1 Functional Description

The test unit TST is designed to test the purging plugs in the ladle preparation area. This is to avoid purging failures in the following heat and to prevent the purging plug from unnecessary excessive cleaning (burning, torching) with oxygen.

Nitrogen or compressed air is used as test media. It’s not allowed to use natural gas or any other inflammable gas.

Test Functions:

Plug Test:
The plug test function generates an indication about the porous plug condition. At a predefined pressure setting the actual flow rate is measured. The actual flow rate defines the condition of the plug. Three levels are defined:

- **Green:** The actual flow rate is between a predefined upper and lower limit → the porous plug is in good working condition.
- **Orange:** The actual flow rate is above the higher limit → there could be a leakage in the piping.
- **Red:** The actual flow rate is below the lower limit → the plug is blocked or partly blocked, oxygen washing could be required (depending on the plug type).
Oxygen washing support (Bypass):
During the washing procedure with an oxygen lance, a continuous pressure through the plug is produced. The flow rate is monitored continuously, as soon as the flow rate exceeds a predefined limitation an indication is generated to stop further oxygen washing.

2 Advantages

- reproducibility and reliability, through numeric test result
- reduction of porous plug consumption, through optimized oxygen washing
- safety due to less burning/washing procedures
- time savings

The TST is independent from the volumetric capacity, corresponding metal level and the amount of plugs installed in the ladle bottom.
It is essential for the purging process to know, if the porous plug is in working condition or if oxygen cleaning is required. For this purpose the plug test function of the TST delivers a fast, reliable and numerical result. For the operators the system delivers a signal not requiring further interpretation, only the three indications. For the records a number (the flow rate) is available, the number gives the opportunity for additional classification of the result.

To improve the cleaning procedure the TST Bypass function gives a continuous feedback on the porous plug condition during the cleaning process. This may increase the porous plug life and reduce the costs of cleaning.
To improve the overall effect even more a second test after the cleaning can give a comparable result about the porous plug condition.
The original test protocol shows two different test situations (blue and red line).

The oxygen washing procedure with an oxygen lance starts with point 1 and ends with point 4.

During the washing procedure a continuous pressure is produced.

In both tests the plug is blocked, the red line shows a partly blocked plug (point 2), the blue line shows a completely blocked plug (point 3).

The washing procedure ends as soon the flow rate reaches the set point.
4 References

- Salzgitter Flachstahl GmbH
- ArcelorMittal Eisenhüttenstadt
- ArcelorMittal Hamburg
- Elbe Edelstahlwerke Feralpi GmbH
- DEW Siegen
- Kind & Co. GmbH Co.KG
- Metamin, Turkey