Moisture and Cold Box Core Strength

Aluminum foundry men are well aware of hydrogen porosity problems that arise during the hot, humid weather of summertime. Are you aware of the effect of slight moisture variations with phenolic urethane cold box (PUCB) systems? These factors can reduce casting quality and dimensional accuracy without you knowing it. Some casting quality issues might be attributable to humidity in your foundry.

Iowa, as well as many other northern states, enjoy cold but dry winters with relative humidity (R.H.) as low as 15%. However, during the summer months the R.H. can reach more than 70%. Even at equal humidity levels, more moisture is present in the air during warm days than cold ones. This can be a serious problem for users of PUCB cores. Research at the Metal Casting Center has shown that PUCB cores produced at 70% R.H. have tensile strength properties 23% lower than cores produced in dry conditions even after one hour as shown below.

How does this affect your operations? Foundries using tensile strength for quality control could inadvertently collect misleading data. Sand testing laboratories in environmentally controlled rooms produce conditions that are not typical in the core room, skewing the true core properties at the point of core making. Conversely, testing laboratories in poorly controlled areas replicate core room conditions but hide potential moisture (i.e. sand, binder, etc.) problems. This can be a dilemma for the core room supervisor if corrective action needs to be taken to rectify production problems.

Solutions to this dilemma start with understanding how humidity can affect supporting core making systems and what the possible solutions are. Considerations and recommendations include: Compressed air dryers work overtime during the summer months. Make sure that the equipment is in good operating condition and that preventive maintenance is done on a regular basis.

Drain air tanks and receivers daily. One foundry complaining of low air storage capacity reported draining over 50 gallons of water from their accumulator tank. Look into automatic drains to lessen manpower.

Design cores robustly to prevent core breakage due to minor variations in core strength.

Bulk storage or barrels used to store chemicals require vents to allow the chemical to be pumped to the mixer. Use vents with built-in desiccators or chemical dryers to prevent moisture contamination of the part II binder.

Use cores as soon as possible after production. This not only prevents moisture pickup, but lowers work in process inventory thereby saving dollars. If cores need to be stored for an

extended period of time, dry cores by placing them in a 350oF oven for 15 minutes and allow the cores to cool to room temperature before using.

Foundry suppliers provide the highest quality materials to foundries. The goal for all foundries is to produce the highest quality castings at the lowest cost. Tracking casting defects with weather conditions could pinpoint processing conditions that might have been overlooked during analysis. Adjusting binder levels to obtain desirable core properties might not always be the correct action.

This article was co-authored by Scott Giese and Jerry Thiel