smartmelter

Furnace Life Optimization Solution

Furnance Bottom Thickness
Blind Trial at a Float Line

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CONTENT

INTRODUCTION

A major US-based float glass manufacturer approached PaneraTech to use our SmartMelter solution to measure the residual thickness of the furnace bottom on a float line furnace. The float furnace was near the end of the campaign, and the health of the bottom was of great concern for the manufacturer. Eight months before the planned shutdown date, PaneraTech performed an initial assessment of the furnace bottom. PaneraTech performed several surveys leading up to the planned shut-down to map the residual thickness of the furnace bottom.

The objective of this monitoring program was to monitor the progress of glass infiltration at the furnace bottom. Prior to the furnace drain for rebuild, PaneraTech performed a final survey of the furnace bottom using the SmartMelter sensors. After this final survey, PaneraTech submitted a report indicating the final thicknesses of the furnace bottom that was mapped over a large area.

After the drain, the float glass team selected several spots and measured the actual physical thicknesses of the bottom. This was compared with the SmartMelter measurements. The overall results demonstrated that the SmartMelter solution had measured residual bottom thickness within 0 - 5mm (0.2 inch) of the actual bottom thickness.

Figure 1
SmartMelter Furnace Bottom Inspection at a Float Line

BOTTOM STRUCTURE AND MEASUREMENT

The measurements were performed on the bottom of the float line manufacturing furnace in the refiner area. The measurements were done in one day and covered 49 blocks-an area of 28 m² (300 ft²). Each block was 305 mm (12 in) in original thickness, except for the last three rows of the furnace, which were 280 mm (11 in) in original thickness. The cross section of the bottom layout over two clay flux blocks is shown in Figure 2. As shown, several measurements were taken using the SmartMelter sensors to cover the whole block. Using this data acquired from SmartMelter, a three-dimensional map of the refiner bottom was created, indicating glass penetration into the clay flux and showing residual thickness.

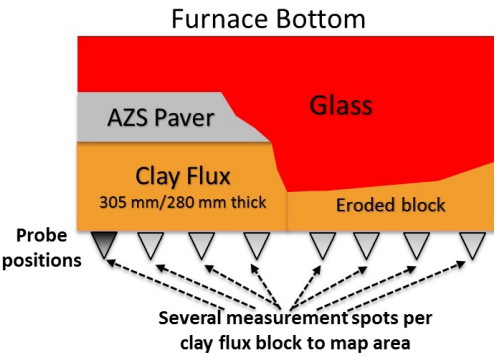


Figure 2
Furnace Bottom Layout and Measurement Spots

THREE DIMENSIONAL VIEW AND MEASUREMENT

Before the drain, the data was obtained so that a 3-D view of the erosion profile on the furnace bottom could be created. A top view of this profile is shown in Figure 3. Five locations were measured for comparison and are marked in the figure. Note that the erosion profile indicates a minimum residual thickness of 99 mm (3.9 in) near spot 1. The blocks in this area show strong erosion, where the original thickness of the block was 280 mm (11 in). A photograph of this same area, highlighted in red, is shown in Figure 4. It is clear from the photograph that the areas of clay flux penetration correspond to the areas indicated in the 3-D erosion view. The perspective view of this erosion is shown in Figure 5. For the physical comparison after the drain, any residual glass remaining was removed from the top of the blocks. Then the spots were drilled and measured. (see Figure 6)

