



Furnace Life Optimization Solution

Cardinal Glass Avoids an Expensive Surprise with **SmartMelter**[®]

卡迪安玻璃应用**SmartMelter**[®]避免了一次昂贵的意外事故

Cardinal Glass is a leading supplier in the production of glass for windows and doors. Cardinal's product line includes insulating, coated, laminated, tempered, and float glass, manufactured across thirty seven U.S. glass plants. When Cardinal FG decided to try SmartMelter® technology to inspect a furnace bottom, they made an important discovery. The expected life of their furnace was too optimistic, and the cold repair schedule in place would almost certainly result in a glass leak. Kelly Busch, Vice President of Cardinal FG, and Mark Purcell, Production Manager, shared how SmartMelter® monitoring kept a surprise maintenance issue from becoming a costly disaster.

卡迪安玻璃是一个在门窗玻璃生产行业的领先供货商，卡迪安玻璃拥有多条保温，镀膜，夹胶，钢化及浮法玻璃生产线，在美国有37个生产工厂。卡迪安浮法玻璃线在使用SmartMelter® 技术对窑炉池底时有了重大的发现，原本他们期望的窑炉寿命非常乐观，如果按照正常的冷修计划时间几乎可以确定将造成玻璃泄露事故。卡迪安浮法玻璃副总裁Kelly Bush及生产经理Mark Purcell 跟我们分享了SmartMelter® 探测监控如何给了他们一个避免高额灾难的惊喜维修机会。

Previous Inspection Methods 以往的探测手段

Mr. Purcell described a close call on a furnace bottom at another plant just six years earlier. A repair was scheduled without any information about the condition of the furnace bottom. Five months before the scheduled repair, they had reason to drill a hole to check the block. In the spot they drilled, only six and a half inches of block was left; when the furnace was shut down, the same area had just over two inches of material left. "Had that date been six months out or a year out, we wouldn't have made it," he explained. "We dodged a bullet."

Purcell先生给我们描述了一个幸免遇难的事例，六年前在他们对另一个工厂的窑炉池底计划进行维修，但是并不知道任何池底的情况，于是就在冷修计划日的五个月前对池底进行了钻孔以便检查池底砖。在他们钻孔的点测得池底砖剩下6.6英寸的残余厚度，但是在停炉后同一个点的那片区域仅仅剩下2英寸的残余厚度了，他解释道“无论那个日期是6个月以后还是1年以后，我们都会出大问题的，我们躲过了一劫”。

Because Cardinal wanted more information on which to base their repair decisions, they began using a system of Thermal Scans and Triplex Thermocouples (TC) that would measure temperatures at three different levels of the block. When a lower-level TC increased in temperature, they would know that the bottom was thinning. While this greatly improved their knowledge about the furnace bottom, it was still limited. Measurements were only taken on specific blocks, and there was still guesswork to determine which areas to measure. A block that was dangerously thin could simply be missed. The expensive platinum TC's also had to be wired back to the control system, leaving them vulnerable to water damage from cooling systems.

由于卡迪安需要知道更多的信息来决定他们的维修计划，他们开始使用一个基于热扫描及对耐火砖进行三点热点偶不同深度测温的方法系统，当一个低点的热电偶温度上升后他们就知道池底就薄了一层，虽然这种方法提高了他们对池底侵蚀的情况了解但仍有局限性，因为这样的测量仅仅是在特定的几块热电偶砖上，对于其它区域的情况依然是猜测推断，某块砖的严重侵蚀变薄会被遗漏，而且需要将昂贵的白金热电偶连接到控制室，白金热电偶也容易受到冷却系统的触水损坏。

The SmartMelter® Inspection SmartMelter® 探测

PaneraTech had been presenting SmartMelter®'s validated ability to identify high-risk areas and accurately measure residual thickness in furnace sidewalls. Cardinal reached out to PaneraTech to see if the technology they had been using on AZS block could be used to inspect a clay flux furnace bottom. Cardinal provided information on the chemical composition, density, and electrical properties of the clay block, and the two companies worked together to develop a successful sensor that could monitor the condition of the entire furnace bottom.

