High premiums reinforce Batchpilot case

Currently prevailing ingot and billet premiums mean that the payback time for a complete automatic Batchpilot system, including installation, is as little as one month for a typical casthouse, says Michael Bryant of MQP.

The difference between the European aluminium ingot and billet premiums has increased by over 50 per cent in 2014. The demand for billets is strong but some of the billet producing capacity at casthouses has been lost[1]. Adding a Batchpilot system to an existing furnace setup is a proven and easily achieved means of increasing casthouse productivity by at least three per cent, and usually much more, without installing additional furnace capacity.

What it does

The Batchpilot solution is a furnace liquid metal weight measuring system which operates on the principle of creating a relationship between the changes in the furnace cylinder hydraulic pressure and tilting angle. A schematic view of a typical tilting furnace is shown in Figure 1. In operation, the furnace is supported by its pivots and up to two hydraulic cylinders, which means that the furnace mass is distributed between the furnace pivots and the cylinder(s). The proportion depends on the location of the centre of gravity of the whole system and can be obtained by straightforward calculations. Due to the geometry of the system, a large furnace angle corresponds to a larger pressure in the cylinder.

Weighing the liquid metal inside the furnace using the hydraulic pressure in the cylinder can be achieved by establishing a relationship between the pressure variations caused by various amounts of liquid metal to determine the actual metal mass inside the furnace. Importantly, several other parameters must be taken into account in order to obtain an accurate measurement.

First, friction plays a significant role in such a system. Secondly, leaks, which are always present in hydraulic systems, can make the furnace move slightly over a period of time. Furthermore, deposits of dross accumulate on the furnace walls and build-ups of significant adherence to the furnace walls, that does not move when the furnace is tilting as opposed to the molten metal, and influences the pressure accordingly.

In practice the Batchpilot system software is able to characterise any furnace by means of conducting a series of calibration measurements with the furnace completely empty and full. Once characterised, the system can be used to determine both heel weights and the weight of metal transferred into the furnace. Batchpilot has the unique facility to detect build-up of dross on the furnace lining and to compensate for this in determining an accurate heel weight.

The Batchpilot system has the capability to measure furnace heel and transfer weights to an accuracy of between 0.5% to 1.0%, which in practice means measuring the weight of a 50 t full furnace to +/- 500 kg. An important feature of the system is a fully automated weighing capability and down line integration of the output data into the customer management data network[1].

Batchpilot benefits

The benefits of accurate measurement of furnace heel and full furnace weights are well accepted in the casthouse industry in terms of:

• Increasing the percentage of “right first time” batching which reduces/eliminates furnace waiting time
• Eliminating short casts
• Making alloy changes easier to manage as heel weights in the furnace are accurately known
• Reducing energy costs by spending less time with burners on idle.

Of the benefits arising from installing a Batchpilot system, increasing the percentage of right first time batching is likely to be the major benefit for any casthouse, and it can be quantified as follows:

Assuming a typical 70 t casthouse furnace handles five charges per day, operating experience shows that installing a Batchpilot system, and benefitting from first time batching, will allow from one to two extra charges to be melted per week. That means at one extra charge per week or fifty extra charges per year of 70 t, an extra 5,500 t cast per year, which is a 2.9% increase in production. At two extra charges per week it means a hundred extra charges per year of 70 t, which is an extra 7,000 t cast per year, or a 5.8% increase in production.

Economics


So, current average billet premium is US$ 340/t. Assuming a conservative saving of only one extra charge per week, which translates to an extra output of 3,500 t per year, at an average US$ 340/t premium this extra output will generate US$ 1,190,000 extra revenue per year. So this means the extra output over only a month, purely in terms of increasing first time batching, equates to an extra income of US$ 99,166 - which is almost precisely the total cost of a fully installed Batchpilot system.

The other Batchpilot benefits listed above all can also bring an immediate economic advantage to the casthouse, particularly the avoidance of short casts. At current billet premiums, eliminating one to two short casts per week will benefit the casthouse by from US$ 500,000 up to US$ 1,000,000 per year.

Installation

The Batchpilot system was designed to be retrofitted to any hydraulically operated tilting furnace with all components being fitted during normal production time. The basic Batchpilot components are:

• Touch screen and plc
• Hydraulic module
• Inclinometer
• Connecting cables.

Batchpilot can be retrofitted into an existing furnace installation with no shutdown or loss of furnace operating time. There is no need to re-line the furnace. Fitting Batchpilot normally involves a one week period during which the casthouse itself installs cables, sensors and the Batchpilot instrumentation (Figures 2a, b and c). This is followed by commissioning, which involves testing connections and carrying out calibration procedures overseen by an MQP automation engineer. In practice the Batchpilot system software is able to characterise any furnace by means of conducting a series of calibration measurements with the furnace completely empty and full.

Casthouse experience

Batchpilot is now well established as a reliable means of accurately measuring liquid metal heel and full furnace weight in tilting furnaces. To date fifty-five systems are in operation in casthouses worldwide. A major plant with several years’ experience of operating the Batchpilot system is Alunorf.

1 Schematic diagram of a tilting furnace.

2a 50 t holding furnace at Alcoa, Duluth.

2b 2.9% increase in production.
in Neuss, Germany. This is a remelt plant with a capacity of 900,000 t and thirteen casting pits fitted with melting and holding furnaces. It produces slabs up to 8.7 m in length and 2.2 m wide. Initially the primary objective of installing Batchpilot was to optimise the number and sizes of slabs being produced as a means of increasing casthouse production capacity. After an extensive evaluation of the Batchpilot system, the conclusions from their management team were:

• Total furnace weights of around 45 t can for the first time be measured accurately
• Frequency of furnace cleaning is now more manageable due to immediate availability of Batchpilot measurements
• Using Batchpilot measurements we can now routinely cast three 1.650 m slabs per cast. This was not possible before
• Since the introduction of Batchpilot there have been no ‘short cast slabs’

• Alloy changes are easier to manage as the heel weights in the furnace are accurately known because of Batchpilot measurements
• Overall production capacity at the Alunorf casthouse plant has been markedly increased by the introduction of the Batchpilot system. Alunorf now operates eleven Batchpilot systems, and since being installed the data output from each unit has been integrated into the plant batching system.

**Operational and financial case**

Since it was first introduced into a European casthouse in the year 2004, it has always been possible to put forward sound operational reasons and strong economic justification for installing Batchpilot. Payback time for the initial investment has always been relatively short as a result of the proven operational benefits, but in the present climate of record billet premiums the payback times are quite appreciably shorter. An automatic Batchpilot system installed on a 70 t furnace at a cost of US$ 100,000 will pay for itself in only a month.

References


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