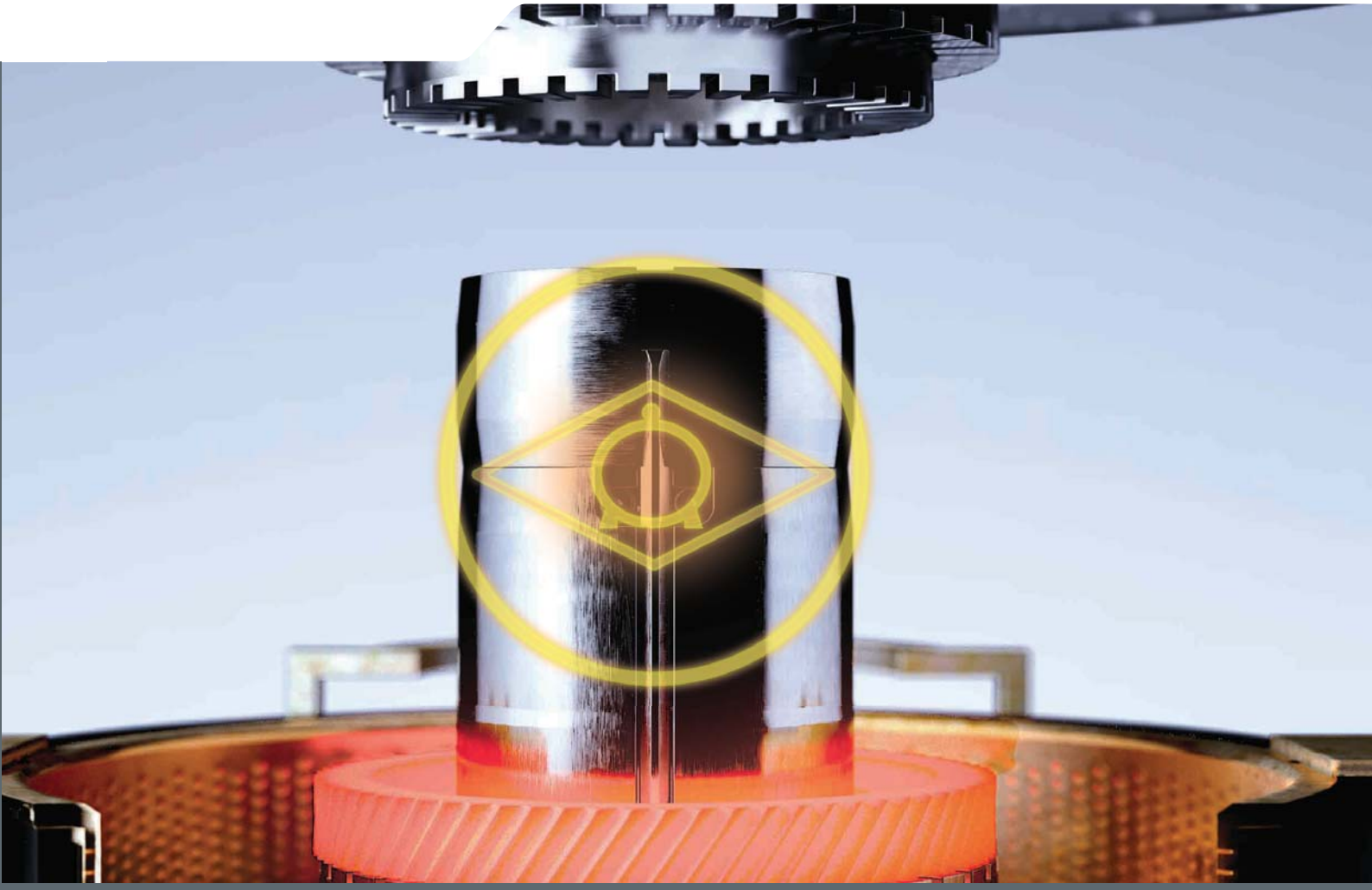
EMA
induction
technology

Inductive Fixture Hardening

for dimensionally accurate parts



Reliability at work

Aichelin

One System for All

EMA Indutec developed a new inductive hardening and tempering process which combines the benefits of induction heating and hardening with the advantages of a press hardening process.

