

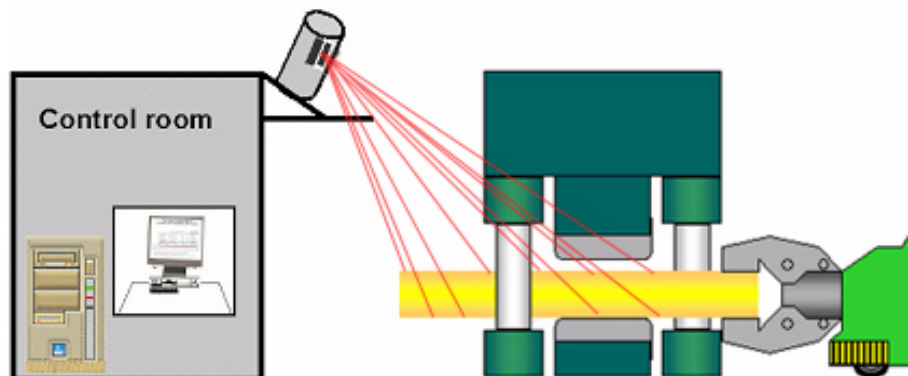
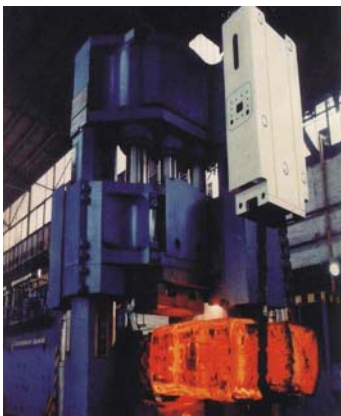
LaCam[®] FORGE

Measuring System

The LaCam[®] Forge measuring system is a new and innovative measuring system for Open Die Forging shops. It uses a three-dimensional eye-safe Laser Scanning System especially designed for hot surfaces and steel mill surrounding conditions. The distance measurement is based on a time-of-flight measurement using a pulsed semiconductor laser deflected in two directions. The heat radiation is measured and provides the possibility to measure the surface temperature distribution of the workpiece.

Setup

The Scanner Head (30cm height) is protected by a cooled housing that includes a movable protection cover. It can be mounted close to the forging dies in order to achieve an optimum view of the ingot.



Applications

Before forging

- Surface Temperature Distribution
- Marking of separation lines on the ingot, e.g. for generator shafts with sections of different diameters

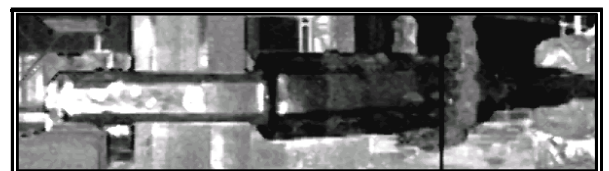
During forging

- Laser-based length measurement after each cogging pass without process interruption
- Process visualization software displaying consolidation zones of all previous strokes respective passes
- Bite shift optimization by operator-guided homogenization of setup point distribution

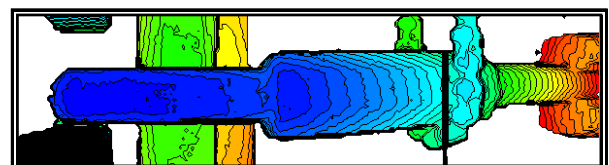
After forging

- Final dimension control
- Straightness measurement
- Tracking of process data for Quality Management

Reflection Image



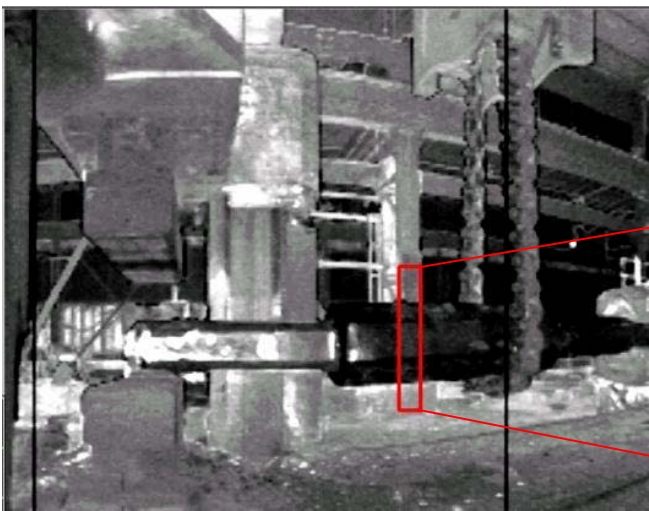
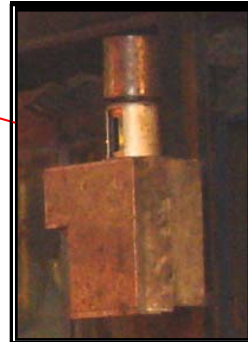
Distance Image



