White Paper: Increase Your Productivity With Better Age Oven Technology

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In today's marketplace, it is critical to optimize the productivity of the equipment in your plant. This is especially challenging for age ovens, which must also be energy efficient, low maintenance and provide consistent metallurgical results with varying parts.

Design For Aging

Many age ovens are general use equipment, not specifically designed for aluminum aging. This drawback costs money through reduced productivity, with the user often unaware that a problem exists. By designing heat processing equipment specifically for aging, cycle times can be reduced and productivity increased.

Convection Is The Key

Aluminum aging is a relatively low temperature operation. The parts are heated using recirculated air and then held at temperature. Convection (forced air) is especially effective in aluminum processing because of the very high thermal conductivity (over 4 times that of steel). Aluminum will accept heat virtually as fast as it can be delivered via the convected air. By using increased convection and heat input, heat transfer to the parts will be optimized. This reduces the oven cycle time. The same principal applies during the cooling cycle. Hot aluminum will release heat extremely quick when cooling air is sufficient and properly delivered, thereby reducing the cooling time.

More Airflow Delivers Better Performance

The biggest factor in the design of any oven, especially age ovens, is the air recirculation rate, measured in CFM (cubic feet per minute) and often expressed in "air changes per minute" (CPM). This refers to the volume of air circulated within the oven by the recirculation blower. The CPM reflects the number of times per minute all the air is completely recirculated through the heating chamber. For example, if an oven work chamber is 8' wide x 10' long x 7' high, its volume is 560 cubic feet. If the recirculation rate is 28,000 CFM, the CPM is 50 (=28,000/560).

A high performance age oven should deliver approximately 30 to 50 CPM. This is in contrast to general-use ovens, which are often 5 CPM, or 2,800 CFM in the above example. Considering that a 28,000 CFM oven operating at 350° F will circulate 82,300 pounds of air per hour, versus 8,230 pounds per hour for a 2,800 CFM oven, it is understandable why airflow has such a big impact on oven performance, as illustrated below.

Figure 1 shows calculated heatup rates of aluminum castings at both 5 and 50 CPM. The 50 CPM design heats the castings to 350° F in approximately 15 minutes, in contrast to 30 minutes for the 5 CPM design, a savings of 15 minutes.

After aging is complete, the cooling cycle will compare similarly, with an additional 15 minute savings for the 50 CPM design. This results in a total savings of 30 minutes over the entire cycle. If the soak time is 2 hours, for example, this savings translates into 20% higher efficiency over each aging cycle, as shown in figure 2. Therefore, the oven will process 20% more product using the higher recirculation rate, which will shorten the payback period and increase the productivity of the equipment by thousands of dollars over its life.

Conclusion: When investigating an age oven purchase, consider a high performance unit designed specifically for aging. It will provide faster payback and increased productivity.

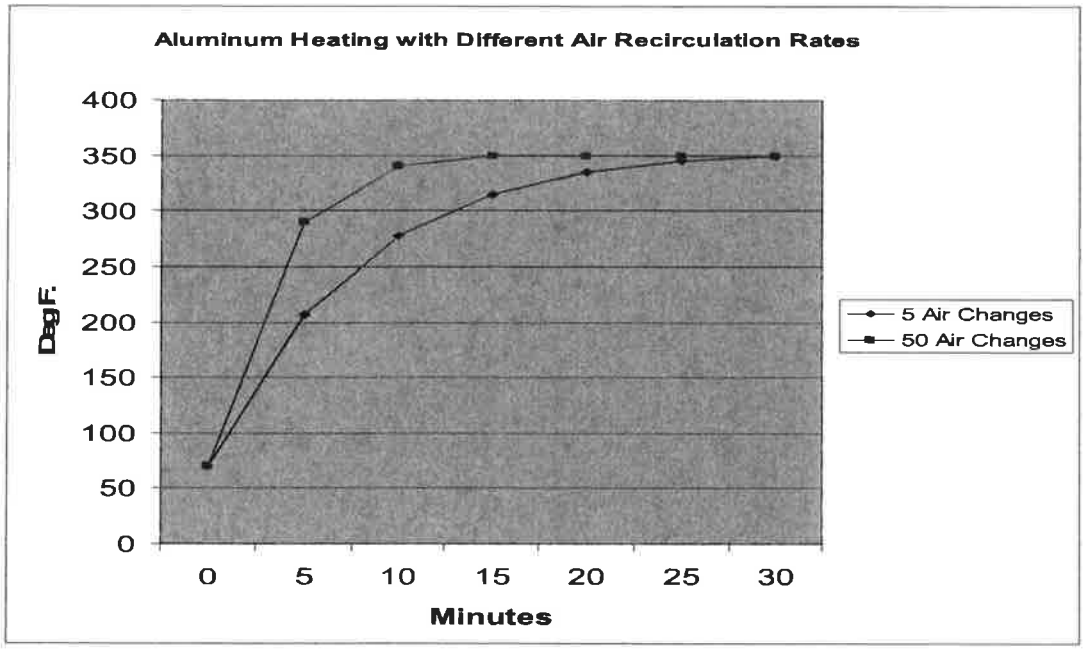

Figure 1

	5 CPM	50 CPM
Heat-Up	30	15
Soak	120	120
Cool	30	15
Total Cycle Time	180	150

Times in Minutes

Figure 2

Please feel free to contact Wisconsin Oven Corporation by phone at (262)642-3938, or by email at sales@wisoven.com, to discuss any of your aging questions or requirements.