Especially automobile manufacturers increasingly require components with higher accuracy for use in sophisticated applications. In order to meet these increased requirements this new process was developed and successfully introduced into the market.

EMA Indutec participated in the Steel Innovation Award 2018 of the German "Wirtschaftsvereinigung Stahl". In the category „Steel in Research and Development", the project „Machine for Inductive Fixture Hardening and Tempering" was chosen as one of the nine best submissions.

According to the jury, the submitted project makes exemplary use of the high innovation potential and the great variety of applications of steel.

The new system is one of the first stand-alone machines worldwide that heats workpieces by induction, hardens or calibrates between fixtures on a mandrel and reheats it up to the shrinking temperature. The workpieces are thus removed almost wear-free from the mandrel.

The process thereby improves the dimensional accuracy of the components and offers many economic advantages through direct integration into the production lines.

The five important and exceptional criteria of the new machine:

1. In the state-of-the-art process, workpieces are heated or carburized in a rotary or ring hearth furnace and, while still hot, transported to the press. During transfer period the parts cool down with varying intensity. It is also known, that the time span from end of heating to first quench is extremely relevant for the quality. This time is minimized in the new process. To compensate temperature losses during the transfer or if necessary, a inductor is capable to compensate these losses.
2. If almost scale-free heat treatment is required, the workpieces are transferred into the cold state, as a rule. The new machine can be equipped with a sealed protective gas chamber, in which the entire heat treatment including reheating, can be performed.
3. Four quenching circuits with mutually independent controls are used. There are quenching holes at the lower fixture, the upper fixture and the calibration mandrel as well as an additional exterior quench. These four quenching options offer maximum flexibility.

Different starting times allow initial shape corrections. Of course the flow rates and quenching times can be adjusted and monitored separately.

4. After quenching, the workpiece is shrunk onto the mandrel. In this position the workpiece is heated up inductively to tempering temperature. This increase in temperature causes the workpiece to expand slightly. With increasing temperature the workpiece expands marginally, creating a minimal gap that enables removal from the plug without affecting the precise, accurate surface of the calibration mandrel. No appreciable traces of abrasion are left on the mandrel. Therefore the life time increases significantly.
5. Since water soluble polymers are used as quench medium, the washing machine required for oil quenching in the state-of-the-art process can usually be eliminated.

The Process in principle – the eight steps:

Hardening

Step 1: The workpiece is placed on suitable supports and moved to the heating position.

Step 2: Inductive heating or reheating to hardening temperature follows.

Step 3: The workpiece is laid down. The upper fixture moves down and the mandrel is inserted.

Step 4: Quenching starts in the pressed state and the workpiece shrinks onto the mandrel.