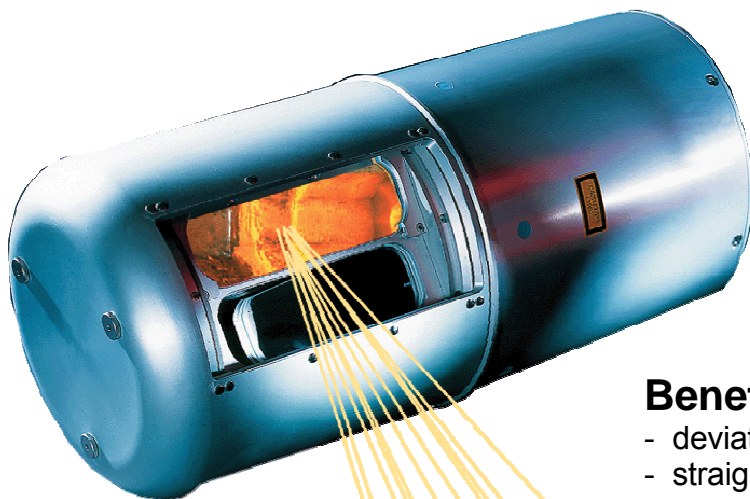
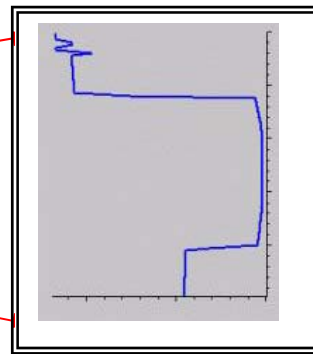
Final Dimension Control



