



STUDENT PROFILE

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Steel ladles are used to transport molten steel from the converter in the BOS plant to the continuous casters. They are lined with refractory materials which at TATA Steel Port Talbot need replacing after around 140 heats (molten steel poured into ladle and transported to the continuous casters). This means the life of a ladle lining will last anywhere between 3 and 8 weeks in production. Every life of a lining is different due to the grades and treatments of steel, and the corrosive effects of these grades and treatments is different. It is important to ensure the refractory lining is replaced before its safety is compromised. Because of this, TATA Steel Port Talbot developed a “Ladle Management System” (LMS) to monitor the more corrosive treatments and grades known as “penalty events”. Each one of these events contributes extra “penalty minutes” to the ladle and reduces the time the ladle can stay in production. These penalty minutes are added to the amount of molten steel contact minutes the lining receives. Once they reach 26000 the LMS shows the ladle lining as reaching 100% of its life. The ladle is then taken out of production while the lining is replaced.



The task was given to analyse the LMS data of the life of the ladle linings from the beginning of 2016. The data showed the largest contributor of penalty minutes was found to be “low tap weight”. The low tap weight minutes are assigned when the amount of steel tapped into the ladle from the BOS vessel is less than 305 tons, which triggers the LMS to add 100 penalty minutes to the lining life. The bottle neck within the steel ladles are the impact pads, not the slag line or barrel, which are the areas of the ladle that would be affected by low tap weight. It was deemed safe to reduce these penalties to 50 minutes for a low tap weight event. The analysis produced on the LMS penalty minutes was used as the evidence for the “management of change” to justify the decision to reduce the penalty minutes.

There were 730 penalty events for low tap weight in 2016, which equates to 73,000 minutes or 2.8 extra linings due to low tap weight. The analysis highlighted the high proportion of penalties and a reduction of the penalty minutes would have saved 1.4 linings. As half the ladle linings are taken out of production due to LMS this would account for a saving of £37,500 in 2016 on refractories, and will now produce a similar saving per annum. Further work is now being done on the other penalty events to produce more cost savings highlighted by the analysis.