Tempering

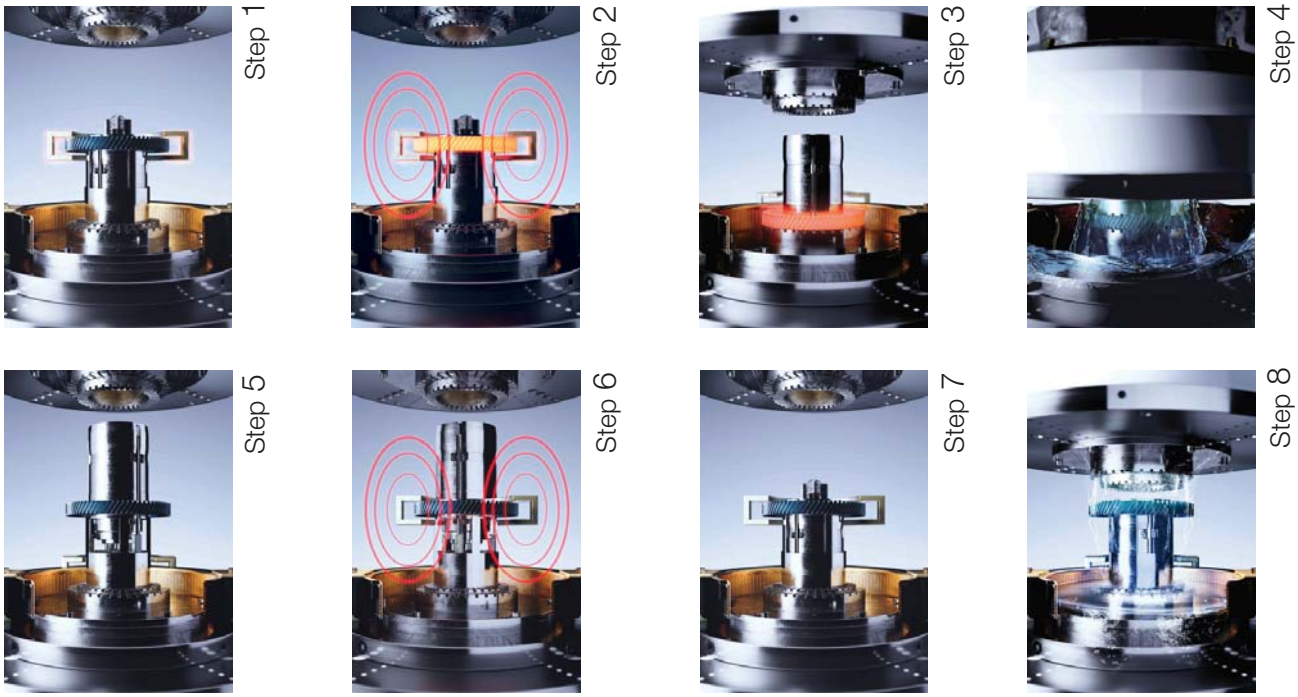
Step 5: The fixture move back apart to give space for the inductor.

Step 6: The Inductor heats the workpiece up to shrinking temperature.

Step 7: The workpiece is removed from the mandrel.

Step 8: If necessary, inductive tempering can follow. After all an active or passive cooling completes the process.

Note: Production machines need to be customized according to workpieces, dimensions and cycle times.



Ideal Solutions for Heat Treatment

Induction heating and hardening systems

- Economical and highly reliable systems
- Low energy consumption per workpiece
- Accurately reproducible hardening results
- High throughputs
- Heating zones and times can be determined precisely
- Heat treatment processes with low distortion
- Scale-free hardness zones due to heat treatment with protective gas
- Simple to integrate into production lines
- Lower expenses for production parts
- Tailor-made induction systems from a single source
- User-friendly adjustment, retrofitting and maintenance
- Modern engineering supported by FEM simulation
- Areas of application: surface hardening, annealing and tempering, heat shrinking, fixture hardening

IGBT converters

- Digital converter control
- Power range from 10 kW up to several Megawatt
- Frequencies from 5 Hz to 400 kHz
- Heating and melting
- Hardening, annealing and tempering
- Forging and forming
- High energy efficiency
- Easy integration into production lines
- Customized solutions and special systems
- Replacement of old and external devices

After Sales Service

- Qualified and knowledgeable Service Centre
- Service hotline for troubleshooting
- Preventive maintenance
- Smart remote control solutions
- Efficient spare part concepts
- Customized plant-retrofit
- Inductor development, construction and repair service
- Training for operators, maintenance personnel and induction experts (also on site)

Top quality from one source

- More than 70 years of experience in heat treatment
- Over 10,000 induction systems in long-term operation worldwide
- Development and manufacture from a single source
- DIN EN ISO 9001:2015 certified
- Efficient project and quality management from the first question to subsequent service

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