

*New Equipment Spotlight...*

## Innovative Furnace Design for Wagstaff's New R&D Center

**T**horpe Technologies Inc. is pleased that its innovative furnace design was selected to provide metal to Wagstaff's new R&D facility's casting pit in Spokane, WA, which it uses to refine casting practices and develop new casting technology for the aluminum industry throughout the 21<sup>st</sup> century.

Thorpe started working on the design concept for Wagstaff's unique furnace requirements for its R&D center in early 2013. The design size was driven by the requirement to be able to charge a single 60,000 lb rolling mill ingot with a combination of two of the three dimensions of a large ingot that is 18 ft (5,485 mm) long by 9 ft 10 inches (3,000 mm) wide by 5 ft (1,525 mm) thick. An ingot with these dimensions would weigh 67 tonnes, so the third dimension of the ingots to be processed would be limited by the furnace capacity limit of 60,000 lbs. Of course, the furnace would also be able to process combinations of ingots.

The design configuration was driven by the particular use of this furnace, as it provides metal to an R&D facility, not a production facility. The same metal is cast, remelted, and re-cast multiple times. Wagstaff wanted to maximize casting time, while minimizing its costs and time handling solid metal.

Charging one 60,000 lb ingot into a skim door, over the sill, and laying it down on the hearth without dropping it and damaging the hearth in a standard box stationary or tilting melter would require an expensive charging machine. Thorpe's solution was a tilting melting furnace with no front wall under the sill. The furnace is charged in the down position, where the hearth is essentially flat. A large forklift is used to place the ingot or ingots flat on the hearth without damage to the hearth refractory. The furnace is tilted up to the melting position at an angle where there is sufficient volume to hold 60,000 lbs of molten metal in the furnace below the bottom of the skim door and pour spout. Once the ingot is completely melted, the molten bath is skimmed, alloyed, and transferred



to the caster in the same manner as a standard tilting furnace.

A furnace tilt mechanical stop prevents the furnace from tilting down below the melting position in the event of power failure. A multi-step control procedure is required to remove the mechanical stop before the furnace can be lowered back to the charge position.

The combustion system capacity is 16 mm BTU/h and includes two Bloom Engineering model 1600 gas fired cold air burners. The melt rate is sufficient to provide molten metal for casting the next morning after completion of casting the previous afternoon. Regenerative combustion was considered, but a cold air system was selected for multiple reasons, including cost and space considerations.

The furnace refractory includes Wahl Refractories UltraWalMaxXx 80 AL precast hearth and WalMaxXx 70M Al lower sidewall precast shapes. The skim, door jambs, lintel, and sill are all removable/replaceable bolt on precast refractory shapes with steel backing plates. The lintel, jambs, and sill are cast using Wahl Ultracommand 70. The roof was installed using 12 precast panels. This design provides the ability to replace individual damaged panels (typically

near the door where they are subjected to more wear from the charging operation) without replacing the entire roof.

Thorpe's tilting furnaces are designed with the tilting cylinders mounted to a main support beam that runs under the furnace on the skim door side. This beam is isolated from the heat, allowing the enclosure steel to grow from thermal expansion without affecting the alignment of the tilting cylinders.

Other features of the furnace include:

- a large skim door opening that is 20 ft wide by 7 ft 8 inches high to provide sufficient clearance for charging the largest ingots
- a hydraulically operated low profile door operating mechanism to clear the bottom of the overhead crane
- a 10 inch diameter rotary joint that transfers molten metal from the tilting furnace to the casting pit
- a fresh combustion air inlet from outside of the building to the combustion blower located on top of the furnace

Thorpe Technologies joins with Wagstaff in the celebration of the start of the second year of operation of Wagstaff's new R&D facility.