

# EXECUTIVE Report

## OEMs Reach for Brazed Copper Brass

*CuproBraze Technology Flourishes in Diverse Applications*

The list of original equipment manufacturers (OEMs) who use brazed copper brass heat exchanger components continues to grow. Many familiar OEM brands have joined the ranks of CuproBraze customers. This *Executive Report* endeavors to round up several recognizable users and to summarize some successful applications of this relatively new technology.

CuproBraze was born in the twentieth century but it is a child of the twenty-first century. Five years ago, only a handful of heat exchanger manufacturers were serious about CuproBraze. Many of the applications discussed here entered into production only in the past couple of years. Many more are on the drawing boards and will be produced in the next few years. As OEM demand heats up for higher volumes of CuproBraze for more applications, heat exchanger manufacturers are adding capacity and increasing production rates.

Most of the CuproBraze production lines discussed here are less than five years old. Now high volume production lines exist in the US, China and Russia, and many more medium volume production facilities exist in every corner of the globe including Mexico, Japan, France, England and Finland.

### Cooling for Locomotives

Global demand has intensified for the huge heat exchangers used in locomotives. In these applications, durability and cooling efficiency are key requirements in addition to cost, size and weight. The decision to use CuproBraze is an easy one because no other material system matches CuproBraze with respect to rugged and efficient designs.

Many of these applications benefit from the FLAT-ROUND® mechanical-bond technology developed by Young Touchstone, a Wabtec Company (Jackson, Tennessee) [1]. These CuproBraze locomotive radiators have



It has long been a goal to replace plate-fin designs with serpentine-fin designs. The CuproBraze process provides a stronger joint between the fins and the flat tubes, allowing OEM customers to switch to the more efficient serpentine-fin design. (Photograph Courtesy of Young Touchstone)

large cores with face areas about 3 meters long by 1.5 meters wide. The radiators incorporate flat brass tubes, transformed to round ends and mechanically bonded into steel headers. These liquid-to-air coolers serve as radiators for cooling large diesel engines.

Young Touchstone supplies CuproBraze radiators to its sister company MotivePower, a Wabtec Company (Boise, Idaho), as well as many other OEMs. MotivePower locomotives use CuproBraze heat exchangers for diesel-powered commuter trains in service throughout North America.

Siemens AG Transportation Systems (Erlangen, Germany) is another powerhouse



This large heat exchanger contains *CuproBraze* radiators and charge-air-coolers. Its end use is a generator set rated at 2000 ekW. (Photograph Courtesy of Young Touchstone)

in the rail industry with *CuproBraze* in its future. It will use *CuproBraze* technology for select diesel locomotives, including its Asia Runner locomotive for South Vietnam and other Asian markets.

Bombardier Transportation (Västerås, Sweden) is another major OEM to reach for *CuproBraze* for its railroad products. In this case, the heat exchanger cools the transformer oil in electric-powered locomotives. These huge oil coolers have been used successfully in coal trains for South African Railways [2]. Bombardier sees a potential market for about 200 *CuproBraze* coolers in its near future projects.

## Industrial Applications

Stationary power generator sets rely on large heat exchangers for cooling. Kohler Power Systems Americas (Kohler, Wisconsin), a division of Kohler Co., provides complete power systems. It has adopted *CuproBraze* technology for diesel engine turbocharger air-to-air cooling in many of its “gen sets.” Kohler is one of the largest users of diesel engines for power generation.

*CuproBraze* radiators are used by SEI Systems & Electronics Inc. (St. Louis, Missouri) for the Tunner aircraft loader, which it provides to the military. These aircraft loaders are described in an earlier Executive Report [3]. *CuproBraze* was chosen for its high reliability and durability in harsh climates.

