



# STEELMAKER'S PLAYBOOK

**B**ar Mill No. 1 upgrade: In 2003, \$31 million was spent to improve Nucor-Darlington's Bar Mill No. 1. Danieli was contracted to upgrade the finishing end, including completely replacing the cooling bed, stacker and finishing facilities. Rockwell provided the drives and the ControllLogix control systems.

As much as possible, existing equipment was reused and in some cases relocated and/or integrated with the new systems. The goal of the upgrade was to generate production efficiencies, ensure product quality and enable very quick changeover times. Andy Munson, Nucor-Darlington maintenance manager, reports a 130% productivity improvement as a result of the finishing upgrade.

✓ **Bar Mill No. 2 upgrade:** In February 2004, Nucor announced that new intermediate and finishing stands were to be installed at Bar Mill No. 2. The \$19 million upgrade, which occurred in early 2005, took just four weeks to complete. Danieli provided the rolling mill upgrade, replacing the existing nine-stand horizontal intermediate finishing mill with a new, state-of-the-art 10-stand twist-free mill. Rockwell again provided the control systems and drives.

In keeping with Nucor's strategy, several existing components and drives were kept and all new machines were designed for expanded product range and productivity. This was a major upgrade aimed at increasing mill uptime and productivity. It would reduce stand changing time, mill set-up and cobble rate. This increased the throughput opportunity through more efficient operation from the mill utilizations gained.

✓ **Consteel process improvement:** Nucor-Darlington employs a continuous steel (Consteel) process that involves preheating scrap as it is sent down the conveyor to the electric arc furnace. The plant wanted to accelerate this process and reduce energy waste, but the melt shop was constrained by transformers dating back to 1993.

Nucor worked with ABB to implement a rectifier cooling system upgrade and unique transformer temperature monitoring that would automatically control the transformer load based on transformer temperature levels. The

upgrade increased the system rating and provided an approximately 11% increase in power to the DC electric arc furnace. It also decreased the tap-to-tap time, or the length of time to produce a heat, by 5% to 8%.

With this change, Nucor was able to squeeze more value out of the existing equipment rather than invest heavily in larger transformers and new electrical equipment. When Consteel was first installed in the melt shop in 1992, it was a 500,000 ton per year facility. Now, Nucor-Darlington is up to 900,000 tons per year with the same transformers installed more than a decade ago.

✓ **Environmental advancements:** Nucor-Darlington is very proactive on the environmental front and is constantly looking for ways to do things better, according to Munson. For example, the Consteel process reduced particulate emissions, and in 2000 the exhaust system was upgraded to better control fugitive emissions from the melt shop furnace. Also in that timeframe, a new zero-discharge water system was installed to control water and wastewater internally on the site, thereby protecting the public water supply.

In December 2000, Nucor Corp. entered into settlement with the Environmental Protection Agency (EPA) to resolve environmental noncompliance violations. The company is working diligently with the EPA, conducting testing, piloting certain pollution control technologies and implementing necessary corrective actions. It maintains an excellent relationship with state and local environmental authorities.

✓ **Ongoing improvements:** Additional upgrades at Nucor-Darlington, too many to list in their entirety, included adding nine Zenar cranes in the past three years; arc furnace modifications with help from SMS Demag; two major installations of Marley cooling towers; a continuous-cleaning sand filter from Parkson Corp. for the major water system; gravity ventilators from Moffitt Corp.; warehouse building materials from the Vucraft division of Nucor; and warehouse and other construction projects using materials from Nucor building systems and steel beams from Nucor Yamato Steel.