Workpiece with LaCam[®] system head in the background

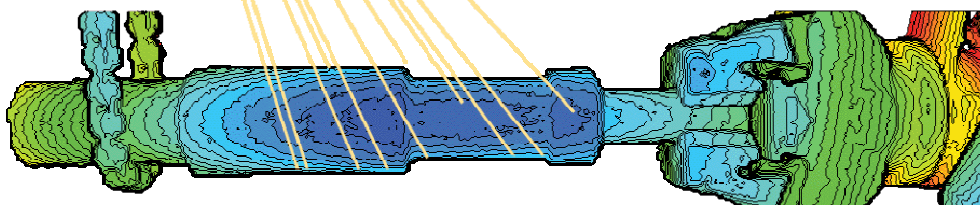


LaCam[®] system scan of generator shaft applying 3D-image processing

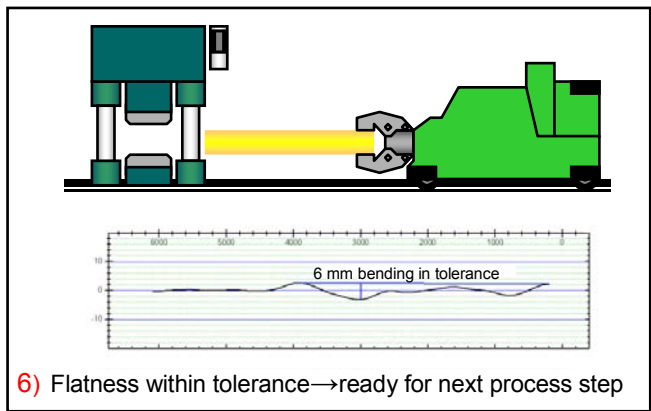
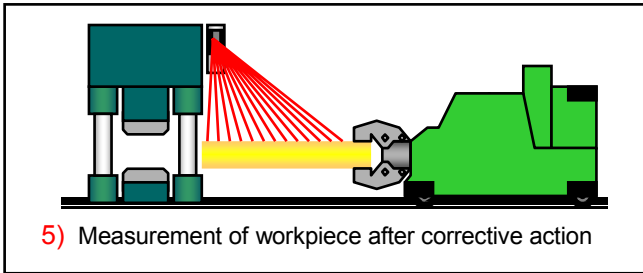
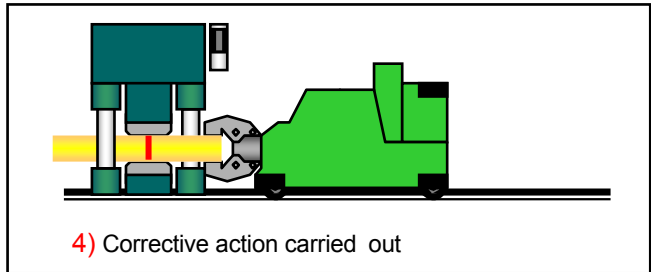
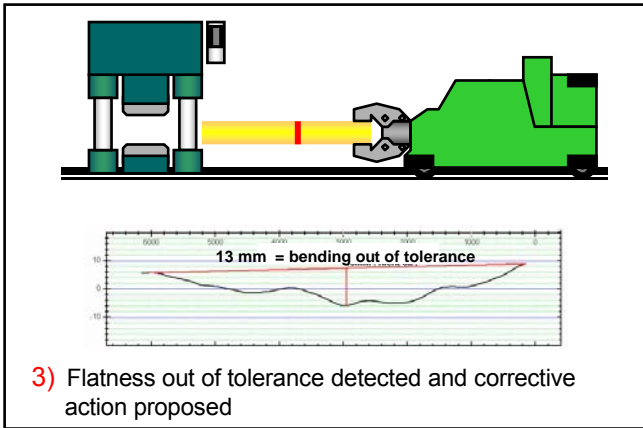
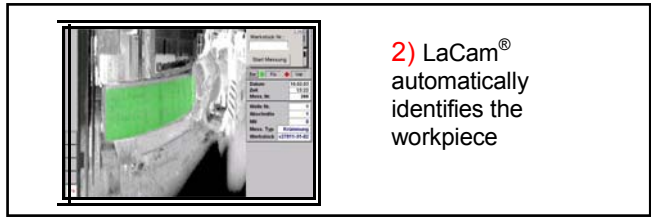
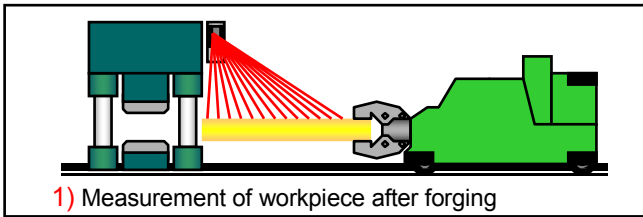


Benefits of shaft measurement

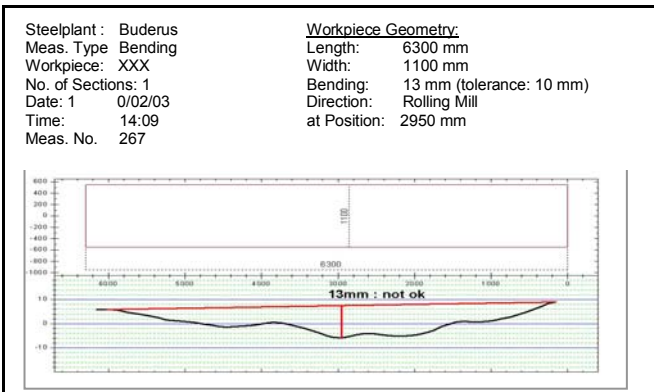
- deviation of co-axiality
- straightness and diameter measurement



