EXECUTIVE Report

Berry Radiateurs adopts *Cu*proBraze process and starts production.

*Cu*proBraze Production Begins in the Heart of France

When our customers see that we can make *Cu*proBraze tubes and heat exchangers cost-effectively and in volume, they become converts to the *Cu*proBraze process.

— Daniel Trotereau, president of Berry Radiateurs.

Berry is now producing a variety of *Cu*proBraze heat exchangers.

Founded in 1933 in Vierzon and later established near the city of Bourges, Berry Radiateurs takes its name from the historic province in the heart of France that dates back to before the year 700. Berry supplies cooling systems to many small and midsize original equipment manufacturers (OEMs) for use in a variety of different types of applications — such as agriculture, trucks, public works and industrial motors — as well as in the aftermarket. It produces about 25,000 radiators and 20,000 radiator cores per year in brass/copper, mechanically assembled aluminum, and brazed aluminum.

Berry engineers recognized the potential of *Cu*proBraze many years ago and followed the developments and advances in the technology. Company President Daniel Trotereau and the engineers made the initial decision to buy the machinery in 2000.

The company is small and completely focused on the production of radiator cores for oil, gas oil, air and water. As a consequence, Berry has invested in several production lines. The adoption of *Cu*proBraze technology and the addition of *Cu*proBraze production capacity perfectly corresponds to the company philosophy, i.e., to follow new technologies.

Flexible Manufacturing

*Cu*proBraze technology can produce all of the cooling systems mentioned above with only one furnace. Berry is using a state-of-the-art, semi-continuous, three-chamber furnace. Thanks to new technologies, once the process parameters for a new product have been established, they can be stored in the furnace's memory. To start production, one must simply recall the parameters.

In a two-chamber furnace, a typical purging, heating and cooling cycle is 20 minutes for a single layer of parts, and 30 minutes for a double layer; purging and cooling must be accomplished at different times in the same chamber. The time in the brazing chamber is the shortest.

Two of the three chambers of Berry's furnace are typically in use simultaneously, halving production time and doubling production rates, compared to a two-chamber batch furnace.

In this semi-continuous process, one tray is indexed into the first chamber (the purge chamber), while another tray can be indexed from the middle chamber (brazing chamber) to the third chamber (cooling chamber).

The process chamber has separate entry and exit doors, and only one door is open at a time. When a tray exits the brazing chamber, some heat escapes to the cooling chamber, requiring that the brazing chamber be re-heated to the operating temperature before it can take the next load from the purge chamber.

Separate areas for loading and unloading the trays further increase throughput.

Trays can be loaded and unloaded even while other racks are being purged, processed or cooled. Additionally, the large size of the furnace allows for even higher throughput. Multiple heat exchangers can be placed on a single tray in one or many layers.

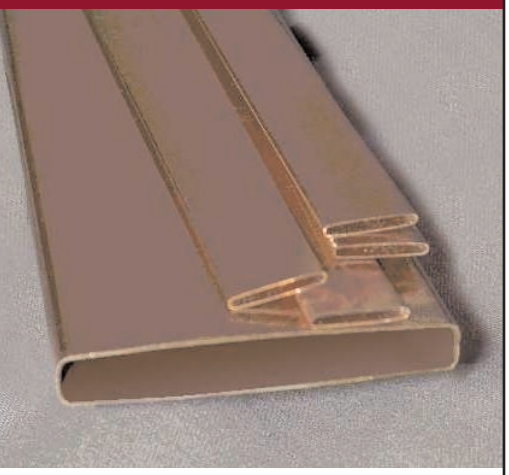
Pre-programmed process recipes eliminate trial and error in switching from one product to another. The setup time from one product to another is practically nothing. It is simply a matter of selecting a new process recipe after indexing a tray into the purge chamber.

The rapid set-up time allows for increased production because downtime is reduced.