PaneraTech帕尼罗科技已经对SmartMelter®在高风险区域进行了与实际测量池壁砖厚度对比的可靠性验证。卡迪安找到PaneraTech帕尼罗科技咨询他们的这项应用于AZS耐火砖检测的技术能否也可用于探测窑炉粘土砖池底部位。卡迪安提供了相应的耐火粘土砖化学成份，密度以及电性能等参数，于是这两家公司就开始合作并成功研发了可以探测整个窑炉池底状况的探测传感器。

The first full inspection on a float glass furnace bottom revealed some shocking information. There were areas that were worn much thinner than expected. The expectations for the furnace life of this specific furnace design placed the next rebuild date at least three years away. However, according to the SmartMelter® data, a cold repair would be necessary in less than a year.

第一次对于浮法玻璃窑炉池底的全面探测结果就带来了了一个令人震惊的信息，有一些部位侵蚀的情况比预想的要薄的很多，所被探测的窑炉预期窑龄计划下一次的重修日期至少在三年以后，然而根据SmartMelter®的探测数据，冷修计划必须提前在一年之内。



Prepared Instead of Surprised 避免意外事故准备

Because of the SmartMelter® report, Cardinal was able to avoid the cost and chaos of an unexpected leak. They scheduled a cold repair in eight months, but were prepared to shut down for repair sooner if necessary. The contract was ready, labor was scheduled, and materials were ordered and on site a few months in advance. Cardinal employed maintenance techniques to slow the erosion and monitored the condition of the furnace bottom with regular SmartMelter® inspections. The furnace remained in operation until the new scheduled repair date, and all customer orders were fulfilled.

由于SmartMelter® 的报告，卡迪安才避免了一次存在争论的高成本玻璃泄露事故，他们开始计划8个月之内进行冷修，但是如果必要将尽快先准备停炉，因此他们尽量提前准备了维修合同，人员组织及材料订货到场。卡迪安还聘请了专门的维修技术专家以延缓侵蚀并对窑炉池底使用SmartMelter® 定期监控探测。窑炉最终维持运行到新的冷修计划日并且完成客户的定单后。

Time and Money Saved节约时间及经济成本

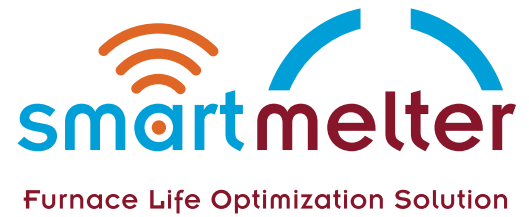
Mr. Busch pointed out that if they had not known about the weak areas, the cost of reacting to a leak would have been considerably higher. Production would have halted for months, as they would have been unprepared for the repair work. Refractory materials would have been rush-ordered at a more expensive price. Lost product and potential damage from leaked glass would have compounded the financial loss. Because Cardinal was informed and ready, what could have been a catastrophe became a simple change in the maintenance schedule.

Busch先生指出如果他们不知道那些薄弱的威胁区域，那么玻璃泄露所带来的事故成本会十分高昂，会造成停产数月，并且由于他们并没有做冷修准备，加急采购耐火砖的成本也会非常贵，生产损失及漏料所带来的破坏对经济的损失会很大，但由于卡迪安得到了信息并做好了准备，一个可能发生的灾难被平稳地转化为了有计划的维修。

Validation and Confidence验证及信心可靠

When the furnace was drained for repairs, all of the SmartMelter® measurements were validated within 5 mm. "That gave us a lot of confidence in the system," Mr. Busch explained. Because of this confidence, Cardinal FG decided to make SmartMelter® monitoring a standard part of their inspection and maintenance program.

在窑炉放水开始维修时，所有的SmartMelter® 探测结果与实测对比验证误差在5mm之内。Busch先生解释道“这个探测系统给了我们极大的信心”，正是有了这个信心，卡迪尔浮法才将SmartMelter® 探测监控系统作为窑炉检查及维护程序的标准之一。



smartmelter.com

PaneraTech, Inc.
帕尼罗科技公司

info@smartmelter.com

P +1 703.719.9666

4125 Lafayette Center Drive, Ste 200, Chantilly, VA 20151 USA

美国弗吉尼亚州拉斐特中心大道4125号尚蒂利200室 邮编20151

