



Express Container Laboratory for the Steel Industry

Abstract

In this application note, we describe a container laboratory especially designed for express sample preparation and OES analysis in steel industry applications. The total processing time including milling, visual inspection, robot handling and OES analysis is only 60 seconds. The efficiency of the laboratory is mainly due to the milling machine HS-F 1000 specially designed for requirements of sample preparation.

Key words

• Express • Laboratory • Sample Preparation • Milling • Optical Emission Spectroscopy

Introduction

Especially secondary metallurgic processes during steel making requires a frequent, fast and reliable quality control. Quick sample preparation and analysis at a high quality level are key requirements for monitoring the complicated operations and complying with the required limits. Here we describe the configuration of a laboratory container, which is located within a converter shop and needs only 60 seconds from sample input to analysis results.

Configuration and processing

The container consists of the milling machine HS-F 1000, the robot handling area including magazines for recalibration and finished samples and the optical emission spectrometer.



Figure 1: Milling machine *HS-F 1000* especially designed for sample preparation

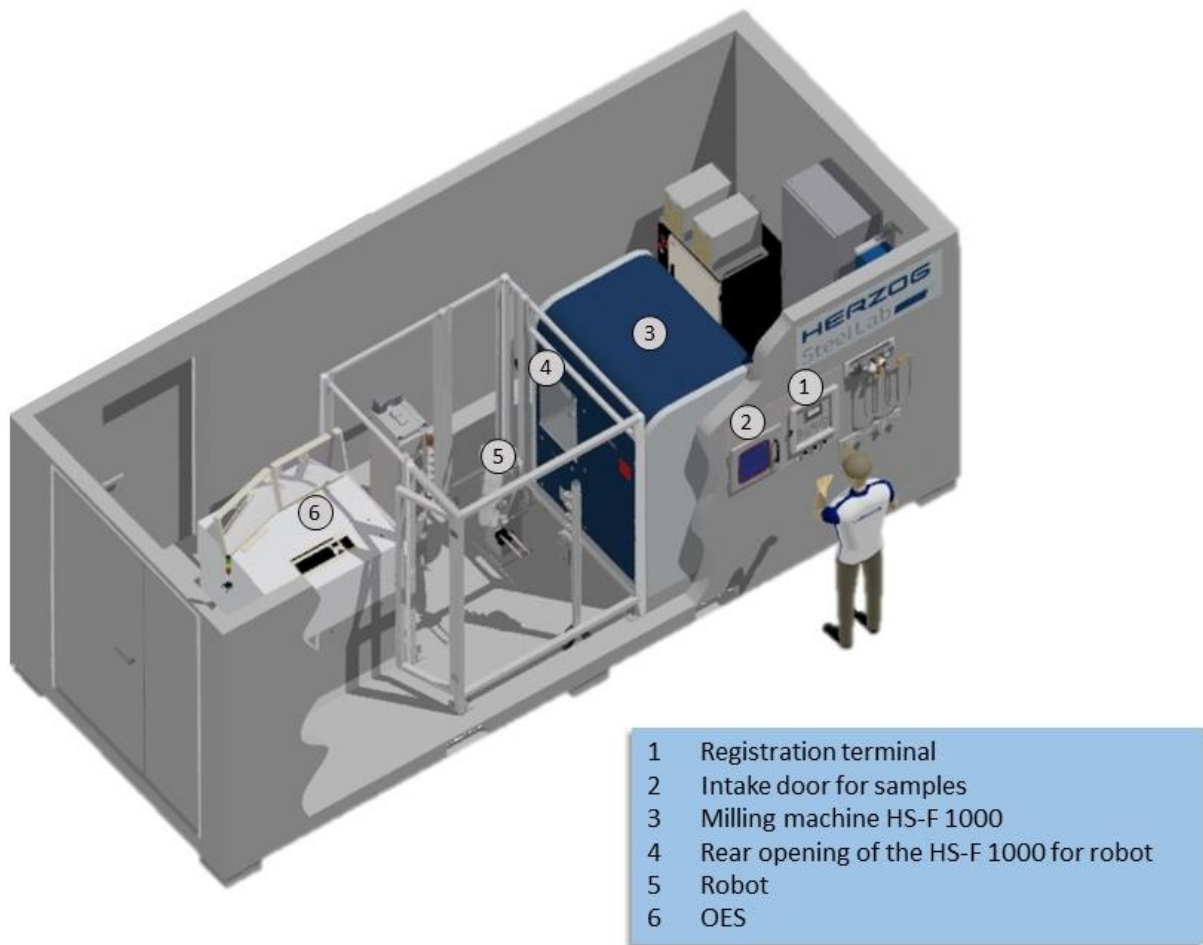


Figure 2: Layout of the express container laboratory for analysis of steel production samples. The operator introduces the sample directly into the milling machine HS-F 1000.

