

The IPSS 3D Process™

Nucor Hickman's Coiling Temperature Control

Discovery Phase

Nucor Steel needed better process modeling software to generate the proper runout table spray pattern presets (headers in the laminar flow sprays) to use to control the coiling temperature at their Hickman hot strip mill. They also needed the process model to have the capability to adapt to future products and cooling strategies.

Nucor also wanted the automation software be installed and commissioned with minimal production impact (interpreted as none) and all within a four month time frame.

Using Nucor's basic performance and requirements guide, we customized our control package to meet their needs. Nucor process control people were intimately involved with the evaluation and recommendation of the various technologies required, along with the interface to the existing system and the supply of the modified PLC and HMI interface.

Development Phase

Using our discovery and Nucor's preferences, we based the new control system on a combination of explicit equations and tabular, learned factors to accurately generate the header selection patterns and sensitivity factors. We wrote all the control system software in ANSI C. .

For our own testing and the Factory Acceptance Test, we developed an extensive first-principles simulator to match current production data. We used the actual computer, PLC and HMI from site, which was 'loaned' to us from the Nucor plant for this test. The Factory Acceptance Test was completed three months after the project began.

Deployment Phase

We tested our control software as much as possible using our simulator and actual mill data, shadowing the existing control. Nucor provided an easy means to switch between the old and new control systems. On several downturns, we tested the new control activating the sprays, while also testing the spray valve timing. We shadowed the mill for one month (during the month of December, which we will avoid in the future). We switched over to the new control during the first week of January and the first week's performance exceeded that of the old control. By the end of January, we exceeded the performance requirements.