

EXECUTIVE *Report*

OEM Truck Maker Is First to Use Brazed Copper-Brass

URAL Installs CuproBraze Radiator-and-CAC Package in World-Class Trucks



All new models of URAL trucks now have CuproBraze brazed copper-brass radiators, and nearly all have CuproBraze charge air coolers.

Today, URAL is unrivaled in the design and manufacture of rugged 4 × 4, 6 × 6 and 8 × 8 truck models. As a leading manufacturer of off-road trucks in Russia, it enjoys a market share of more than 70 percent for full-drive trucks; and 20 percent of that country's total truck market. Additionally, URAL exports about 25 percent of its production, and it plans to enter the heavy-duty on-highway truck market as well.

First OEM to Adopt CuproBraze

URAL passed many milestones in recent years on its way to becoming a world-class truck maker. One important achievement this year was becoming the first OEM truck maker in the world to use CuproBraze® radiators. It now uses CuproBraze products made by SHAAZ in all of its trucks.

Advanced CuproBraze designs replace soldered copper-brass radiators, which has allowed URAL to skip over intermediate aluminum technologies. By adopting the most advanced heat exchanger technology available today, well in advance of other off-road truck makers around the globe, URAL has shown that it is a leader rather than a follower.

Besides using CuproBraze brazed copper-brass radiators in all new models of its trucks, approximately 95 percent of its trucks have CuproBraze charge air coolers as well. In fact, many URAL trucks are installed with an integral heat exchanger that includes a radiator and charge-air-cooler in one package. This approach simplifies production and assembly processes.

URAL trucks are equipped with the diesel engines produced by Yaroslavl Motor Plant (YaMZ). These 180- to 400-horsepower engines

currently meet the Euro II regulations; meanwhile, URAL management is looking forward to meeting the next stages of lower emissions standards. New engines and cooling systems are being developed for highway and off-road trucks to meet these new requirements as well.

According to Alexander Vedernikov, Technical Development Manager, URAL engineers envision all future designs of URAL trucks with CuproBraze advanced heat exchanger technology.

Passability, Reliability, Versatility

High passability is a trademark of URAL trucks and a part of the company's heritage. "Passability" could be defined in terms of the truck or the terrain. Given Russia's vast territories and harsh climate, the production of off-road trucks that can drive through extremely rough terrain is crucial to its economy. With powerful engines and special driving axles, URAL trucks are engineered to withstand the most challenging off-road conditions imaginable. For example, they can operate in 1 meter (3.3 ft) deep untrodden snow, or 1.7 meter (5.6 ft) deep water; and they can drive over 1.3 meter (3.9 ft) ditches and 0.55 meter (1.8 ft) vertical walls.

URAL trucks are essential to huge Russian industries such as oil, forestry and agriculture. Some of the most sought-after features of these trucks are high load-capacity, superior reliability and repairability — not to mention versatility: URAL truck chassis serve as platforms for nearly 180 different types of vehicles, including buses, cranes, fuel tankers and heavy wreckers.

Taking into account the above, it is not surprising that URAL trucks are counted among the toughest and most durable in the world. Comparable ruggedness and durability is demanded of every subsystem, especially the cooling system. The truck radiators and charge air coolers must be durable to an extreme.



URAL trucks are mounted with powerful diesel engines from Yaroslav and cooling systems from SHAAZ.



CuproBrazed heat-exchangers are ready for mounting in URAL trucks. SHAAZ integrates the charge air cooler and radiator into a single package before delivery to URAL. The integrated package can be quickly and easily mounted into the engine compartment at the URAL plant.



URAL is the first OEM truck maker to adopt CuproBrazed technology. This advanced new technology simplifies the development of clean diesel engines that meet stringent new emissions standards.

The Road to Modernization

URAL's plant is located in the city of Miass, in the Urals region, which is considered to be the industrial heart of Russia. The plant encompasses a fully automated assembly line that can produce 30,000 trucks per year. With the cooperation of Western partners, URAL recently renovated the facility's painting, tooling and calibration departments. The plant now is certified according to key criteria (ISO 9000 standards) of the International Organization for Standardization, qualifying it to supply parts to the global automotive marketplace.

Today, all URAL trucks incorporate CuproBrazed radiators, and 95 percent of the company's trucks tout CuproBrazed charge-air coolers. These numbers include the 3,000 vehicles per year manufactured by IVECO-URALAZ, URAL's joint-stock company with IVECO, a leading international manufacturer of heavy-duty trucks, parts and diesel engines. SHAAZ-made CuproBrazed radiators cool the 370-horsepower IVECO 8210.42.k diesel engines on board URAL-IVECO 6329 trucks.

For 2004, the company expects to turn out 19,000 vehicles, all of which will be equipped with CuproBrazed copper-brass radiators manufactured by its main supplier, SHAAZ.

A Beneficial Relationship

SHAAZ previously opened a high-volume production facility in Shadrinsk, Russia [Ref. 1] and since then has been brazing copper-brass radiators

and charge air coolers for many Russian over-the-road and off-road truck makers.

"After our specialists attended several seminars and visited SHAAZ's new plant, it was obvious that CuproBrazed was exactly what we needed," says Alexander Vedernikov, Manager of Technical Development at URAL. "We were so interested in CuproBrazed that we made a financial investment in SHAAZ to help them begin production as soon as possible."

