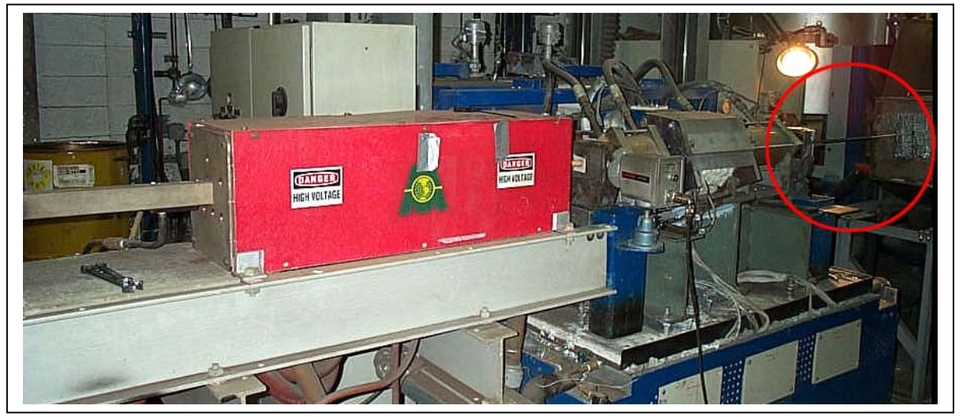

Wire preheating coil (red) and coating chamber (blue)

Your Invitation to Work with Us

We are interested in collaborating with you. Please contact the Business Office to discuss your particular needs.
☎ (613) 996-8693
✉ cetc-bdo@nrcan.gc.ca

For Further Information Please Contact:

Jacques Guérette, PEng
Manager, Industry Group
☎ (613) 943-2261
✉ jguerett@nrcan.gc.ca

CANMET Energy Technology Centre - Ottawa
Natural Resources Canada
1 Haanel Drive
Nepean, Ontario, K1A 1M1
Canada

cetc.nrcan.gc.ca

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C E T C CANMET ENERGY TECHNOLOGY CENTRE

INDUSTRY ENERGY RESEARCH AND DEVELOPMENT PROGRAM

CLEAN ENERGY TECHNOLOGIES

GALVANIZING THE CLEAN ENERGY EFFICIENT WAY

With help from the Industry Energy Research and Development (IERD) program, a Canadian firm has developed the first North American application of an advanced galvanizing technology that produces a better product while saving energy, materials and the environment.

The Opportunity

The conventional method of galvanizing steel involves more than a dozen steps, including pickling, drawing, annealing, treating with flux, hot dipping, quenching, rinsing and wiping. It's a noisy, messy business. The application of zinc takes place in huge open vats of molten metal that spew heat and fumes into the work-space. The process consumes vast amounts of energy, water and zinc, and produces a witch's brew of pollutants, including acid, ash and contaminated water.

For several years Galvacor Inc., a small firm specializing in hot-dip batch galvanizing, had been studying a revolutionary new galvanizing technology being developed by Delot Process S.A. of France. In 1995 Galvacor acquired exclusive rights to use the technology in Ontario and Quebec, and the following year applied to the IERD program for help in bringing the technology to Canada. Recognizing the potential for technological advancement and energy saving inherent in the proposal, IERD responded with $1,282,500 in financial support, about 20% of

Coated wire coil, at end of process line

Canada

CETC – OTTAWA
CANMET Energy Technology Centre - Ottawa
Natural Resources Canada
1 Haanel Drive, Ottawa, Ontario K1A 1M1
Tel : (613) 996-8693 **FAX :** (613) 995-9584
www.cetc.nrcan.gc.ca

Uncoated wire exiting cleaning station

the project's costs. The IERD program, which is administered by the CANMET Energy Technology Centre-Ottawa of Natural Resources Canada, helps Canadian firms develop and commercialize new, energy-saving technologies, products and processes. The project received additional support from Hydro-Québec, Ministère de l'industrie, du commerce et de la technologie du Québec, Ministère des Ressources Naturelles du Québec, Delot Process S.A. and from several private investors.

The Project

With IERD support, Galvacor purchased equipment for two prototype Delot lines, installing them in its Quebec City plant. The first line became operational in 1997, after a year of testing and upgrading. Under license to the International Lead Zinc Research Organization (ILZRO), Galvacor also began experimenting with the use of a proprietary zinc alloy, called Galfan®, which contains 5% aluminum. Studies have shown that Galfan can be 4 to 10 times as effective as pure zinc in resisting corrosion.

Compared to traditional galvanizing techniques, the Delot process is a model of elegant efficiency. Steel wire or rod enters the receiving end of a long, streamlined machine, where it is first straightened, then shot-blasted to clean and prepare its surface. After being heated in an induction furnace, the steel wire or rod enters the galvanizing chamber. It then passes through a bubble of molten zinc held in suspension by electromagnetic fields at about a 100 metres per minute. In the critical stages of the process, an inert gas is pumped into the vessels to displace oxygen and prevent it from gaining a foothold on the hot metal. The treated wire is subsequently water-cooled, tensioned and sheared to length or re-spooled.

