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INB SM1-203R

Subject: Dezincification of Silicon Bronze Impellers - (Peerless Material Code 449) March 7, 2002

Information Bulletin SMI-203 *was issued on May 24, 1996 regarding the use of silicon bronze in certain applications. Excerpts from this bulletin follow:*

"This bulletin becomes part of and is to be retained in your Sales Manual until further notice."

"Silicon brass can experience Dezincification in certain types of applications. Dezincification is the process of selective removal of zinc from copper-zinc alloys leaving a porous mass of copper with very little mechanical strength. With impellers the first sign of Dezincification will normally be loss of performance."

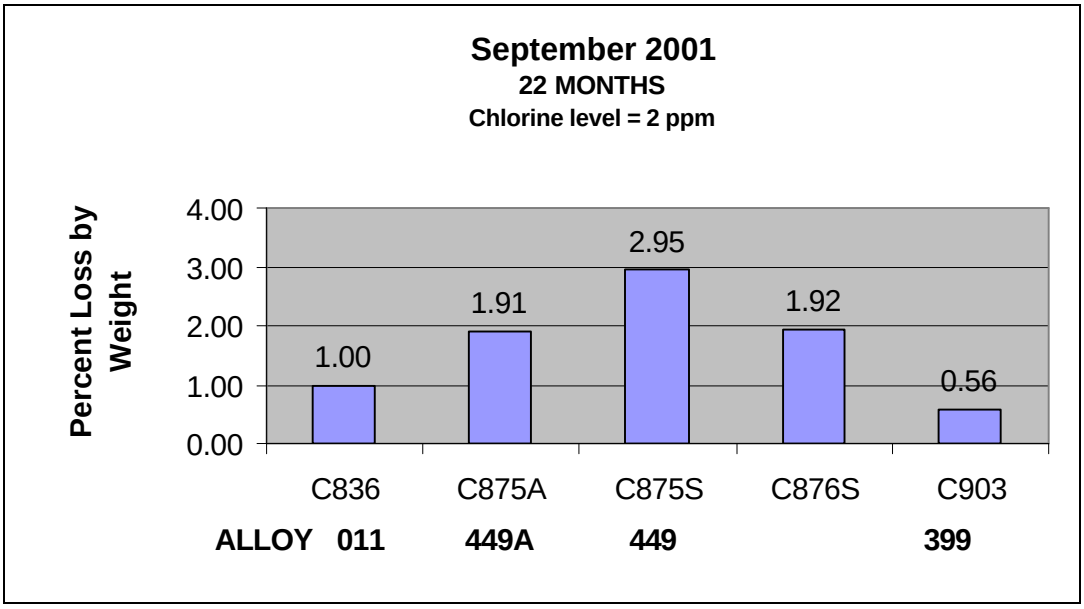
"The following application conditions will result in Dezincification of silicon brass impellers:

1. **Water with high oxygen, carbon dioxide, and/or chlorine content.**
2. **Slightly acidic water, at room temperature, which is low in salt content.**
3. **Alkaline water above room temperature which is high in salt content."**

When any of these application conditions exist, impellers in silicon bronze, material code 010, 011 and 449 ***should not be used***. Substitution of cast iron (040), Aluminum-bronze (023) (for Vertical pumps) or Nickel-aluminum bronze (577) (for end suction and split case pumps) will eliminate any possibility of Dezincification.

Peerless has been working with a number of end-users for several years addressing Dezincification applications. During 2001 Peerless and one of our major impeller suppliers were involved with several test set-ups hoping that we could define a specific chlorine concentration level (parts per million, ppm) at which we would recommend making an alloy change. Running and impingement tests were/are conducted with chlorine concentrations of 1,2,3,5 and 7 ppm comparing several alloys in each concentration. There was no definitive chlorine concentration level at which we could clearly recommend changing our standard impeller alloy. The following bar graph shows a comparison of product loss for several tested alloys in a chlorine concentration of 2 ppm. This was a typical comparison for all of the chlorine concentrations noted above, but more product loss was evident with higher concentrations of chlorine.

Our major supplier, through stricter quality control, has minimized the percentage of zinc in the impellers we are furnished (from 16% to 12%) and still meet the C87500 specification. This is noted as Peerless material code 449A (C875A) in the bar graph.



Copper Development Association	C836	C875A	C875S	C876S	C903
Peerless Internal Material Code	011	449A	449		399

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1. **The C83600 (011) SAE 40 bronze**: This alloy was the standard impeller material used for over 50 years. This alloy contains 5% lead and has been discontinued by most foundries in the USA. Interestingly enough, this alloy also contains 5% Zinc.
2. **The C87500 (449) Silicon brass**: This alloy has been used in Sterling Fluid Systems (USA), Inc. (Peerless Pump) end suction and split case pumps for over 30 years and contained ~ 16% Zinc. It has been suitable for 99.9% of our applications.
3. **The C87500 (449A) Silicon brass**: Our impeller casting vendor, by tighter quality control measures, has minimized the Zinc content to 12% Zinc which still meets the alloy specification. This alloy has been used in casting Peerless end suction and split case impellers for over a year. This has reduced the potential for Dezincification by 30% (Note: Alloy C87500 is utilized in a vacuum die casting process that produces a superior quality impeller casting.)
4. **The C90300 (399) Tin bronze**: This is one of the alternate zinc (4% Zn, 8% Sn) alloy impellers that we have field tested to date. We have a distributor whose end-user has been requesting this alloy for two years in lieu of the 499 bronze that was destroyed in 6 months..
   (Note: This alloy has been used as a standard only for AD impellers.)

Why hasn't Peerless Pump standardized on another alloy without Zinc to eliminate of this dezincification problem?

Here are some of the reasons resulting from our testing:

1.) Our casting vendor reports that some of the alloy changes affect the lining life of the vacuum die equipment.
2.) The scrap rate increases with some of the alloys.
3.) Cost increases with some of the alloys.
4.) The alloy is not compatible with the configuration of the impeller.

We're still working with our vendor(s) for total resolution of this problem to provide our customers with quality impeller castings at a reasonable price while greatly improving longevity of impellers.

Richard Sheets
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