"It was a special advantage for us," notes Vedernikov, "when SHAAZ began to supply packages that integrated the radiators with the charge air coolers. This approach simplifies our assembly process and saves time."

Durability — Defined

"In Russia, we do not traditionally install aluminum radiators on trucks," Vedernikov says. "The majority of our trucks have been equipped with soldered copper-brass radiators."

CuproBrazed technology is a method of joining new alloys of copper and brass with a filler metal that melts at a relatively high brazing temperature. The CuproBrazed alloys and brazing process result in joints that are much stronger than soldered joints. This advanced technology was developed to manufacture a new generation of exceedingly durable automotive, heavy-duty truck and industrial heat exchangers.

"The CuproBrazed process produces strong, lightweight, compact and efficient heat



Internationally renowned IVECO-URAL 6329 trucks now benefit from CuproBrazed technology.

exchangers,” says Vedernikov. “The prototype radiator that we first examined was 25 percent more efficient than conventional radiators. More important, brazed copper-brass serpentine fins are more durable than their alternatives. Reliability is a crucial advantage in Russia, because service stations can be several thousand kilometers apart. For the same reason, reparability is also important. *CuproBraz* is a natural fit for URAL.”

Vedernikov further explained that URAL trucks need to operate at ambient temperatures ranging from 55 degrees below zero to 122 above zero on the Fahrenheit scale (i.e., from $-50\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$). The cooling systems also need to be forgiving to the quality of coolants. Drivers cannot afford to deal with frequent failures of cooling systems; and, when there is a leak in a cooling system, it is essential to make repairs in the field.

Because they are made of brass rather than aluminum, *CuproBraz* charge air coolers and radiators can withstand the higher operating pressures and temperatures associated with new designs of diesel engines. Due to stringent international emissions standards, and stricter Russian standards scheduled for 2005, URAL engineers are confident that *CuproBraz* is the right choice for the future. Tougher standards mean clean diesel engines will require more

complex heat exchangers than in the past. The high temperature performance of copper-brass charge air coolers allows them to retain much of their strength and avoid metal corrosion. By replacing temperature-challenged aluminum charge air coolers with copper-brass counterparts, the automotive industry can reduce emissions and increase fuel efficiency.

Glorious Past, Promising Future

URAL was founded under the name URALAZ in 1944 when it began making trucks for the Russian army. Many of these trucks were mounted with the now famous “Katyushas,” which were the first mobile rocket or missile launchers to be used in World War II [Ref. 2]. URAL trucks today are the progeny of these famous military trucks, which played such a decisive role in ending the war and upon which the company first staked its reputation.

This year marks its sixtieth anniversary, and URAL is celebrating not only its conspicuous service in the past eras but also its spectacular modern-day achievements and beckoning future. The toughness and passability of today’s



URAL truck with 4 x 4 wheel drive descends a steep incline.



URAL truck with 8 x 8 wheel drive competes in truck trials, passing over rugged terrain (left), preparing to descend a steep incline (top) and approaching the bottom of the hill (bottom).

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 CuproBraz process or ICA's CuproBraz consulting services, please contact the International Copper Association at Alea@copper.org.



Vintage URAL trucks were on display at the Sixtieth Anniversary celebrations

models was clearly on display at the truck trials hosted by URAL during its anniversary celebrations. Video clips of these truck trials are available upon request [Ref.3].

You can look forward to hearing more about URAL. The company is so confident in CuproBraz that it plans to expand its markets and capabilities. It will begin producing on-highway trucks and tractors this year. URAL will also continue to compete in

marathon rallies to attract potential customers, such as the ones it has attended in Moscow, London, New York and Siberia, to the delight of off-road enthusiasts around the world!

"We are looking forward to the next step in developing our production capabilities and introducing to the market our new U.S.-class over-the-highway trailer trucks," exclaims Vedernikov. As it looks back on its proud heritage, URAL is ready to assume a leadership role in economic development at home as well as in global markets. ■

Fire departments throughout Russia rely on URAL trucks. This ladder truck illustrates the diversity and versatility of URAL trucks. Hundreds of different application designs begin with a URAL chassis.



Contact Information

URAL automotive plant

Avtozavodtsev, 1
456300 Miass, Russia
www.uralaz.ru
press@mail.uralaz.ru
Tel/fax +7 (35135) 516 37

SHAAZ

1, Sverdlov Street
Shadrinsk 641876 Kurgan Region, Russia
www.SHAAZ.ru
SHAAZm@SHAAZ.ru, post@SHAAZ.ru
Tel/fax +7 (35253) 32-0-93,
Tel +7 (35253) 3-29-39

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2. Albano Castelletto, "The Last Horse Warriors," World War II magazine, January 2004, www.thehistorynet.com/wwii/blhorsewarriors/index2.html; Mike Yoder, "Battle of Stalingrad," 2000, www.militaryhistoryonline.com/wwii/stalingrad/default.aspx; "WWII Stories in Their Own Words," http://carol_fus.tripod.com/army_hero_russian_side.html.

3. Video in Russian available upon request. Please write to Truck Trials Video, The Kellen Company, 355 Lexington Ave., New York, NY 10017.



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