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Improving Blast Furnace Efficiency and Reducing Carbon Emissions With Blast Furnace Oxygen Pulsing Technology

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ABSTRACT

The SIP Oxygen Pulsing technology was commissioned in late 2020 on the 40-tuyere thyssenkrupp Steel Europe Schwelgern BF1 in Germany, and demonstrated immediate improvements in eta-CO. The technology reduced the total fuel rate and also allowed an increase in the ratio of PCI to coke. These results demonstrate both a reduction in OPEX as well as a reduction in the carbon emissions from the blast furnace, within a very short payback period. This paper will discuss the technology and the learnings from the Schwelgern BF1 operations with Oxygen Pulsing.

INTRODUCTION

Blast Furnace operators worldwide are often tasked with producing high quality iron, at a high throughput. This, however, must often be achieved against a backdrop of operational and process challenges. The limited availability of high-quality raw materials and irregular properties of available alternatives can lead to a departure from ideal operating conditions to a reality under which production targets must be made[1,2].

Consider further, demands in modern blast furnace ironmaking to reach carbon emission targets and reduce energy costs, whilst also effectively managing blast furnace campaigns, then the task only becomes more challenging, especially when using high PCI rates[3]. A new technology with the potential to provide significant process improvements and help overcome these challenges, is a welcome addition to the tools available to any blast furnace operator.

The Sequence Impulse Process technology, or SIP for short, is such a technology. SIP addresses these problems by improving permeability in the lower part of the blast furnace for gas distribution away from the raceway and liquids drainage to the hearth, resulting in demonstrable benefits to the efficiency and stability of blast furnace operation. Figure 1 depicts in summary how the benefits may be realized in a practical sense, enabling positive adjustments to the blast furnace operating points. This gained process stability paves the road to push the process beyond current limitations. It can be used to either:

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