Massive Reduction of Energy Consumption and Power-On Time

Comprehensive EAF Modernisation Project for Efficiency Increase at Fujian Fuxin Special Steel/China

Fujian Fuxin Special Steel Co. Ltd. (called hereafter Fuxin) operates one 160 tons electric arc furnace at Zhangzhou / China, producing two main grades of stainless steel in different operating modes. In order to improve its furnace efficiency in a coordinated and sustainable way, Fuxin has been cooperating with BSE.

Project Approach
In April 2017, BSE conducted a technical assistance in the field of active power input increase at the EAF. Fuxin was pleased by the BSE expertise and by the outcome of the technical assistance. Subsequently, BSE proposed to Fuxin a package for efficiency increase featuring a set of measures to reduce power-on time and energy consumption. The mutually elaborated concept, different site visits and a visit to BSE/BSW in Kehl by the Fuxin project team increased the confidence in BSE, hence in 2018 Fuxin awarded BSE with the order for implementation of the proposed measures.

Scope of Supply
BSE provided engineering (including calculation of high-current electric components with the BSE unique Finite Network Method) and supplied the following key components:
- New current conducting copper-steel electrode arms
- Modification of high-current system
- New ELARC electrode regulation
- Electrode mast positioning system
- New Tiltable Virtual Lance Burners
- Modification of existing Lance Manipulator with lifting/lowering device

The cooperation also included BSE/BSW experts supervising the installation works and accompanying the start-up process at site, taking place in July 2019.

Results / Benefits
The modernisation of the EAF has resulted in a massive increase of efficiency and reduction of consumption figures — as to be seen in the following table, comparing the performance for both steel grades [SG] before and after installation/start-up of the new equipment.

<table>
<thead>
<tr>
<th></th>
<th>SG#1</th>
<th>SG#2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power-on Time</td>
<td>3.4</td>
<td>3.1</td>
</tr>
<tr>
<td>Elect. Energy</td>
<td>60</td>
<td>37</td>
</tr>
<tr>
<td>Electrode Cons.</td>
<td>0.35</td>
<td></td>
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</tbody>
</table>

Installation/start-up of electrode arms, equipped with specially designed loop for improved harmonic level

Mast Positioning System
The modernised EAF at Fuxin is also equipped with the new mast positioning system, which BSE developed together with BSW, the mini-mill of the Badische Group. The system uses flow transmitters in the supply line of each electrode mast cylinder.

- Combined with a smart logic, a good signal can be provided to feed the regulating system and support its performance.
- Accurate indication of each mast position
- Evaluation tool to check and assess the regulation behaviour between regulating valve and electrode arm
- Investigation tool in case of electrode breakages
- Possibility to check and measure the regulation speeds of each arm
- Eliminates the usage of electromechanical travel sensors (encoders), which usually are difficult to maintain in the harsh EAF environment
- Damage by scrap or dust eliminated

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Since 1983, the Badische Stahl-Engineering GmbH (BSE) has been acting as a service provider for increasing the efficiency and productivity in the electric steel industry worldwide.

BSE is a sister company of the Badische Stahlwerke GmbH (BSW), one of the world’s most efficient Electric Arc Furnace steel plants.

This unique partnership between BSW and BSE ensures that all products and services provided by BSE are not just based on mere theory, but on more than 4 decades of own proven operational experience.

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