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Online Temperature and Deformation Measurement for Vessel Shell of Oxygen Steelmaking Converters

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To know the temperature and deformation of the vessel shell of steelmaking converters, is already years a wish for the maintenance team of steelmaking plants in order to predict remaining lifetime of top cone, detect damages in refractory, compare operation conditions, etc. However, the most interesting areas for this information are barrel section and top cone. But these areas are not visible from outside, because trunnion ring and slag shields are hindering a direct view e.g. by thermo cameras. Hence, sensors have to be arranged directly on the vessel shell in a high temperature surrounding. But this fact makes it impossible to use electronics, which has a maximum working temperature of 80° C.

In 2019 Danieli Corus developed an online temperature measurement system and the first field tests have been applied within a co-operation with voestalpine Stahl GmbH in Linz. In the first approach 3 temperature measuring elements, the so called Q-Temp 2.0 element, have installed on LD-converter #9 inside the trunnion ring. After some optimization, these 3 elements are giving online temperatures of the vessel shell since April 2021.

Based on this design, such Q-Temp elements have been installed on both 180 t LD-converters for a steel plant in Brasil, which are running since 2021 and 2023. There, 32 Q-Temp elements and two infrared cameras are arranged for temperature image of the complete vessel shell. In 2024 all 3 LD-converters at voestalpine Stahl Linz have been equipped with such elements monitoring the temperature of the top cone close to the tap hole.

In a next step, Danieli Corus upgraded the Q-Temp 2.0 sensor, which can additionally measure the deformation of the vessel shell. This, so called Q-Temp 2.1 element, was developed and tested in the laboratory of Danieli Corus. The first prototype was then installed on LD-converter #7 of voestalpine Stahl Linz in November 2024. The measured deformation are very promising and now the long term experience is under the focus. By end of 2024 a revamped 240 t LD-converter in Latin America will come in operation, equipped with 12 Q-Temp 2.0 elements, two infrared cameras as well as 4 Q-Temp 2.1 elements.

Speaker Country

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Yes

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