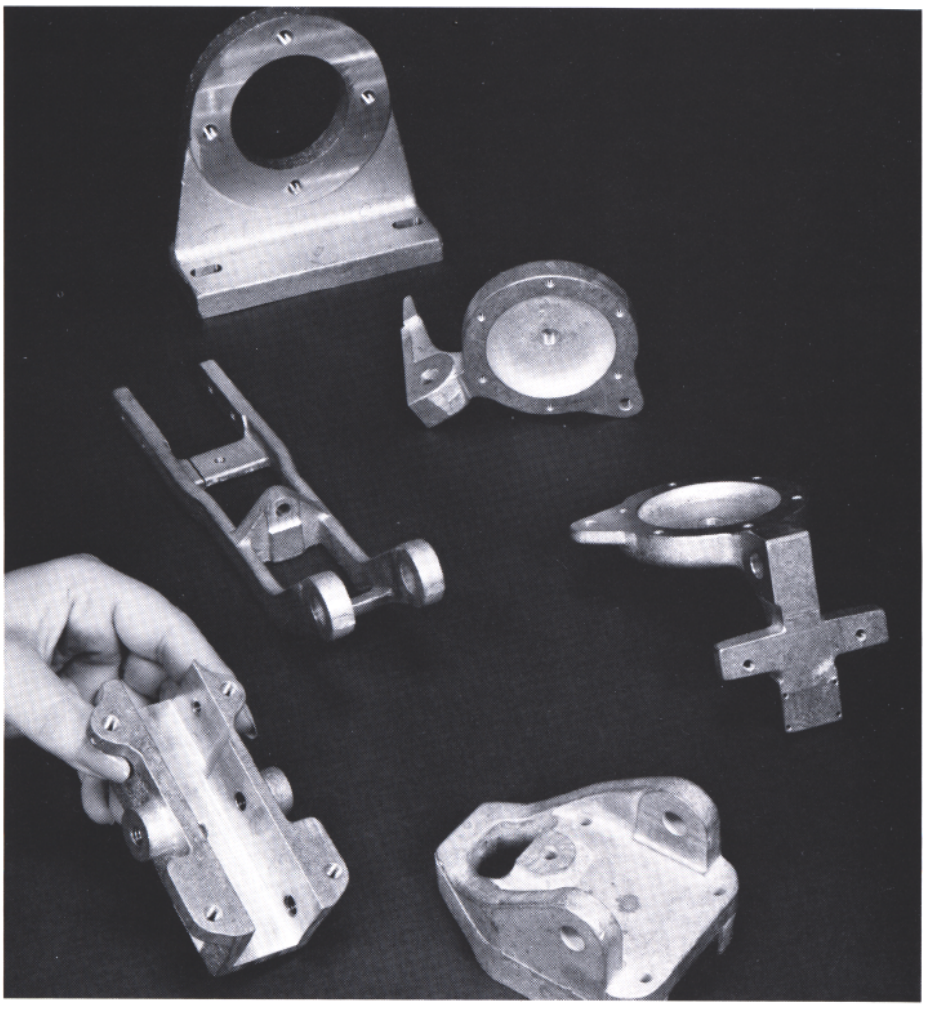
High Strength Zinc Sand Castings Save Major Manufacturer **44%**



ZA-12 castings provide excellent wear resistance, high strength and pressure tightness.

FMC Corporation's Film and Packaging Division in Kennett Square, PA is currently enjoying a 44% cost saving on six parts used in their APM-2A strapping machine. This machine is a complex automatic unit which applies and heat-seals plastic strapping. The castings represent a good assortment of functional machine parts, requiring moderate strength, wear-resistance, pressure-tightness and good bearing properties. The parts require extensive machining. Switching from manganese bronze to high-strength ZA-12 zinc alloy has resulted in an average 30% saving on six sand castings, and 51% savings in NC machining costs, which totals a projected $26,179 annual savings for 550 machines.

In mid-1976 FMC was investigating possibilities for cost reduction and looked into replacing the high-strength bronze castings with aluminum. FMC's engineering group vetoed this idea after a stress analysis indicated most of the parts would fail because of aluminum's lower strength. The foundry supplying the parts recommended ZA-12 and FMC's engineers agreed that at 40-45,000 psi the new zinc alloy should do the job. Based on the anticipated 30% savings in cost of castings (in material cost alone ZA-12 is less than one-half the cost of bronze), FMC ordered a trial batch of castings. This involved no investment in tooling, because the identical foundry patterns are used.

Functional tests of the ZA-12 proved very satisfactory, with one surprising result: in wear tests of the critical platen housing, the zinc outperformed the expensive bronze! Cycling the cam-operated tool steel anvil 100,000 times in **unlubricated** platen housings of aluminum, bronze, and ZA-12 produced serious galling of the aluminum, noticeable wear (fine particles) of the bronze, and **no measurable wear of the zinc part.**

Part of the clamp arm casting functions as a pressure vessel and must be pressure-tight. A number of bronze castings had to be rejected for leakage, compared to zero porosity defects in the zinc castings.

The greatest savings for FMC is not the material cost savings, or reduced rejects, however. All of the castings are heavily machined and even with FMC's efficient NC setup, machining costs are many times the cost of the raw castings. Value analysis forms prepared by Mike Derrickson, CMfgE, the plant's manufacturing engineer, detail an average **51% savings** in NC machining costs! This accounts for over 80% of the total cost savings.

A typical example of the savings is the platen housing casting. FMC is now saving $1.08 per purchased casting and $6.14 in machining costs for an overall savings of 41% on a one pound (finished weight) part. As Mike says, "We'd have changed for the material cost savings alone, but the savings in machine time make it mandatory. We're very pleased to have a high-strength sand casting that machines so well."

Mike is an expert in NC machining and now has enough experience with ZA-12 to assign his own "machinability rating" to it. For example, for drilling with HSS twist drills he assigns these SFM values: soft brass-175 common bronze-150, high strength bronze-75, cast iron-40 to 100, malleable iron-85, and ZA-12-200 SFM.

Milling with carbide end mills is a very useful NC method and Mike has confirmed these speeds (SFM): soft brass-800, common bronze-400, high strength bronze-300, cast iron-175 to 300, and malleable iron-300. ZA-12 at 800 SFM ties for first with the softer brass.

The high strength "ZA" zinc foundry alloys machine faster and easier than any other alloys with comparable strength and hardness. Only aluminum or brass alloys, which are softer and weaker than zinc alloys can machine as fast as zinc.

FMC's profitable experiences in converting to zinc sand castings will be repeated over and over as industry discovers the ZA family of alloys, and the resulting cost savings.

Extract from the "Alloyer", Eastern Alloys' *bi-monthly newsletter*

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