BLAST FURNACE NO.5
TATA STEEL LIMITED,
PORT TALBOT, UK

primetals.com

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Blow-in of Tata Steel's Port Talbot No.5 blast furnace took place on 19th January 2019 after a short campaign extension.

PROJECT HIGHLIGHTS

- Replacement of belly shell, cooling and refractory due to aged condition of this area
- Replacement of hearth pad and taphole refractory due to heavily worn condition
- Replacement of downcomer and supported section of semi-clean gas main
- Replacement of critical furnace cooling pipework
- Coordination between large number of contractors and extended hearth clearance activities
- 7 – 10 year operating life extension
- Successful coordination of works involving Tata Steel and other contractors
- Zero lost time accidents
- Furnace successfully retained original profile

THE CHALLENGE

Following a successful installation and commissioning of blast furnace No.5 in 2003, Tata Steel Port Talbot once again called on Primetals Technologies' expertise to support them in extending the campaign life of the blast furnace.

The project would ensure the operating life of the blast furnace would be increased by a further 7-10 years.

With a strong orderbook to satisfy, Tata Steel created a tight project timescale and a fixed shut down period.

The contract was awarded to Primetals Technologies in April 2018 on a 'turnkey' basis.

OUR SOLUTION

Primetals Technologies had already become a proven supplier to Tata Steel during the rebuild of the No.4 blast furnace in 1992 and essentially repeat engineered this design to rebuild blast furnace No.5 in 2003. This rebuild in 2003 proved to be the world's best time achieved for building a new blast furnace on an existing foundation.

Primetals Technologies were able to agree to the ambitious deadlines due to the familiarity with the No.5 blast furnace.

The critical areas for achieving the desired campaign extension were highlighted as the following:

1. Downcomer
2. Furnace shell
3. Hearth refractory

DOWNCOMER

The downcomer was highlighted as a critical area due to concerns over the internal refractory and shell condition. A further complication was that a large section of semi-clean gas main was supported off the downcomer.

To ensure a good fit the existing downcomer was surveyed extensively using 3D scanning equipment to determine its relative position and overall size. This information was then imported into modelling software which was used to design the new downcomer.

The new downcomer was pre-assembled on site and lifted into position in one unit following removal of the existing piece.

The downcomer was then lined with refractory in situ to prolong its life. This required careful coordination with surrounding works in the gas cleaning plant.

The planning and preparation that preceded the installation activity made a huge contribution to the success of its construction and reduced the schedule dramatically.

FURNACE SHELL

The belly area of the furnace was identified as a critical area as wearing refractory had caused premature ageing of the shell in this location. As a result, a band in the belly area of the furnace was removed and replaced with new, including new refractories.

The removal and installation of the new shell was carried out during hearth clearance activities below, saving time but introducing risks which needed careful management.

Other works included repairing the throat area and replacement of instrumentation, damaged cooling elements and the flexible piping between the cooling elements.

These works were carried out both from outside the furnace and internally using a number of movable platforms inside the furnace.

Tata Steel Ltd, Port Talbot, Blast Furnace No.5

HEARTH REFRACTORIES

The hearth pad was identified as a critical area due to significant wear being identified from the embedded thermocouples. A partial repair of the hearth area was carried out at the tapholes and the base of the hearth. This included the replacement of the embedded thermocouples and the external cooling system.

The interface between the existing and new hearth refractory proved difficult but the construction team managed the installation extremely well.

The biggest challenge for this area was the uncertainty surrounding the condition and what would be found once access was gained to the furnace. As a result, at the design stage many different possibilities were considered and contingencies were incorporated into the design to enable flexibility.

SCOPE OF WORK

- Removal and replacement of hearth pad and taphole refractories, hearth thermocouples, hearth and taphole cooling pipework
- Removal and replacement of belly section, damaged cooling elements, stack instrumentation and tuyere stave pipework. Complete shotcreting of furnace from tuyeres to throat
- Repair of throat area, Inspection of dirty gas system, removal and replacement of the BLT chute, gearbox, LSV and chute door
- Removal and replacement of downcomer, semi clean gas main, furnace top silencer and relief main
- Plus all temporary works, removal and re-instatement of plant items as required to complete all demolition and erection activities

FURNACE DESIGN PARAMETERS

Average production	5,050 t/d
Peak production	6,000 t/d
Furnace hearth diameter	10.8 m
Furnace working volume	2,134 m^3
Furnace inner volume	2,467 m^3
Top gas operating pressure	1.2 bar g
Blast pressure at furnace)	1.5 bar g
Normal productivity on inner volume	2.05 tHM/d/m^2
Normal productivity per hearth area	55.1 tHM/d/m^2
Number of tuyeres	30 off
Number of tapholes	2 off

SUMMARY

15 years after the original rebuild project, blast furnace No.5 has undergone a campaign extension which will prolong its operating life by 7-10 years.

After signing the EPC contract on the 10th April 2018, readiness for the shut down was declared on the 16th August. This led to the blow down on the 14th September allowing the campaign extension works to begin.

The furnace was successfully blown-in on the 19th of January 2019 which, given the obstacles and short timescales faced during every phase of the contract is testament to the excellent effort by all involved.

Primetals Technologies Ltd
A joint venture of Mitsubishi Heavy Industries and partners

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