## Heavy-Duty Trucks

*CuproBraze* has been widely adopted by Russian truck OEMs. KAMAZ (Tartarstan, Russia) [4] and URAL (Miass, Russia) [5, 6] use *CuproBraze* radiators and charge air coolers in world-class heavy-duty trucks built for a variety of off-highway and on-highway applications. URAL and KAMAZ are especially noteworthy for their use of a CAC-Radiator package, and URAL has a joint venture with the Italian truck-maker IVECO. Recently, UAZ (Ulyanovsk, Russia), a maker of jeep-like vehicles, began using *CuproBraze* radiators [7]. Other OEM users in Russia include LIAZ and GAZ. MAZ in Belarus uses *CuproBraze* products and has a joint venture now with German truck maker MAN.

These OEMs use *CuproBraze* for both on-highway and off-road applications, for both radiator and charge-air cooler applications. Their main supplier SHAAZ was among the first to produce *CuproBraze* heat exchangers in volume and is a member of the *CuproBraze* Alliance [8-10]. Now SHAAZ is adding a second *CuproBraze* production line in Shadrinsk, to meet the growing demand for *CuproBraze* heat exchangers. This second high-volume production line will be commissioned in 2009. New OEM customers are developing locomotive and marine diesel applications of *CuproBraze* in Russia.

Nanning Baling Technology Company dedicated a *CuproBraze* production line in 2005 in China to serve a long list of major OEMs in China [11, 12].

## Construction Equipment

The Finnish Radiator Manufacturing Company (Suolahti, Finland), also known as Suomen Jäähdytintehdas Oy, or simply "SJT," produces radiators and charge air-coolers for a variety of OEM manufacturers of off-road construction equipment in Finland as well as globally [13-15]. SJT's OEM customers include Valtra Tractors (AGCO Group), Kalmar Industries Inc. (terminal tractors), Avant Tecno Oy (multipurpose machinery) and Junttan Oy (piling rigs). SJT has changed production to about 95 percent *CuproBraze* and plans to changeover to 100 percent *CuproBraze*.

In Japan, Nakamura Jico Co., Ltd. (NAJICO) makes *CuproBraze* heat exchangers for a variety of OEM applications, including construction equipment, locomotives and on-highway trucks [16].

Indian OEM truck makers are also gearing up to use *CuproBraze* technology and several large suppliers are prepared to meet their needs [16-17].

Numerous other OEMs around the globe are testing cooling systems with *CuproBraze* radiators and charge air coolers, keeping in mind the 2010 (on highway), 2011 (off-road) and 2012 (locomotive) EPA emissions standards and similar standards in Europe and Japan. There is an industry-wide consensus that present-day charge air-cooling systems will be inadequate for the higher turbocharged pressures and temperatures planned for future diesel engines.

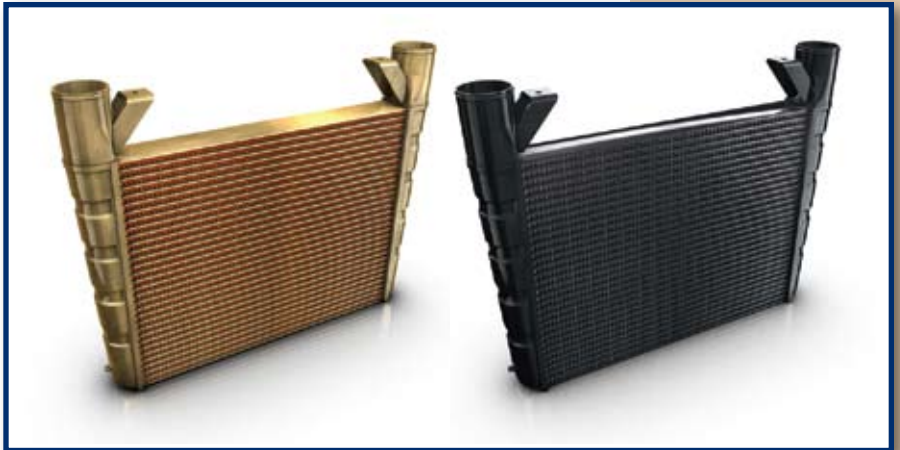
## An Industry in Transition

It is not possible to name all of the OEMs who have adopted this technology to date. In some cases, confidentiality is an issue and must be respected both with regard to the supplier and the OEM. In other cases, the technology is still undergoing testing and evaluation, and final decisions are pending. All told, there are about 30 *CuproBraze* evaluation projects underway globally, mostly by heat exchanger manufacturers.

