

EXECUTIVE *Report*

Manufacturers Discover the Simplicity and Flexibility of Copper-Brass Brazing Number of Heat Exchangers in Service Skyrockets

Eight years ago, the International Copper Association predicted that the CuproBraz manufacturing process would position the copper industry to retain or recapture large shares of the worldwide radiator market, which aluminum had been steadily eroding. Today, that prediction rings true: a growing number of manufacturers are embracing the CuproBraz technology.

"Facilities worldwide are brazing copper-brass heat exchangers in every OEM and aftermarket product category," says Nigel Cotton, Automotive Manager for the International Copper Association. "Manufacturers are catching on to the advantages and flexibility of the CuproBraz process."

CuproBraz is a simpler, more efficient alternative to aluminum-brazing processes and other joining methods such as welding and soldering. The simplicity of the process makes it easily adaptable to a wide range

of products and different types of production facilities.

Strong Joints Allow More Uses

The CuproBraz copper-to-brass brazing process is superior to soldering. Brazing creates a joint that is stronger than a soldered joint and comparable in strength to a welded joint. Unlike welding, brazing does not melt the base metals, so the dimensions can be tightly controlled and dissimilar alloys can be joined.

In addition, the superiority of copper-brass over aluminum with respect to thermal conductivity, corrosion resistance, durability and ease of fabrication makes the CuproBraz technology a better choice for a wide range of applications and categories. Besides radiators and charge air coolers, the process is used to make oil-coolers, climate control systems and other heat transfer cores.

The strength of the joints formed by copper-brass brazing allows the process to be used in applications unsuitable for a soldered joint. CuproBraz is used in the manufacture of heat exchangers for heavy-duty highway trucks, construction and agricultural equipment, stationary power generators, light trucks and SUVs and passenger cars.

Off-road trucks require radiators and charge air coolers that are durable to an extreme; equipment operators in the field cannot tolerate frequent failures of cooling systems.

Since they are made of brass rather than aluminum, CuproBraz charge air cooler and radiator tubes can withstand the higher operating pressures and temperatures associated with new designs of clean diesel engines.

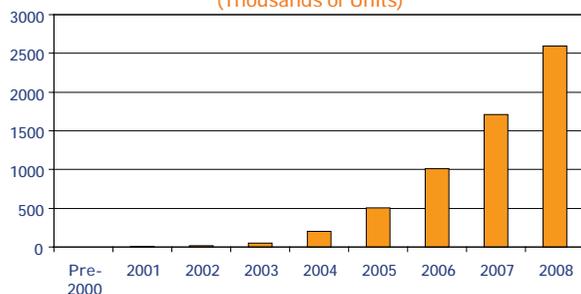
Simpler Process, More Flexibility

As a simple, straightforward process, CuproBraz allows for considerable latitude in brazing furnace design. Suitable furnaces for copper-brass brazing are widely available, and they cost much less than aluminum brazing furnaces.

CuproBraz heat exchangers can be processed in batch, semi-continuous or continuous furnaces, depending on part sizes and production volumes. Batch furnaces are ideal for producing a variety of sizes and shapes in small volumes. Semi-continuous furnaces are also flexible, but offer higher throughput than batch furnaces. Meanwhile, continuous furnaces are suitable for high-volume production.

The CuproBraz process provides more flexibility than the Nocolok® process, which is commonly used for aluminum brazing. Heat exchangers of different sizes and mass can be brazed in the same furnace with minor adjustments because of the wide margin between the brazing and melting temperatures of brass. In the CuproBraz process, brazing occurs at 600 °C (1112 °F), which is 300 °C (572 °F) below the melting temperature of brass. In the Nocolok process, on the other hand, a much slimmer margin of 40 °C (104 °F) exists between brazing and melting temperatures.