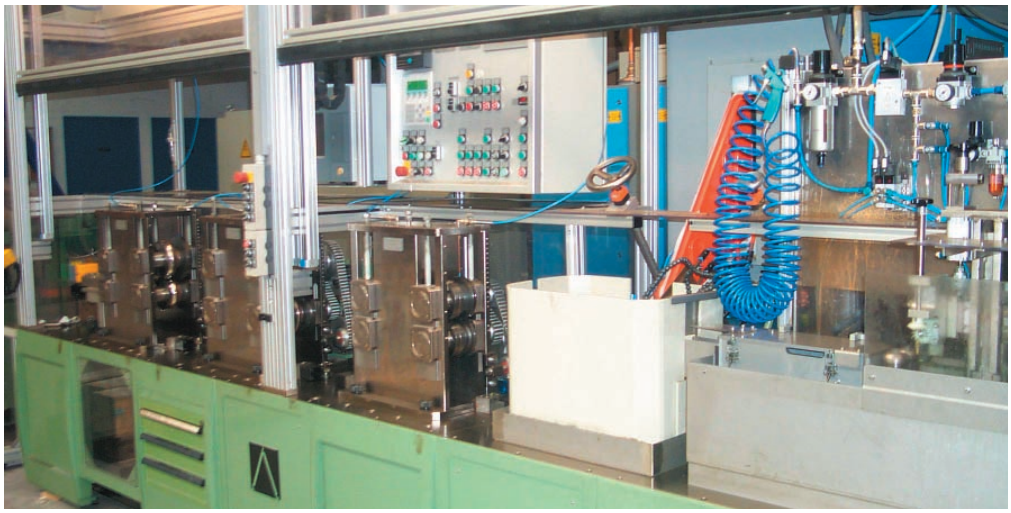
The International Copper Association, Ltd. (ICA)

is the leading organization for the promotion of the use of copper worldwide. The Association's twenty-nine members represent about 80 percent of the world's refined copper output, and its six associate members are among the world's largest copper and copper alloy fabricators. ICA is responsible for guiding policy, strategy and funding of international initiatives and promotional activities. With headquarters in New York City, ICA operates in 28 worldwide locations through a network of regional offices and copper development associations.

For additional information about the *Cu*proBraze process or ICA's *Cu*proBraze consulting services, please contact the International Copper Association at Alea@copper.org.



Berry makes high-frequency welded tubes for the production of charge air coolers and radiators.



HF-welding machine for making *Cu*proBraze brass tubes from strip.

Volume Production

With its highly efficient setup, Berry has demonstrated a production capacity of about 250 cooling systems per week (13,000 per year) in one shift, depending on the radiator sizes.

To increase the volume of output on its *Cu*proBraze production line, the company has invested in a header slurry application machine, a fin-tip paste application machine, and a high-frequency (HF) tube welding machine.

Volume Production of HF-Welded Tubes

Its HF welding capacity makes Berry an even more competitive player in the market. HF welding uses rapidly alternating electromagnetic fields to induce resistance heating in the parts to be welded. It is a well-established technology, but not all manufacturers bring this process in-house. Some prefer to buy HF-welded tubes from other manufacturers.

Berry fabricates HF-welded *Cu*proBraze tubes in many different sizes for its own use and for sale to other heat-exchanger manufacturers. Thus, Berry is positioned to be one of Europe's premier suppliers of tubes for *Cu*proBraze heat exchangers. "We find that we have better control over production using HF welded tubes," said Trotereau.

HF-welded *Cu*proBraze tubes are available from Berry with or without dimples in sizes of 13 by 2.43; 14.9 by 1.88; and 18.88 by 2.25 (width by height with all units in millimeters).

Available gauges (tube wall thickness in millimeters) are 0.15 or 0.20 for the 13 by 2.43 tubes; 0.118 or 0.15 for the 14.9 by 1.88 tubes; and 0.118 or 0.16 for the 18.88 by 2.25 tubes (all units in mm).

The company also makes larger HF-welded tubes for oil coolers (41 mm by 4.4 mm by 0.2 mm) and charge air coolers (53 mm by 10.5 mm by 0.17 mm).

The wide selection of tube sizes and types allows Berry to manufacture a wide variety of *Cu*proBraze radiators, oil coolers, charge air coolers and other heat exchanger products.

Conclusion

Today Berry is setting records in the production of HF-welded *Cu*proBraze tubes and *Cu*proBraze heat exchangers, including radiators, oil coolers and charge air coolers.

While it is difficult to predict the rate of market penetration for *Cu*proBraze products, the company is already establishing itself as a leader and is offering unique products to decision makers in the European automotive industry.

"When our customers see that we can make *Cu*proBraze tubes and heat exchangers cost-effectively and in volume, they become converts to the *Cu*proBraze process," said Trotereau.

Technical know-how and product knowledge with respect to the *Cu*proBraze process give Berry important advantages over competitors. As a result, the company is well-positioned for growth, as the benefits of *Cu*proBraze products become more familiar to designers of advanced cooling systems. ■

Berry Radiateurs S.A.

Contact Daniel Trotereau, president.
Z1 de Malltorne, BP 12, St. Doulchard, France.
Telephone +33 2 48 24 09 70, Fax: +33 2 48 65 94 30.

COPPER
International Copper Association, Ltd.

International Copper Association, Ltd.
260 Madison Avenue, 16th Floor, New York, NY 10016-2401
Tel: 212.251.7240, Fax: 212.251.7245