TECHNICAL SOLUTION

Hot DRI exiting the dry furnace is highly reactive and therefore has to be inerted with seal gas. As the dry seal gas contains a small amount of oxygen and CO₂, some reoxidation takes place. These gases reduce the product quality, while the use of high-purity nitrogen instead of dry seal gas eliminates this reoxidation and keeps product quality at highest possible level.

Nitrogen is often either unavailable or has to be purchased externally for a high price. The Product Quality Conservation System (PQCS) enables the onsite production of low-cost high-purity nitrogen, resulting in a high DRI product quality. Nitrogen is used by plant operators in order to increase HDRI/HBI product quality.

Additionally, the emission of undesirable gas components such as CO can be reduced by more than 60%.

The main components of a PQCS system are an air compression unit, N₂-PSA (pressure swing absorption) unit, nitrogen buffer vessel, and interface equipment (mechanical as well as electrical/automation). Proper integration into the seal gas, purge gas, utility and E&A system of an existing MIDREX plant is of utmost importance and can be executed by Primetals Technologies.
GENERAL FEATURES OF THE PRODUCT QUALITY CONSERVATION SYSTEM:

• Fast start-up

• Fully automatic and unattended operation

• Product flexibility regarding nitrogen flow and purity

• Completely pre-manufactured skids

• High availability and reliability

MAIN ADVANTAGES

• Low-cost production of N₂ for use instead of dry seal gas

• Reduction of undesirable gas components, e.g. CO, by more than 60%

• Increased plant availability (e.g. full back-up system for bottom seal gas compressor)

• Higher DRI production rate or increase of DRI product metallization

• Increase in DRI carbon content

FIELD OF APPLICATION OF NITROGEN GENERATOR

MAIN DATA

Two examples of PQCS configuration

<table>
<thead>
<tr>
<th>Case</th>
<th>PQCS plant capacity:</th>
<th>Product gas analysis:</th>
<th>Nitrogen delivery pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>5,000 Nm³/h</td>
<td>≥99.0 vol %</td>
<td>up to 7 bar*</td>
</tr>
<tr>
<td>Case 2</td>
<td>3,500 Nm³/h</td>
<td>≥99.9 vol %</td>
<td>up to 7 bar*</td>
</tr>
</tbody>
</table>

- Nitrogen & Argon
- Oxygen
- Carbon dioxide

≥ ≥ ≤ < < < 10 ppmv 10 ppmv

Nitrogen delivery pressure

* upon customers request

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