TECHAPPLICATION

Resistance Melting - A Bellringer at Temple Aluminum

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THE CHALLENGE:

To Improve Casting Quality and Quantity While Reducing Dross Losses

BACKGROUND

In 1990, Temple Aluminum Foundry, Inc. headquartered in Blandon, Pennsylvania sought an alternative to melting aluminum in gas reverberatory furnaces. The company's goals were to:

- Increase production
- Reduce metal losses due to porosity
- Increase yield by reducing excessive dross formation
- Improve the working environ ment

A decision was made to purchase an electric resistance crucible furnace.

THE OLD WAY

Temple Aluminum had been using two 600 lb gas-fired, crucible-type furnaces. Due to the noise and heat generated by these furnaces, it was necessary to house them in a separate "melting area". During casting, molten aluminum had to be carried a long distance from the melting area to the pouroff section.

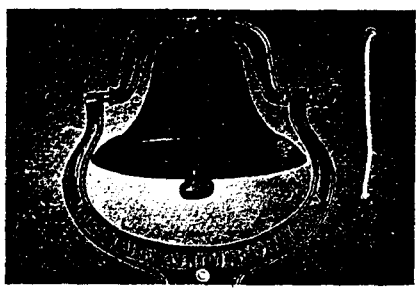

Figure 1. A "bell-support" cast at Temple Aluminum.

In addition, the gas-fired furnaces generated large amounts of aluminum dross. Over twenty years had past since the furnaces were installed, and it became evident that it was time to modernize. If a reasonable payback could be realized, Temple Aluminum was ready to make a change.

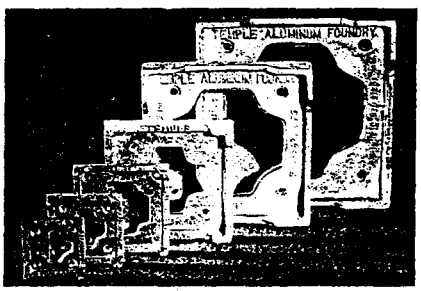

Figure 2. Porch post bases.

THE NEW WAY

The solution to Temple Aluminum's problems was the result of a cooperative effort with the Metropolitan Edison Company (Met-Ed). Working with their utility representative, Dave Hillanbrand, Temple learned that resistance melting furnace technology would help reduce production costs through increased yield due to less metal oxidation (dross) and efficient energy use. In addition, labor savings would be realized by installing the compact furnace into a new floor plan.

The centerpiece of the foundry's modernization is a 2400 lb capacity electric resistance crucible furnace built by Dynarad Corporation, San Leandro, California. Temple placed the new unit in the center of an addition to the foundry. This central layout markedly improved the ergonomics on the production floor.

THE RESULTS: ENVIRONMENTALLY-CLEAN, COST-EFFICIENT MELTING

With a crucible furnace, metal melting actually takes place within a graphite container inside the crucible. Heat, generated by electric resistance elements, is applied from outside the crucible and is conducted through its walls. This results in very high efficiency due to minimum heat losses by convection or radiation. Electric resistance melting also provides greater control and longer crucible life than does gas melting. The furnace is ideal for melting low-temperature metals like aluminum. For a smaller foundry with short production runs, such as Temple Aluminum, resistance melting offers the advantages of fast heating and flexibility.

Resistance melting provides uniform, high-quality melts, with fewer rejects due to porosity. This is because electric melting minimizes oxides and inclusions associated with direct impingement of flame on metal. Another factor contributing to material quality is the stillness of the melt. Metal is not agitated during heating,

reducing oxidation and dross formation caused by surface turbulence.

With resistance melting furnaces, temperatures are easily controlled, so uniform conditions are maintained. And superior temperature stability in both melting and holding translates into high-quality parts–consistently.

Electric heating virtually eliminates air pollution problems. Without the need for combustion air, environmental contaminates are not produced and scrubbers or other cleaning devices are not needed. And, because electric furnaces are significantly quieter than gas-fired, working conditions are safer and more worker-friendly.

SUMMARY OF ADVANTAGES

Low metal losses. Consistently under 2 percent compared with up to 12 percent for gas furnaces.

Superior quality. Turbulence that leads to oxidation and dross formation is eliminated. Aluminum is produced with a smoother finish.

Thermally efficient. Efficiency values as high as 75 percent have been reported for resistance furnaces. Temperatures can be controlled to within ± 5°F.

Long lining life. Refractory life is extended due to less erosion, resulting in additional operating savings.

Quiet operation. Electric melting is almost noiseless.

Minimal heat loss. Efficiency of operation with little escaping heat provides comfortable working conditions.

Pollution-free. Emissions-free melting improves health and environment.

Reduced labor. Less downtime and maintenance mean reduced labor cost per unit output.

Cold start with limited scrap. No molten metal heel is necessary with resistance melting. The furnace operates reliably with repeated cold starts.

Fast melting time. Efficient, controlled heating results in one-to-two hour melt cycles for faster operations and easier, more flexible scheduling.

THE BOTTOM LINE: BENEFITS FOR FOUNDRY, EMPLOYEE, AND COMMUNITY

Three years after commissioning its resistance melter, Temple has paid back the $30,000 installation cost based on the yield savings alone. Due to the success of the electric melting operations, a second similiarly-sized resistance furnace is planned for installation in 1993. It will operate during off-peak hours.

COMPANY PROFILE

Temple Aluminum Foundry, Inc. has been a family-owned and managed operation since 1952, when James W. Schoellkopf, Sr. founded the company in Temple, Pennsylvania. The business was successful and was moved to a 30,000 sq. ft. facility eight miles north of Reading, in Blandon, Pennsylvania.

Temple purchases aluminum ingots that are produced from the recycling of automotive and commercial castings. After melting the ingots, Temple Aluminum produces aluminum patterns for concrete lawn ornaments, decorative accessories, builder's hardware, floor drains, truck and machine parts, electrical fittings and boxes, along with a variety of commercial castings, see Figures 1 & 2.

Eric Schoellkopf, President of Temple Aluminum, and Dave Hillanbrand, Met-Ed, discuss the melting efficiency of Temple's electric resistance crucible furnace.

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For ordering information, call EPRI's AMP Program 1-800-4320-AMP

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