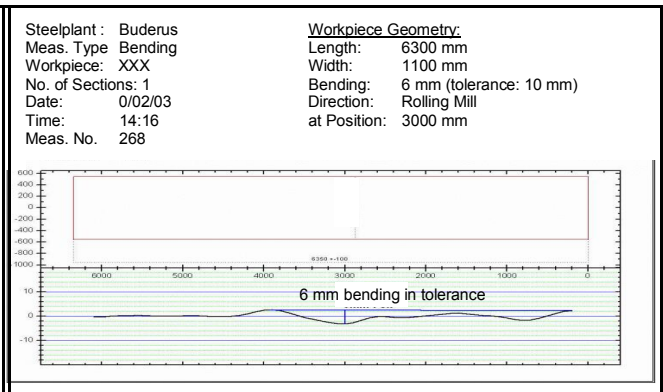
Straightness Measurement



FINAL STRAIGHTNESS REPORT



Bending out of tolerance

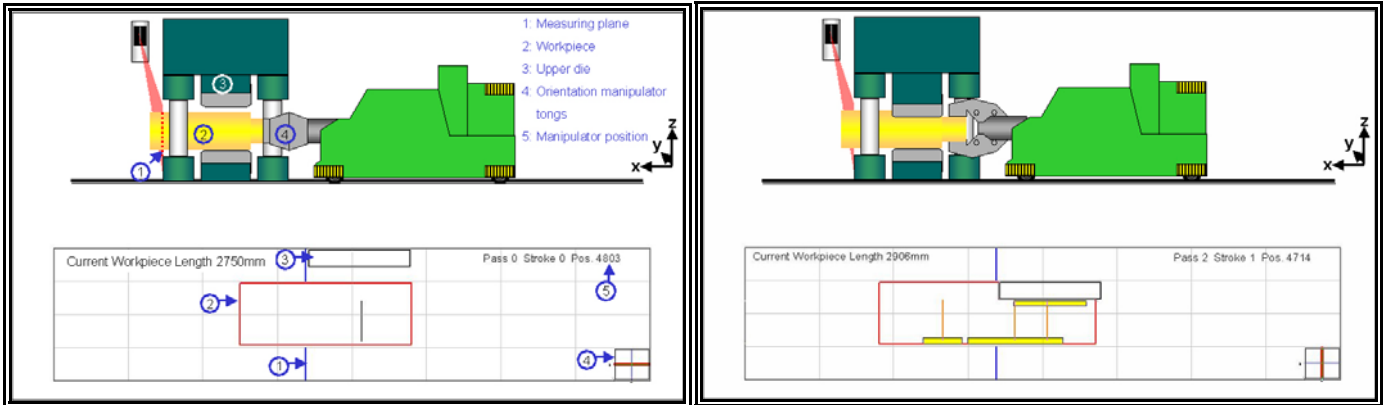


Same workpiece after machining based on LaCam® system evaluation results

Benefits of straightness control

- Reduction in straightening procedure for flat and round pieces
- Less bending rejects after reheat cycle due to optimized straightening during the forging operation
- No cool down time, no manual measurement, no reheating, no extra transport

Process visualization and bite shift optimization



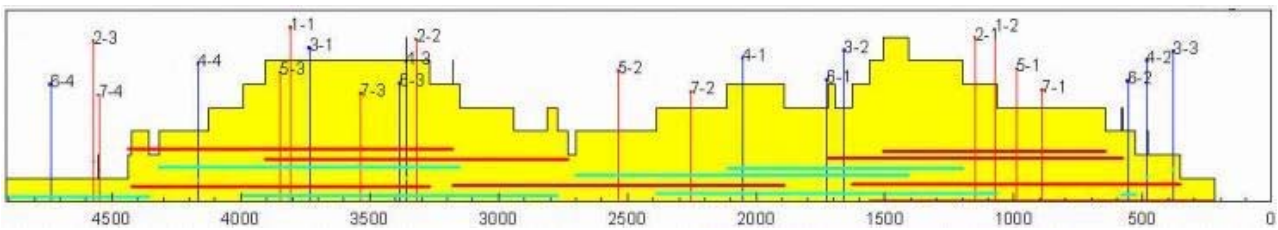
Online –Process visualisation

Length measurement by LaCam® system in Line-Scanning mode

Showing current consolidation zones, potential width and position of the oncoming stroke

Final Report

Displaying distribution of stroke positions and consolidation zones along the workpiece



Benefits of Online measurement

- Avoiding holes by controlled bite shift operation

Overall savings in:

- Production time
- Energy
- Forge capacity
- Furnace capacity (less reheating necessary)
- Raw materials



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