

LEO-SCAN

External inspection of centrifugally cast reformer catalyst tubes



Outside tube measurement with multiple lasers and Eddy Current (EC)

FOERSTER has developed and built the proprietary 'LEO-Scan' system. The inspection is carried out from the outside of the reformer catalyst tubes, using the eddy current and laser technique.

The complete LEO-Scan system is mounted on a unique tube crawler. The special construction of the crawler transports the sensors from the furnace floor – depending on the reformer design – all the way up to the roof. This includes the areas below the top of flue gas collection tunnels, if present. The probes and lasers are mounted near the bottom of the crawler, allowing readings to be taken in the most critical areas of the typical down-flow reformer, since this is considered the hottest portion of the tube.

The benefits

■ Precise detection of the three damage scenarios in reformer tubes

- Cracks without diametrical growth (thermo-shock/strong short-term overheating)
- Diametrical growth (long-term overheating)
- A combination of both

■ The only proven EC system in use today that **penetrates the complete tube wall thickness** up to 24 mm (0.95 in)

■ **Dual-axis laser system** to measure the outside diameter (OD) of the tubes over their entire tube length inside the firebox

■ **Full repeatability of EC and laser measurement** allows an accurate comparison between different datasets

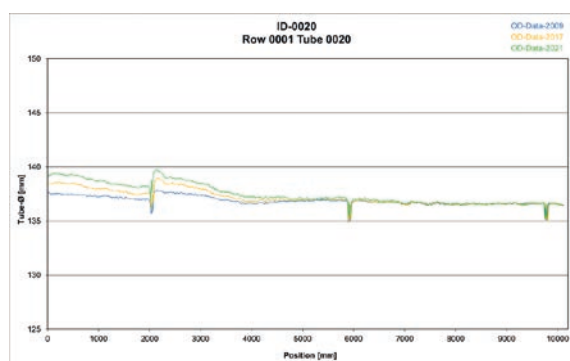
■ Possible **problematic areas** inside the furnace **can be revealed** out of the inspection results

■ **Helpful for eliminating the causes** leading to damage and tube failures

LEO-SCAN - In successful use for more than 20 years

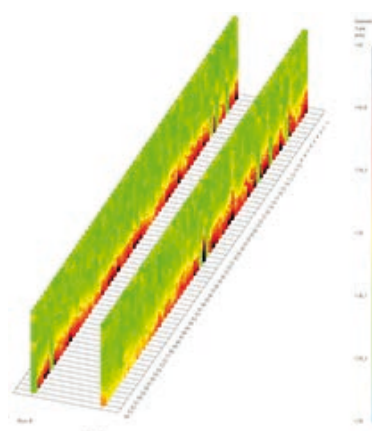
The only proven EC system that penetrates tube wall thicknesses up to 24 mm (0.95 in)

As the crawler ascends the tubes, proprietary designed EC probes record signals for evaluation. Not only does the system record the variations in electrical conductivity & magnetic permeability, but more importantly, the system processes and continuously monitors them, thus allowing the EC system to detect cracks and defects within the tube wall and the surfaces of the OD and the ID. The LEO-Scan has a very high repeatability which allows a high accuracy for comparing subsequent datasets.



OD measurement with dual-axis laser system

The LEO-Scan device uses a dual-axis laser system to measure the OD of the tubes over their entire tube length inside the firebox. OD measurement, while not the primary inspection tool, is an important secondary test for identifying creep. The use of lasers for this inspection ensures repeatability and allows the tube diameter to be recorded over the complete tube length inside the reformer. The results show the tube external diameter in a 3D, 360° view. This information can be presented for single tubes, single rows, or the entire reformer.



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