The OEMs mentioned here typically have completed testing and made a decision to use *CuproBraze* technology. The industry is moving fast. The automotive industry is in a transition phase with new engine technologies in development on several fronts, including spark ignition, diesel, hybrid, electric and fuel cells. *CuproBraze* technology is also under evaluation for mobile air conditioner (MAC) applications as a consequence of



Young Touchstone has *CuproBraze* heat exchangers in production for locomotive, stationary generator and off-road applications and is preparing for additional customer demand in all of its global markets. (Photograph Courtesy of Young Touchstone)



SJT Finnradiator produces *CuproBraze* radiators and charge air coolers for many major OEMs, including Valtra, Kalmar Industries, Avant Tecno, and Junttan. (Photograph Courtesy of SJT Finnradiator)

the antimicrobial properties of copper for evaporator applications and new designs of multiport tubes for condensers.

Ever-more stringent emissions standards are looming for passenger cars as well as light-duty, medium-duty and heavy-duty trucks, including both on-highway and off-highway. No engine technology is immune to change.

## 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 information about the CuproBrazed process or ICA's CuproBrazed consulting services, please contact the International Copper Association at: [cuprobrazed@copper.org](mailto:cuprobrazed@copper.org).  
For European inquiries contact: [ndc@eurocopper.org](mailto:ndc@eurocopper.org).

According to Mike Sprenger, Director of Sales & Marketing for Young Touchstone, "In the past several years, OEMs have shown increasing interest in the benefits of this technology. We have successfully tested cooling systems with our customers and are now experiencing the initial waves of demand for CuproBrazed. With numerous heavy-duty applications now in production, we are preparing for additional customer demand in all of our global markets." ■



The Nanning Baling Technology Company produces CuproBrazed heat exchangers for more than a dozen OEMs in China. (Photograph Courtesy of Nanning Baling Technology Company)

## Select OEM Users of CuproBrazed Technology

### United States

The MotivePower division of Wabtec Corp. (Boise, Idaho)  
[www.wabtec.com](http://www.wabtec.com)

Kohler Power Systems, (Kohler, Wisconsin)  
[www.kohlerpower.com](http://www.kohlerpower.com)

SEI Systems & Electronics Inc., DRS Technologies  
(St. Louis, Missouri) [www.drs.com](http://www.drs.com)

### Europe

Siemens AG Transportation System (Erlangen, Germany)  
[www.mobility.siemens.com](http://www.mobility.siemens.com)

Bombardier Transportation (Västerås, Sweden)  
[www.transportation.bombardier.com](http://www.transportation.bombardier.com)

IVECO (Turin, Italy) [www.iveco.com](http://www.iveco.com)

Valtra Tractors, AGCO Group (Soulahiti, Finland)  
[www.valtra.com](http://www.valtra.com)

Kalmar Industries Inc. (Helsinki, Finland)  
[www.kalmarind.com](http://www.kalmarind.com)

Avant Tecno Oy, (Ylöjärvi, Finland) [www.avanttecno.com](http://www.avanttecno.com)

Junttan Oy (Kuopio, Finland) [www.junttan.com](http://www.junttan.com)

### Russia

GAZ (Nizhny Novgorod, Russia) <http://eng.gazgroup.ru>

LiAZ (Likino, Russia)  
<http://eng.gazgroup.ru/about/structure/bus/likino/>

KAMAZ (Tartarstan, Russia) <http://kamaz.net/en/>

UAZ (Ulyanovsk, Russia) [www.uaz.ru/eng](http://www.uaz.ru/eng)

URAL (Miass, Russia) <http://4320.ru/>

See Also <http://eng.gazgroup.ru/buyers/lorry/ural>

### Belarus

MAZ (Minsk, Belarus) [www.maz.by](http://www.maz.by)

### China

The Nanning Baling Technology Company (Nanning, Guanxi, China) customers include the following OEMs. See [www.baling.com.cn/EN/](http://www.baling.com.cn/EN/) for more information.

