



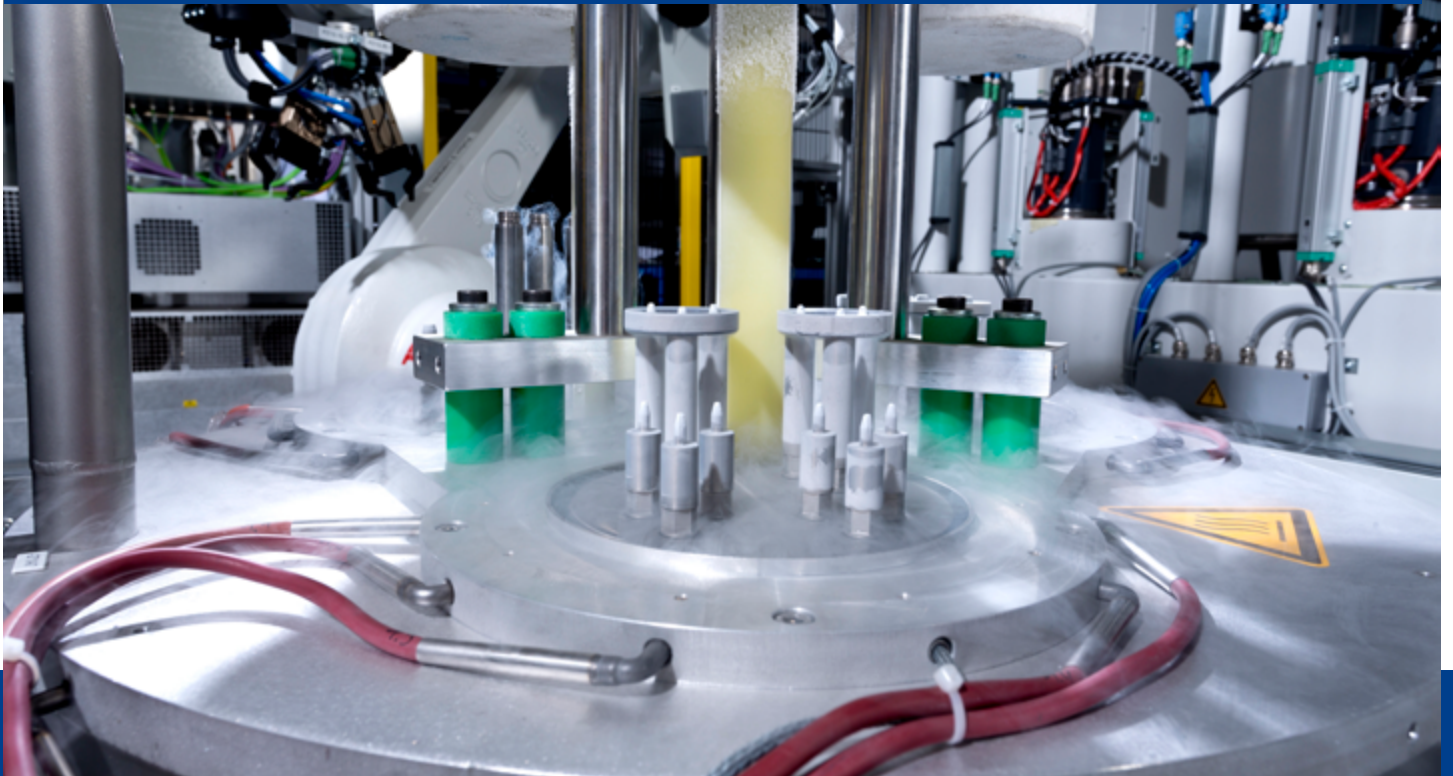
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CYLINDER HEAD ASSEMBLY PRODUCTION LINE

EXTREME SUPERCOOLING: PRESS-IN

OPERATIONS AT APPROX. 200°C BELOW ZERO



Siberian conditions: We built a system for the assembly and leak testing of cylinder heads for a large manufacturer of trucks, buses and diesel engines from Russia. This even includes a liquid nitrogen container in which the components are super cooled for pressing in.

Precise assembly under extreme conditions is crucial for components that have been precision-machined down to the micrometer, such as valve guides or valve seat rings. Due to the extreme supercooling of the components using nitrogen, these are shrunk together to make it possible to press them into the openings provided. This is a high-precision process that has to be implemented in a very short time.

CELL 1: ASSEMBLY OF NITROGEN-COOLED COMPONENTS



Cell 1 general overview



Automatic supply of valve seat rings



Automatic fitting of the liquid nitrogen tank with valve seat rings and valve guides



Transfer of the cylinder head from the intake roller conveyor



Pressing in of nitrogen-cooled valve seat rings



Pressing in of nitrogen-cooled valve guides

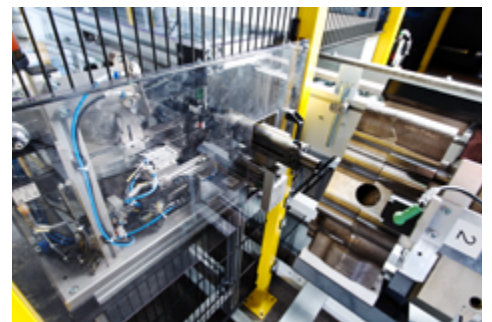
CELL 2: ASSEMBLY OF CLOSURE ELEMENTS AND INJECTOR SLEEVES AS WELL AS LEAK TESTING



Transfer of the cylinder head from the intake roller conveyor



Loctite wetting and pressing in of threaded bushings and closure caps



Fully automated O-ring assembly



Loctite wetting of injector sleeves



Assembly of KVT expander plugs



Leak test of oil chamber using the pressure difference procedure



Horizontal visual inspection

THE PROJECT IN FIGURES

Precision and speed are equally important when working with extremely supercooled components.

Precise cycle times and accurate matching of processes present special challenges here.

Facts

- Cycle time of <78 sec. per cylinder head
- 10 process steps divided into two cells
- 5 Robots
- Supercooling of the components to be pressed in to $-195.8\text{ }^{\circ}\text{C}$



INDIVIDUAL OPERATIONS IMPLEMENTED

The integration of manual processes with semi-automated and fully-automated procedures in assembly and material flow requires perfectly coordinated timing, which satisfies not just the needs of the manual work, but also the requirements of the special assembly conditions. In this project, we coordinated all steps down to the last detail.

Automation

- Component feed by roller conveyor
- Visual inspection by vertical and horizontal axes
- Use of handling robots

Assembly

- Pressing in of nitrogen-cooled valve seat rings and valve guides
- Pressing in of closure caps, including Loctite wetting
- Pressing in of threaded bushings

- Fully automated O-ring assembly
- Screwing in of Loctite-wetted injector sleeves
- Manual placement of a KVT expander plug

Leak testing

- Leak testing of the oil chamber using the pressure difference procedure



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CONTACT

ARE YOU FACING SIMILAR CHALLENGES?

We would be happy to advise you on comparable projects and answer any questions regarding our reference cases.