The HS-F 1000 allows direct sample input from outside of the container through the lateral opening of the machine.

The operator registers the sample via the terminal, opens the intake door and drops the sample on the input position of the machine. As soon as the door is closed again, the system runs automatically and time measurement starts. Since the HS-F 1000 mills the bottom sample surface, the sample is already in a defined zero plane position and time consuming determination of sample height is not necessary.

The mobile support clamps the sample and transports it to the milling spindle where it is milled from below. Afterwards, the support drops the sample on the output position of the machine. The sample preparation process is complete after 17 seconds.

Subsequently, the robot flap on the rear side of the HS-F 1000 opens and gives access for the robot. The robot picks the sample from the output position of the HS-F 1000 and transports it to the camera position.

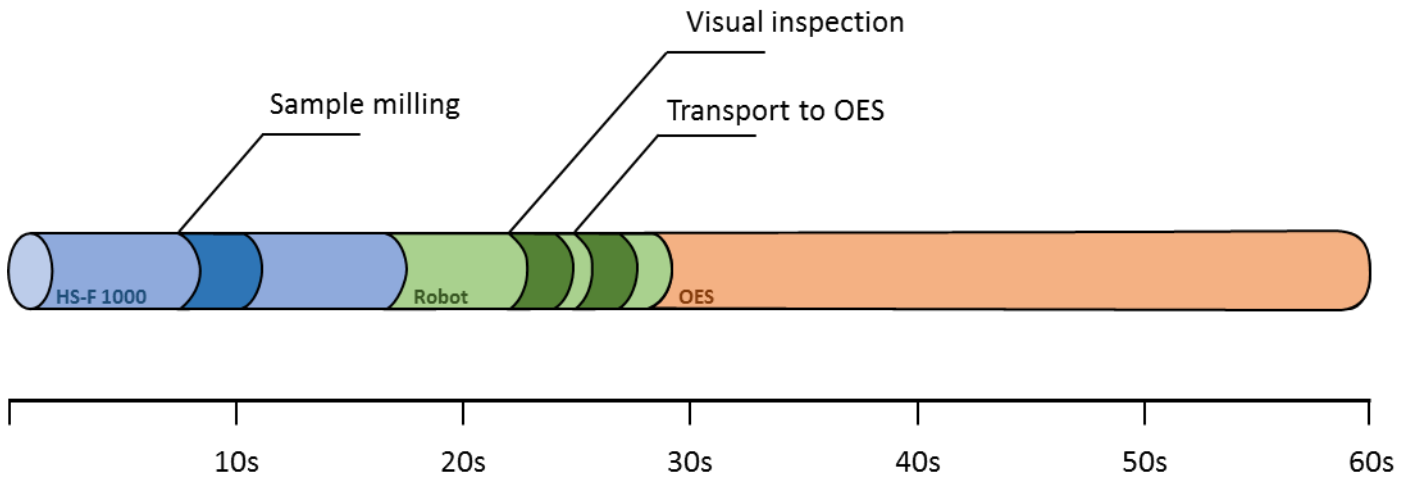


Figure 3: Timeline for sample preparation in the HS-F 1000 (blue), sample handling by the robot (green) and OES analysis (red). Machine design and automation configuration have been optimized for short preparation and handling times.

The integration of the camera system within the rear opening of the HS-F 1000 allows significantly shorter travel paths of the robot resulting in substantial time saving. Following visual inspection, the robot moves the sample to the spark stand of the OES. The robot sample handling takes a total of 12 seconds.

Eventually, the sample is positioned on the optical emission spectrometer. In this case, due to the use of a double electrode spark stand, the analysis is finished within approximately 31 seconds and reported to the level 2 system. The total processing time is 60 seconds.

Conclusion

The intelligent and variable design of the HS-F 1000 ensures rapid sample processing times. In this application note, we show that the HS-F 1000 is an optimal component for container laboratories. However, it can also be used in any other kind of automated laboratory for quick and efficient sample preparation.



Figure 4: Rear opening of the HS-F 1000 for robot access into the milling machine including camera system for sample inspection

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