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Lead-free water from **Eco Brass**

Eco Brass provides a solution to new lead-free brass requirements

An illustration of a brass faucet pouring water onto a globe. The water is depicted as a stream of blue droplets. Several small circles containing the chemical symbol 'Pb' are scattered around the globe and the faucet, suggesting lead contamination. The background is a bright yellow sunburst pattern.

It's easy being green

BY LAUREN DUENSING

There is a growing green movement in the metals industry that continues to add eco-friendly products to its arsenal. While some legislation is prompting the move toward green products, “regardless of what the regulations are, there is a perception that a green, environmentally friendly product is something that consumers are going to want,” says Al Barbour, president and CEO of Concast Metal Products Co., Mars, Pa. “I think that corporations are going to want to present that they are doing the right thing for the environment to their customers, employees and shareholders. This is a long-term trend.”

California moves forward

About 10 percent to 20 percent of Concast's product line goes into water applications, and California has recently made a major change to its law regarding lead in plumbing. On Sept. 30, Gov. Arnold Schwarzenegger signed into law a bill that mandates a reduction of lead levels in plumbing pipes, fittings and fixtures to no more than 0.25 percent. The current law allows for up to 8 percent lead levels in pipes and fittings and up to 4 percent in fixtures. The new law, entitled AB 1953, was authored by Assemblywoman Wilma Chan, D-Alameda. It will become effective in 2010. The law excludes service saddles; backflow preventers for non-potable services,

such as irrigation and industrial; and water-distribution, main-gate valves that are 2 inches in diameter or larger. These can contain up to 8 percent lead.

By signing the law, Schwarzenegger brings the issue of possible lead in potable water to the forefront. According to the Clean Water Action organization, exposure to low concentrations of lead in drinking water can result in delays in physical and mental development, along with deficits in attention span and learning abilities. The CWA notes that up to 20 percent of total childhood lead exposure is from drinking water and that even though lead content in drinking water is regulated, testing demonstrates that leaching of lead

at high levels still occurs, even with materials meeting all current specifications and regulatory requirements. The organization notes that a survey of several California cities, conducted in 2004 by the EPA, said that 20 percent of homes tested under the Lead and Copper Rule had significantly elevated levels of lead in drinking water.

In addition to the issue of lead in drinking water, there are other lead-related issues that need to be addressed. One is the machining and grinding of castings at machining stations in foundries and machine shops because castings containing lead will impart some lead into the workplace atmosphere. A second issue is the added cost and effort incurred in treating lead-containing foundry sands for disposal.

Ivan Betcherman, sales manager for Ingot Metals Co. Ltd., Weston, Ontario, says, "Potable water notwithstanding, clean air legislation makes it incumbent upon foundries to have pollution control equipment that is engineered to prevent lead from entering the atmosphere. Foundries are a step ahead of the game when they can pour alloys that are lead-free from the get go."

"Whether you agree with the politics and science of the effects of lead on our health, lead is coming under increasing pressure to be eliminated from all facets of our lives," says Jim Palmour, vice president, sales, for Chase Brass and Copper Co. Inc., Montpelier, Ohio. "This pertains not only to our exposure as consumers but also to our exposure as workers. At some point, U.S. manufacturers may have to consider whether it is practical to make lead-containing products. Regardless, leaded brasses continue to be made safely and are safe to use in all current applications."

Providing an alternative

A product that takes care of the leaded brass issue is just coming into the market in North America, but has been used commercially in Japan for almost seven years to produce "more than four million cast water meter bodies, almost two

million forged water meter caps and countless screw machines and CNC parts," says Palmour. "It is clearly not a laboratory alloy." Eco Brass was developed by Sambo Copper Alloy Co. Ltd., Osaka, Japan, as a lead-free brass alloy that can be used to meet the requirements of the law. Chase Brass and Copper Co. was licensed by Sambo to produce and sell Eco Brass rod and ingot in North America. Concast Metal Products Co. and Ingot Metals Co. Ltd. are sub-licensees, making it so the product covers the entire gamut of the lead-free brass industry.

"The Eco Brass alloy has a nominal composition of 75 percent copper, 3 percent silicon, 0.09 percent phosphorus and 21 percent zinc," says Palmour. "Rod from Chase Brass and Copper Co. Inc. is sold under the Green Dot trademark, which differentiates it from our leaded Blue Dot rod alloy." Other Eco Brass products include ingots from Ingot Metals Co. Ltd. Inc. and continuous cast rod from Concast Metal Products Co.

