

# STEEL

## Project Fact Sheet



## CONTINUOUS CASTING/INSIDE ROLLING OF HOLLOW ROUNDS

### BENEFITS

- Promises potential energy savings of up to 200,000 barrels of oil per year if invention replaces current processes for pipe production
- Eliminates energy-consuming downstream processing
- Produces higher quality seamless pipe
- Lowers manufacturing costs and offers U.S. manufacturers the opportunity to regain market share from overseas competitors
- Process can be retrofit to existing machinery at moderate cost

### APPLICATIONS

This new technology is primarily applicable for steel industry manufacturers of pipe for the gas, oil, chemical processing, and power generating industries.

## CONTINUOUS CASTING AND INSIDE ROLLING OF HOLLOW ROUNDS SAVES ENERGY AND REDUCES PIPE PRODUCTION COSTS

A significant portion of steel produced in the United States is used for pipe and tubing, and half the steel pipe and tubing the Nation's economy consumes is imported from overseas. Pipe and tubing come in two varieties, welded or seamless. Users often prefer seamless pipe (it amounts to 50% to 60% of new pipe production) because it greatly reduces the chance of leaks. The oil and gas industries also prefer seamless pipe because its greater tensile strength improves the integrity and reliability of pipelines.

Conventional processes for manufacturing seamless steel pipe begin with cast solid rounds or ingots with a square cross-section, an energy and labor intensive method. A new process based on continuous casting and inside rolling of hollow steel rounds makes steel pipe and tubing more energy and cost efficient. The new technology consists of a system and equipment that continuously cast and hot work the inner annulus of hollow round steel cylinders. The result is a high-quality, seamless steel pipe or tubing product. Casting hollow cylinders directly eliminates both equipment and the reheat step from the old process, saving work and energy. The pipe and tubing created through this process have thinner walls, which lower transportation and handling costs for further efficiency and savings.

### CONTINUOUS CASTING OF STEEL



**A** new method for creating steel pipe and tubing combines casting and rolling of pipe into one process, reducing the amount of energy and labor required for production.



## Project Description

**Goal:** The goal of this project was to install a combination casting/hot rolling production machine in a pipe-producing mill to verify performance and product quality in a commercial facility.

Using the new technology, pipe manufacturers would produce hollow rounds by pouring steel into a cooled vertical mold that has an oscillating outer shell. As the cast steel solidifies at the inside and outside diameters, it proceeds out the bottom of the mold. Sprays then further cool the outer diameter. Inside the combination casting/hot rolling production machine, a cooled cylindrical mandrel (axle) is mechanically driven in a rolling pattern around the inner diameter of the cast round. Without slipping, the patented mandrel cools the cast round from the inside and concurrently hot works the steel to create a permanent, fine grain structure, which improves the mechanical properties of the product.

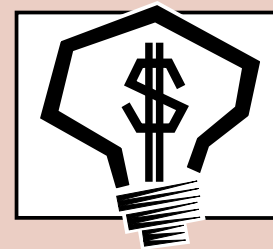
Schwarz Consulting is developing this new technology with the help of a grant funded by the Inventions and Innovation Program through the Department of Energy's Office of Industrial Technologies.

## Progress and Milestones

- Based on a successful bench test of the mandrel, the inventor is looking for a pipe production plant to install and demonstrate the technology.
- Protected by U.S. patent 4,546,816.

## Economics and Commercial Potential

- About 1 million tons of seamless pipe and tubing are produced in the United States each year. Besides improving product quality and saving labor, if all seamless pipe were produced using the continuous casting process, it is estimated that the process would save approximately 93,000 barrels of oil.
- Seamless pipe accounts for 50% to 60% of steel pipe and tubing manufacturing, a \$3 billion per year market. By saving time, labor, energy, and money, this technology could help United States manufacturers raise productivity and enhance competitiveness.



The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and conduct early development. Ideas that have significant energy savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

### PROJECT PARTNERS

Inventions and Innovation Program  
Washington, DC

Schwarz Consulting, Inc.  
Avon Lake, OH

### FOR PROJECT INFORMATION, CONTACT:

Gerhard (Gary) E. Schwarz  
Schwarz Consulting, Inc.  
33020 Lake Road  
Avon Lake, OH 44012-1405  
Phone: (440) 933-9340

### FOR PROGRAM INFORMATION, CONTACT:

Sandy Glatt  
Program Manager  
Inventions and Innovation Program  
U.S. Department of Energy  
1000 Independence Ave., SW  
Washington, DC 20585  
Phone: (202) 586-2079  
Fax: (202) 586-7114  
sandy.glatt@ee.doe.gov

Visit our home page at  
[www.oit.doe.gov](http://www.oit.doe.gov)

Office of Industrial Technologies  
Energy Efficiency  
and Renewable Energy  
U.S. Department of Energy  
Washington, DC 20585

## INDUSTRY OF THE FUTURE—STEEL

*Through OIT's Industries of the Future initiative, the Steel Association, on behalf of the steel industry, has partnered with the U.S. Department of Energy (DOE) to spur technological innovations that will reduce energy consumption, pollution, and production costs. In March 1996, the industry outlined its vision for maintaining and building its competitive position in the world market in the document, **The Re-emergent Steel Industry: Industry/Government Partnerships for the Future.***

OIT Steel Industry Team Leader: Scott Richlen (202) 586-2078.



DOE/GO-102000-0864  
Order# I-ST-400  
January 2000