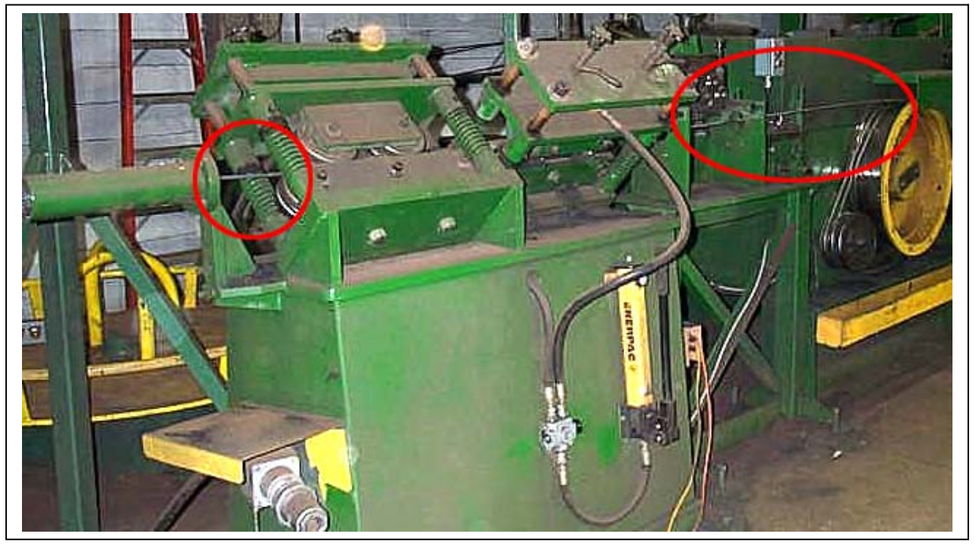
The result is a smooth, uniform coating of zinc that provides twice the corrosion protection than conventional hot-dip galvanizing. The zinc coating is so ductile and adheres so well to the underlying metal that it remains intact, without splitting or flaking, when the metal is drawn, spot welded or formed into a variety of finished products.

With the success of its first line, and having set several industrial precedents, Galvacor is taking the technology a step further. The company's second Delot line will be configured vertically to permit a thicker more uniform coating and to prevent the slight pooling of the zinc on the undersides of the metal as it cools.

The Rewards

Conventional hot-dip galvanizing uses a lot of zinc and a lot of energy. Each kettle holds as much as 600 tonnes of the metal, which is melted and kept at a temperature of 450°C. Having little control over the thickness of the applied zinc, operators tend to use more than is necessary to be sure of meeting clients' specifications. A conventional galvanizing line might use as much as 65 kg of zinc and 3.2 gigajoules (GJ) of energy per tonne of coated product.

In the Delot machine, a single tonne of zinc is melted in a sealed ceramic crucible and fed to the galvanizing chamber by an electromagnetic pump. The thickness of the coating is controlled by varying the strength of the elec-tromagnetic field in the chamber. Unused zinc is recycled back to the melting crucible. As a result, the process uses just 18 kg of zinc to produce a 25 micron thick coating on a tonne of steel wire. At an average annual production of 4,300 tonnes, the Delot process can save an estimated 59 tonnes of zinc and 10.5 Terajoules of energy per line per year over conventional hot-dip galvanizing. The unused zinc represents an additional energy saving equivalent to 4.3 TJ per line per year.



After cleaning, wire straightening, prior to coating

Because the Delot process uses no acid or flux and produces very little ash or dross, it's much easier on the environment. Thanks to reduced energy consumption, emissions of carbon dioxide are cut by 219 kg per tonne of processed Delot material. And because the cooling water is recycled, the process conserves about 6 million liters of water per line per year.

"We are the only company in the world that can apply Galfan® using the Delot technology, and one of the few in North America that can handle low- and high-carbon steel rod and wire up to 12 mm in diameter," says Denis Cantin, Galvacor's Financial Director. "As a result, we can supply products that are unavailable anywhere else."

So certain is Galvacor of its prospects that it recently sold its batch galvanizing equipment to a competitor and committed itself entirely to the Delot technology. The company is already doing a brisk business selling its Galfan and zinc-coated rod and wire to manufacturers of nails, staples, fencing, springs, welded wire fabric and other wire products, while exploring, among other things, the use of Galfan to coat metal tubing for the automotive industry.

"We've come a long way in a very short time," says Denis Cantin. Of course, in the early stages, when the technology was new and un-proven, people weren't exactly lining up to support us. By sharing some of the up-front risks associated with the project, IERD made it all possible."