"Eco Brass was developed in response to a tightening of the drinking water lead leachate restriction in Japan that took effect in April of 2003," says Palmour. "Sambo went beyond the requirement of eliminating lead, however, and developed an alloy that can be machined, forged or cast; has strength like some stainless steel alloys; and has superior resistance to dezincification and stress corrosion cracking compared to existing leaded brasses." Eco Brass is currently used in water supply devices such as faucets, valves and fittings. It also has applications in fire protection devices such as ceiling sprinklers, ball valves, automotive parts (to meet the European RoHS and WEEE directives) and as a substitute for free-machining stainless steel in general applications.

Normally, in drinking water systems,



the lead in the castings makes them more machinable, says Betcherman. However, the problem with that is clear—now lead can be leached into the water. Eco Brass solves that problem with similar machinability to traditional brass alloys and has a high-strength equivalent to stainless steel. In addition, the alloy is suitable for casting and forging, allowing manufacturers to produce any shape.

"The composition of Eco Brass results in a copper-zinc-silicon phase, which breaks up chips similar to C360," says Palmour. "With high strength like stainless steel and a machinability rating of 70 percent to 80 percent, a machine shop may have to adjust setups, tooling types, cycle times and possibly coolant to optimize productivity. These issues will become minimal as experience is gained in the machining of this alloy.

"Forgeability is rated at 95 percent of C377 so Eco Brass may require changes in forging temperature and trimming tool alloy," he notes. "There is no castability rating so the comparison here is with short freezing range alloys. A foundry may be required to modify its gating and risering system if it is currently casting long freezing range alloys. The advantages are that with Eco Brass, current processing methods can still be utilized in machining, forging and casting environments."

The future of eco-friendly materials

"Customer feedback so far has been very positive for Eco Brass," says Betcherman. "At this early stage in the



development of the alloy in North America, we're hearing good things from the

foundries. The castability is excellent, the melting temperature is less than other lead-free alloys and Eco Brass is meeting its advertised mechanical properties."

Palmour says that customers have approached the alloy both enthusiastically and cautiously. "It's an alloy that solves a lot of performance and regulatory problems but it is a change for them. Eco Brass is a high-performance alloy that has not yet attained commodity status. Machinability differences in terms of cycle time and tooling need to be calculated into costs and capital equipment planning, as well as segregating the scrap from leaded brasses to prevent cross-contamination," he notes.

"All of the positive attributes of a copper-based alloy are retained," Palmour says. "One of the most important facts is that the same alloy composition is utilized in machining, forging and casting processes. Therefore, those manufacturing facilities with various processes would not have to be concerned with segregating their scrap."

The two leading alloys for lead-free applications are bismuth-containing bronzes and the silicon brasses (such as Eco Brass). Bismuth-containing alloys have been used successfully for many years now. "Foundries have substituted bismuth for lead to meet the demand for lead-free machinable castings," says Betcherman. "The American Foundry Society is presently addressing the issue of the world's bismuth supply to meet the anticipated future demand. This

concern has prompted many consumers to look closely at the silicon brass alternative."

Eco Brass has a very significant advantage over other silicon brass alloys. "It is dezincification resistant—much more so than the rest of the silicon brass family," says Betcherman.

"Silicon brasses have been around for a long time, too," says Palmour, "but their chemical compositions don't create the same combination of machinability, formability or dezincification resistance found in Eco Brass. There are some very low-lead brasses (0.5 percent) being offered but they suffer from lower machinability compared to Eco Brass and C360, plus they are corrosion prone and still would not be regarded as lead-free. These are the areas where Eco Brass has manufacturing and performance advantages."

Eco-friendly products allow manufacturers to satisfy the needs of their customers as the green movement grows. In addition, products like Eco

Brass give manufacturers the opportunity to diversify their product line by adding lead-free alloys to the mix. Barbour notes that Concast has always had an interest in lead-free alloys "just to be able to diversify our product line because a lot of our products do have lead in them. We believe over a period of time with the different health risks associated with lead that we should be moving toward having offerings with lead-free product. That's kind of our motivation for wanting to be part of the Eco Brass family."

Incorporating lead-free alloys into product lines around the country will put most manufactures ahead of the curve. "You can't make a faucet or a valve just for California," says Barbour. "I think this has very far-reaching applications." In this way, Eco Brass represents the future as an environmentally friendly material that can satisfy all requirements for brass rods, bronze rods and castings. ■

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