

# STEEL

## Project Fact Sheet

### METHOD OF MAKING STEEL STRAPPING AND STRIP



#### BENEFITS

- Potential electricity savings of 13.2 million kWh/year for a line producing 35,000 tons of strapping
- Potential industry-wide savings of 169 million kWh/year
- Improved strength and quality due to the absence of microcracks
- Lower conversion costs and reduced costs associated with using rod produced from scrap steel
- Higher tensile strength allows for thinner strapping and lower material costs
- Lower processing and capital costs than conventional production
- Wide variability in the finished products' range of tensile strength and ductility

#### APPLICATIONS

The process represents a new approach to producing any steel strapping used for bundling and packaging items for storage or transport. In addition, this innovative new process can be used to produce cold-rolled strip steel, a basic raw material for automobile parts, hardware, office equipment, and many other products.

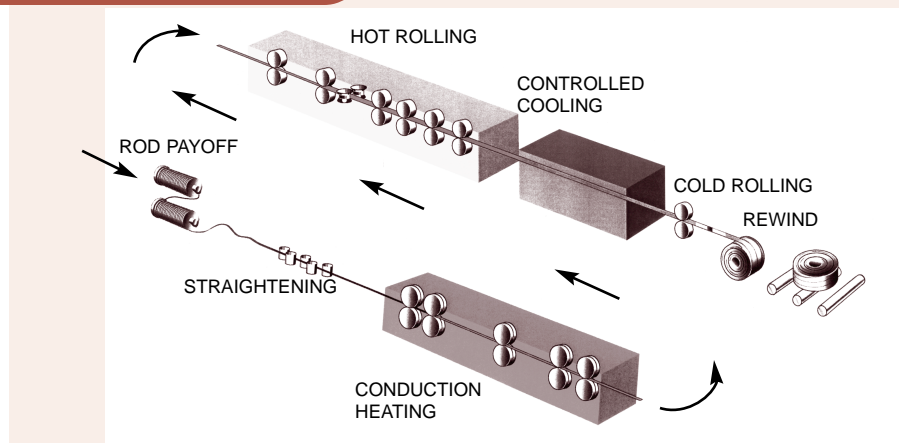
### A NEW CONTINUOUS PROCESS PRODUCES HIGH-QUALITY STEEL STRAPPING AND STRIP FROM ROD STOCK PRODUCED FROM SCRAP STEEL

There is a large movement in the American steel industry to utilize more recycled steel. Recycled steel melted in the electric arc furnaces of mini-mills is being used as the source of raw materials for an increasing number of products, largely due to its lower price.

However, conventional processes for producing steel strapping and cold-rolled strip steel restrict manufacturers from using more than 50% recycled steel. In addition, steel strapping and cold-rolled strip steel traditionally require many production steps. They are produced from primary steel that has been cast into slab, heated, rolled to achieve the desired thickness, and slit to the desired width. The slitting process produces microcracks along the edge of the strapping or strip, which reduce tensile strength.

A new continuous process produces steel strapping and 1/2" to 6" strip steel from the rod and strip stock made from scrap steel in mini-mills. The new process creates steel strapping and strip with improved strength and quality due to the absence of microcracks caused by the conventional slitting process. The finished product is cheaper because of the lower cost associated with using rod and lower conversion costs. In addition, the higher tensile strength of the product allows for thinner strapping.

#### STEEL STRAPPING AND STRIP



By using a continuous process to create steel strapping and strip steel, manufacturers will be able to increase the amount of recycled steel in their products while also increasing product strength.



## Project Description

**Goal:** The project goal is to develop computer models to simulate strip cooling and to determine final cost estimates for the creation of a pilot plant.

The process rolls rod stock of proper diameters and strip of appropriate thickness directly into strapping or strip of a desired width or thickness. The rod or strip is heated using electric resistance, which passes an electric current through the rod using roller contacts to supply the current. This innovation leads to substantial savings over conventional furnaces.

After the rod or strip stock is heated to an appropriate temperature, it is hot rolled and heat-treated. One of a variety of heat treatments can then be chosen to cool the product to produce specific structural constituents, such as pearlite, martensite, or bainite. A variety of properties can be developed offering a range of tensile strength and ductility. After heat treatment, the product may be either coiled or cold rolled.

Robert Reilly & Associates 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

- Current efforts are focused on the development and fabrication of a pilot plant model to substantiate claims and to evaluate various sources of heating.
- Protected by U.S. patent 5,542,995.

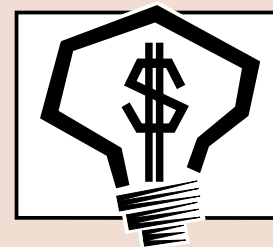
## Economics and Commercial Potential

The process offers the potential to completely replace the conventional method of steel strapping production, yielding a higher quality, less expensive product. It also offers the potential to produce and compete in the 1/2" to 6" width cold-rolled strip steel market. In addition to these markets, the inventor is evaluating the viability of supplying strip steel to reinforce pipelines and to armor fiber-optic cables.

Annual domestic production of steel strapping is between 500,000 and 600,000 tons. The total world market is 3 to 4 times this amount. Selling prices range between \$800 and \$1,000 per ton.

Approximately 1 million tons of strip to 6" width was produced in the United States in 1998, with prices ranging between \$600 and \$1,800 per ton.

The process has the potential to benefit the steel industry by increasing productivity, reducing product cost, and increasing the quality of steel strapping and strip. The major challenge now is to demonstrate the technology's capabilities to the industry's satisfaction. A plan for meeting this challenge has already been developed and initial steps are underway.



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

Robert Reilly & Associates  
Northfield, IL

## FOR PROJECT INFORMATION, CONTACT:

Robert Reilly  
Robert Reilly & Associates  
1050 Arbor Lane #203  
Northfield, IL 60093  
Phone: (847) 446-5860

## FOR PROGRAM INFORMATION, CONTACT:

Sandy Glatt  
Program Manager  
Inventions & 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-10099-850  
Order# I-ST-719  
November 1999