs.

Traditional coil coating lines rely heavily on the coating machine operators to make adjustments in nip pressures in an effort to maintain proper coating thickness. Due to the chemistry and physics of the coating process, coating rolls tend to swell as they absorb solvents or heat up due to friction. These changes in roll diameter require manual adjustment of the coating roll nip force by the operator to compensate for the change in pressure that will subsequently change the thickness of the applied coating.

New technology has vastly improved the ability to maintain coating thickness accurately with unmatched precision. Load cells determine nip pressure and, via software and automation, the roll forces are constantly monitored and automatically adjusted to maintain a set nip force.

Advanced coater head control systems (CHCS) significantly improve operator efficiency and provide superior quality in coating applications. The CHCS is specifically designed for those coil coaters whose high process speed, stringent quality control specifications and/or numerous coater setups exceed the capability of "conventional" (i.e. manually adjusted) coaters. Standard gearbox head adjustments are replaced with computer-controlled roll positioning, allowing greater accuracy, faster and repeatable coater setups, and continuous feedback and monitoring of the coater.

The standard head adjusting gearboxes are replaced with



precision electro-hydraulic actuators capable of exerting 5000 lbs.

(2268 kg.) of force. Load cells with that capacity are incorporated into the roll support frames to provide accurate force feedback to the CHCS controller.

High-resolution color graphics, user-friendly menus and displays provide the machine operator with a straightforward approach to improving coating quality and consistency. The graphic display shows the coater configuration, as well as the force and position of all controlled rolls on the operator screen. The CHCS allows operators to save coater setups for future use, thereby simplifying setup, reducing downtime and adding more consistent control to the coil coating process.

Run time data can be viewed in real time, and historically trended in a graphical format to ensure the coater setup remains constant throughout a complete run. Position and force set points, and data can also be shared in real time with a customer-provided PLC-based line control system, if compatible.

All controls have been designed for ease of operator use and are arranged in a simple, logical sequence, minimizing operator setup time and optimizing production throughput.

Rapid and accurate head setup before the start of the coating process allows immediate production-quality coating upon engaging the head with the strip. The controller also saves the setup for future use, again providing the user with faster, repeatable coater preparation.

Coating roll position and force are constantly monitored and controlled, giving greater consistency in thickness and appearance, and allowing users the ability to minimize coating tolerances resulting in material savings.

Coil coating has often been referred to as black magic due, in large part, to relying on operators making adjustments to the roll coaters based on "feel" and experience. Through the use of repeatable, controlled and accurate pressure control, some of the magic can be transformed into a science that will improve quality and consistency, and reduce rejected coils. This technological advance represents one of the most cost-effective tools available to coil coaters today and should be a major consideration when reviewing coater capabilities. ■

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