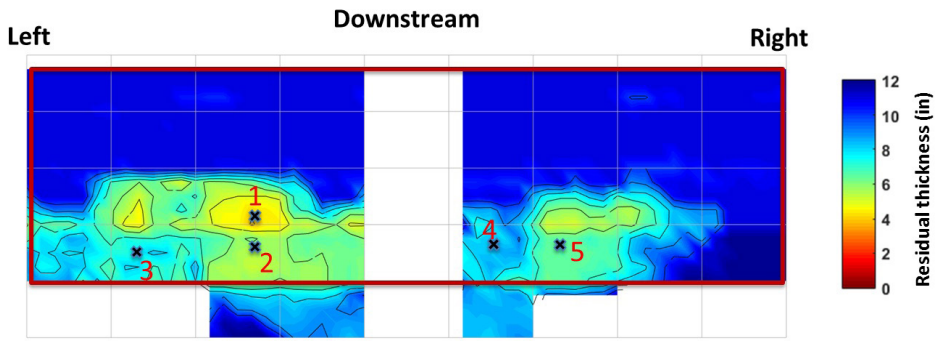


Figure 3
Top view of clay flux erosion obtained before furnace drain

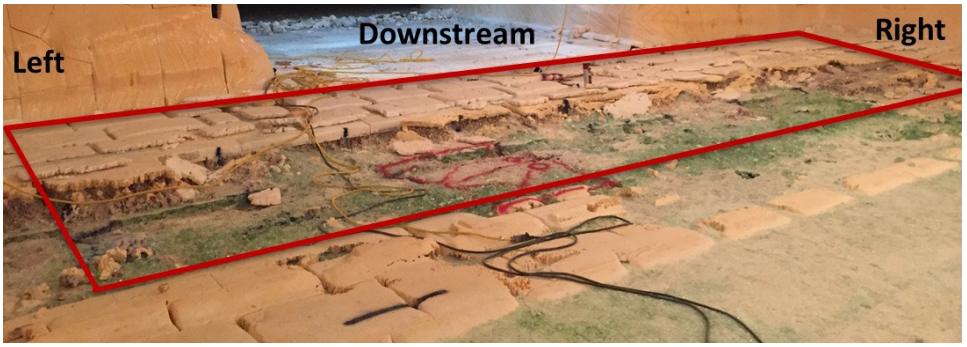


Figure 4
Post-drain photograph of area under inspection (red)

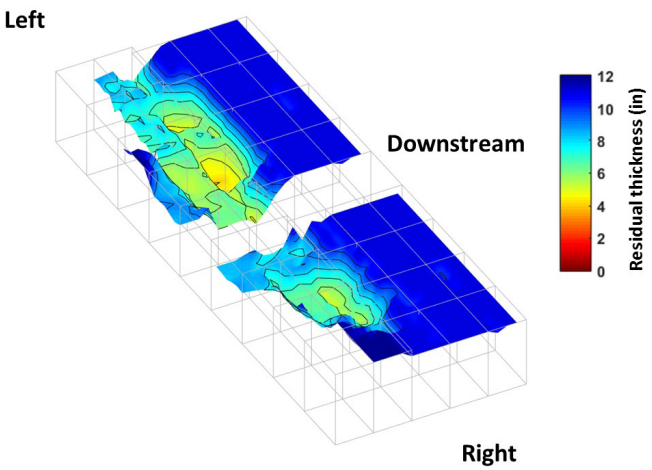


Figure 5
SmartMelter 3D visualization of furnace bottom at the refiner area before furnace drain

THE RESULTS

After the drain, several spots were chosen by the float glass manufacturer for comparison with the SmartMelter results. The remaining cold glass was removed and these spots were drilled. The actual thickness of each block was measured by the float line manufacturer team. In the spots that were examined, the original AZS paver blocks had eroded and glass had penetrated into the clay flux. The SmartMelter sensor successfully measured the thickness of the residual clay flux for these five spots within 0 - 5 mm (0.2 inch) accuracy as shown in Table 1. The five blocks had residual thicknesses of 99 mm to 208 mm.

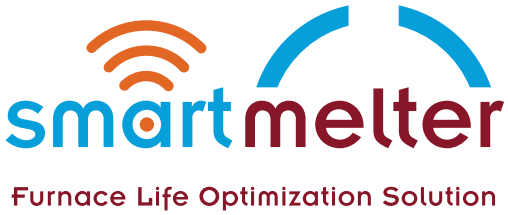
Figure 6
Validation of SmartMelter with glass removal, drilling and measurement of actual thickness

Block Number	SmartMelter Sensor Reading	Actual Clay Flux Block Thickness	Difference
1	99 mm	102 mm	-3 mm
2	140 mm	140 mm	0 mm
3	203 mm	203 mm	0 mm
4	208 mm	203 mm	-5 mm
5	163 mm	165 mm	-2 mm

Table 1
Comparison of Actual Block Thickness with SmartMelter Measurements

CONCLUSION

This blind trial clearly demonstrated the accuracy of the SmartMelter system for measuring furnace bottom thickness. The trial also facilitated a safe shutdown for the float line manufacture with a drain that occurred according to schedule.



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