Estimated Number of CuproBraz Heat Exchangers in Service Worldwide
(Thousands of Units)



The International Copper Association, Ltd. (ICA)

is the leading organization for the promotion of the use of copper worldwide. The Association's 29 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 general information about the CuproBraz process or ICA's CuproBraz consulting services, please contact International Copper Association at mrosario@cupper.org.

For technical information contact cuprobraz@cupper.org. For European inquiries contact ndc@eurocupper.org.

RADAC, which makes heat exchangers for the commercial and industrial aftermarket, was among the first to adopt the CuproBraz technology. The manufacturer needed a batch furnace that would be flexible enough to quickly switch between large "one-off" specialty cores and medium-volume production of smaller replacement cores based on OEM part numbers. RADAC chose a controlled atmosphere brazing (CAB) batch furnace that can hold cores with length-by-width dimensions as large as 65 in. x 65 in. The company has since received requests from customers in every product category, including heat exchangers for construction equipment, forklifts, commercial trucks and power generators.

Promising Future

ICA knew CuproBraz would someday be used in a wide range of mobile heat-exchanger applications. Today, nine manufacturers around the globe already are producing radiators, charge-air coolers and related equipment using the CuproBraz process, and 13 more players recently decided to open CuproBraz production facilities.

"The growth in CuproBraz production in the past three years has been spectacular," said Staffan Anger, speaking on behalf of the CuproBraz Alliance at a recent press conference.

The number of CuproBraz heat exchangers in service tripled compared to all of the previous years combined in 2003, the year that SHAAZ opened a high-volume production facility in Shadrinsk, Russia. SHAAZ radiators and charge-air coolers are now being installed in many well-known truck brands in Russia including URAL, KAMAZ and IVECO.

Young Touchstone is among the U.S. companies to adopt the CuproBraz technology in

the past few years. From its production facility in Jackson, Tennessee, the company has been developing lower-cost products for OEM customers using the FLATROUND® technology—in which the ends of flat tubes are rounded and mechanically inserted into the round holes in the header plates.

Another U.S. player, Astro Air, has demonstrated the CuproBraz advantages of smaller size and increased cooling efficiency by putting thousands of copper-brass mobile heating units into service in passenger vehicles.

China joined the growing list of countries to adopt the CuproBraz technology last November, when Nanning Baling Technology Co., Ltd. unveiled its CuproBraz manufacturing plant in the city of Nanning. NBT plans to turn out 500,000 CuproBraz heat exchangers annually for China's domestic automotive industry.

Other innovators employing the CuproBraz technology include Berry Radiateurs of France, SJT of Finland, Radicon of Thailand and Najico of Japan.

And with stringent new emissions regulations taking effect in the U.S., Europe and Japan in the next few years, the need for CuproBraz will only increase. Diesel engine makers are seeking workable solutions, such as exhaust-gas recirculation (EGR), to reduce harmful emissions from diesel engines.

The average inlet temperature in current charge air coolers is 190 °C. To comply with the reduced emission standards, the industry expects the average inlet temperature to reach more than 240 °C. CuproBraz CACs can easily cope with these higher temperatures.

Considering the factors above, the International Copper Association estimates that one million CuproBraz heat exchangers will be in service by 2007.

Says Anger, "With 80 more companies currently evaluating the CuproBraz technology, the numbers are skyrocketing." ■



Staffan Anger of the CuproBraz Alliance spoke at a recent press conference of the rising demand for CuproBraz products.

Worldwide Presence of CuproBraz

Astro Air – Jacksonville, Texas, United States
 Berry Radiateurs – St. Doulchard, France
 Najico – Tsukiji, Chuo-Ku, Tokyo, Japan
 Nanning Baling Technology Company – Nanning, China
 Radac – Cincinnati, Ohio, United States
 Radicon – Nongchok Bangkok, Thailand
 SHAAZ – Shadrinsk, Kurgan Region, Russia
 Suomen Jaahdytintehdas (SJT) – Suolahti, Finland
 Young Touchstone – Jackson, Tennessee, United States

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 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