Chang An Motor Corporation

Chery Automobile Co., Ltd.

Chongqing Chang'an SUZUKI Co., Ltd.

Chongqing Heavy Duty Car Group Co., Ltd.

Dongfeng Auto Corporation, Liuzhou Automobile Factory

Dongfeng Auto Corporation, Truck Company

FAW First Automobile Group

Liuzhou Engineering Machine Works

Liuzhou Special Car Factory of China

Nanning Chang'an Automobile Co., Ltd.

SGM Wuling Co., Ltd.

Shanghai Auto Group

Yuchai Machinery Co., Ltd.

## References

1. "Young Touchstone Leverages Benefits of Copper/Brass Brazing for Heavy-Duty Markets," *ICA CuproBrazed Executive Report*, Issue 33.
2. "Bombardier Achieves Superior Performance at a Lower Initial Cost," *ICA CuproBrazed Executive Report*, Issue 51.
3. "Celebrated Aircraft Loader System Boasts Brazed Copper-Brass Radiator," *ICA CuproBrazed Executive Report*, Issue 43.
4. KAMAZ Web site in English is at <http://kamaz.net/en/>.
5. "URAL Installs CuproBrazed Radiator-and-CAC Package in World-Class Trucks," *ICA CuproBrazed Executive Report*, Issue 36.
6. URAL Web site in Russian is at <http://4320.ru/>. Web site in English is <http://eng.gazgroup.ru/buyers/lorry/ural>. For more about URAL trucks, see [www.russiantrucks.com/trucks/ural.html](http://www.russiantrucks.com/trucks/ural.html). See video about URAL trucks at [www.youtube.com/watch?v=5VaQqhPsal](http://www.youtube.com/watch?v=5VaQqhPsal)
7. UAZ Web site in English is at [www.uaz.ru/eng](http://www.uaz.ru/eng).
8. "SHAAZ Becomes High-Volume Producer of New Generation of Truck Radiators and Charge Air Coolers," *ICA CuproBrazed Executive Report*, Issue 27.
9. SHAAZ Web site in Russian is at [www.shaa.ru](http://www.shaa.ru).
10. JSC SHAAZ is a member of the CuproBrazed Alliance. See [www.cuprobrazed.com/alliance\\_jsc.asp](http://www.cuprobrazed.com/alliance_jsc.asp)
11. "Chinese Company Brazes Copper-Brass Heat Exchangers," *ICA CuproBrazed Executive Report*, Issue 38.
12. The Nanning Baling Technology Company Web site in English is at [www.baling.com.cn/EN/](http://www.baling.com.cn/EN/).
13. "Finns Find Profit in Special Products," *ICA CuproBrazed Executive Report*, Issue 32.
14. "SJT Looks Ahead While It Reflects on Past," *ICA CuproBrazed Executive Report*, Issue 44.
15. SJT is a member of the CuproBrazed Alliance. See [www.cuprobrazed.com/alliance\\_suomen.asp](http://www.cuprobrazed.com/alliance_suomen.asp)
16. NAJICO is a member of the CuproBrazed Alliance. See [www.cuprobrazed.com/alliance\\_najico.asp](http://www.cuprobrazed.com/alliance_najico.asp) See also Web site in English at [www.najico.co.jp/en](http://www.najico.co.jp/en)
17. "Indian Manufacturers Adopt Copper-Brass Brazing," *ICA CuproBrazed Executive Report*, Issue 45.
18. "Copper-Brass Heat Exchangers Are Now Brazed in Punjab in Northwest India," *ICA CuproBrazed Executive Report*, Issue 48.