

## Alloy has ORNL on roll

By LARISA BRASS, brass@Knews.com  
December 9, 2005

A material developed at Oak Ridge National Laboratory has brought new life to the process used to manufacture steel — and it took only 20 years and between \$20 million and \$30 million.

Duraloy Technologies, a Scottsdale, Pa., company that makes equipment for the steel industry, has licensed from ORNL an alloy called nickel aluminide.

The company is using the material to produce large rolls that, lined up side by side in conveyors as long as a football field, are used to transport sheets of steel through mills' high-temperature treatment furnaces. And Duraloy is exploring other applications for the material.

The material — which combines metal with ceramic — is extremely strong, impervious to heat and resistant to the warping and buckling that requires frequent outages to repair and replace the rolls steel mills currently use.

"It's just a fantastic new alloy," said Tony Martocci, a steel industry consultant who worked with lab researchers to develop the furnace roll application for nickel aluminide. Martocci helped ORNL develop the technology when he worked for Pennsylvania-based Bethlehem Steel. The rolls were first tested at Bethlehem Steel's plant in Burns Harbor, Ind.

Martocci estimates the new materials will give steel furnace rolls, which typically last two to five years, a life of at least 10 years under heavy use.

The problem with the old rolls, he said, is that because of high temperatures in the furnaces where sheets of steel are treated, the rolls warp and bubble and can damage the final product.

As a result, steel plants must shut down production every couple of weeks to polish the rolls, costing the company in production, energy and labor.

After Bethlehem Steel installed in its furnace rolls developed by ORNL and built by Duraloy over a period of several years beginning in the mid-1990s, the furnace did not have to be shut down for two years, Martocci said. The company has been working on the technology with lab researchers for nine years.

"Certainly in man-hour savings, just in the people, you're saving probably one to two (employees) a year," he said.

Add in energy savings and production increases due to the lack of outages, and "you're into the hundreds of thousands of dollars a year easily on any of these counts. ? And that's just for one furnace," Martocci said.

But it wasn't so easy to begin with.

Two decades ago researchers at ORNL had developed a class of new alloys that were



PHOTOS SPECIAL TO THE NEWS SENTINEL

Duraloy Technologies licensed nickel aluminide from ORNL to make large rolls to transport sheets of steel that stand up to the heat of mills' high-temperature treatment furnaces longer than traditional rolls.

strong and became stronger as they were heated and resisted corrosion, said Peter Angelini, manager of the lab's industrial technologies program.

More importantly, the material didn't "cost the national debt" to create, he said, although it is about 25 percent more expensive than traditional nickel alloys rolls often used.

The problems were these: the new alloy was very brittle, it didn't weld easily and, therefore, it proved troublesome to manufacture.

Over the next several years, researchers worked to make the material ductile and able to weld. About three years ago, Bethlehem Steel began testing the new rolls, and now they're available to all manufacturers through Duraloy.

Roman Pankiw, vice president of engineering and quality for Duraloy Technologies, said the steel market is ripe for new technologies like nickel aluminide.

When the domestic market was hit several years ago with strong competition overseas, it was tough to get plants to innovate, he said.

"The economic situation was not good, so they weren't interested in adopting the technology for a few years," Pankiw said. "The steel industry has been through a big transformation in the past few years, and we see that the steel companies that are growing and progressing are early adopters of new technology. ? Most of the major steel mills are lined up right now (to buy the new rolls) as well as engineering firms that design furnaces."

Nickel aluminide also is being used to make other products, including trays to hold auto parts during heat-treating, radiant burner tubes for furnaces and forging dies.

The new technology provides a good example of how federally funded programs can aid private industry, said Ashok Choudury, who is with ORNL's technology transfer office.

He estimates about \$20 million to \$30 million in government funding has been invested in preparing the technology for market.

"The Department of Energy program really primed the pump," he said.

Business writer Larisa Brass may be reached at 865-342-6318.

Copyright 2005, KnoxNews. All Rights Reserved.