

HEAT TREATMENT SOLUTIONS



TRADITION – KNOWLEDGE – QUALITY



MIHEU d.o.o. IS A FAMILY BUSINESS WITH OVER 40 YEARS OF EXPERIENCE IN THE FIELD OF HEAT TREATMENT OF STEEL.

Throughout its existence, the company has grown and developed in order to pursue the individual needs of customers. Starting as a workshop for hardening and tempering and case-hardening, it has expanded into **a heat treatment center** with a wide range of additional services. The company continues to grow, while maintaining its flexibility and responsiveness of smaller systems.

Heat treatment solutions range from traditional oil hardening and tempering in pit furnaces to the most advanced systems for the processes of carburizing, carbonitriding, nitrocarburizing, vacuum furnace hardening and all kinds of nitriding, gas as well as plasma nitriding. Investing in superior equipment and highly qualified personnel, together with many years of experience and knowledge, sets the main guideline of the company to achieve the best results.

Additional services represent a wide range of treatments that enable the company to find the most appropriate solution for customer's specific requirements. This covers the processes of annealing, quenching (oil or water) and normalization, sandblasting and bluing, dimensional control and straightening, and above all, CNC machining on high-performance milling and grinding centers. Advising the customer to find the right solution is the basic approach to a successful partnership.

In our own laboratory, we monitor heat treatment quality with advanced instruments using hardness and microhardness measuring equipment and optical microscopes to inspect microstructures. These analyses help us confirm that results are really in accordance with customers' specifications.

Technical equipment provides only a tool, while know-how and experience make the real driving force in seeking the best solutions for individual customer's needs. We are proud of our business ties with several business partners that have continued for many years, giving us great motivation for the future. Join us and experience the wide selection and great quality of our heat treatment solutions.

WE BUILD OUR PRESENCE ON TRADITION AND LONG YEARS OF EXPERIENCE – WE PLAN OUR FUTURE WITH CONTINUOUS INVESTMENTS IN KNOW-HOW AND NEW TECHNOLOGIES.



CASE-HARDENING – CARBURIZING AND CARBONITRIDING



Carburizing and carbonitriding are thermo-chemical processes for surface treatment of steel.

During the process of carburizing, steel surface forms a hard martensitic layer which is compactly adhered to the base and provides high wear resistance together with a tough pearlitic core. In the process of carburizing, steel is carburized in the austenitic range (between 880 °C and 940 °C) in a gas medium down to a depth of 5 mm. The process is followed by hardening and tempering to the specified hardness in the range of 55-64 HRC. During the process of carbonitriding, steel is case-hardened as well as nitrided. The process takes place at temperatures between 860 °C and 890 °C in gas media, forming carbon and nitrogen. The method is used for low-alloyed steels and to achieve higher hardness on the workpiece surface.

ADVANTAGES:

- High surface hardness with an extremely tough core
- Increased wear resistance
- Durable dynamic and compressive strength.

APPLICATIONS:

- Parts for automotive industry
- Mechanical parts for engineering
- Drive gears (gears, pinions, axles, shafts, etc.)
- Stamped parts
- Various machine parts (bearing housings, flanges, bushings, clamps, etc.).



GAS NITRIDING – NITROCARBURIZING



Gas nitriding is a thermo-chemical process of steel surface hardening. During gas nitriding, steel is heated to a temperature between 500 °C and 580 °C in the ammonia atmosphere. There is a layer of nitrides formed on the surface. By adding carbon to the workpiece surface, the process of nitrocarburizing is performed. Both processes can be upgraded with post-oxidation.

A solid compound layer (γ' and / or ϵ - nitrides) is formed on the steel surface, followed by a diffusion layer and a tough core. The depth of nitriding layer (both compound and diffusion) ranges between 0.1 mm and 1.0 mm, and it depends on the duration of process, temperature and steel alloying elements.

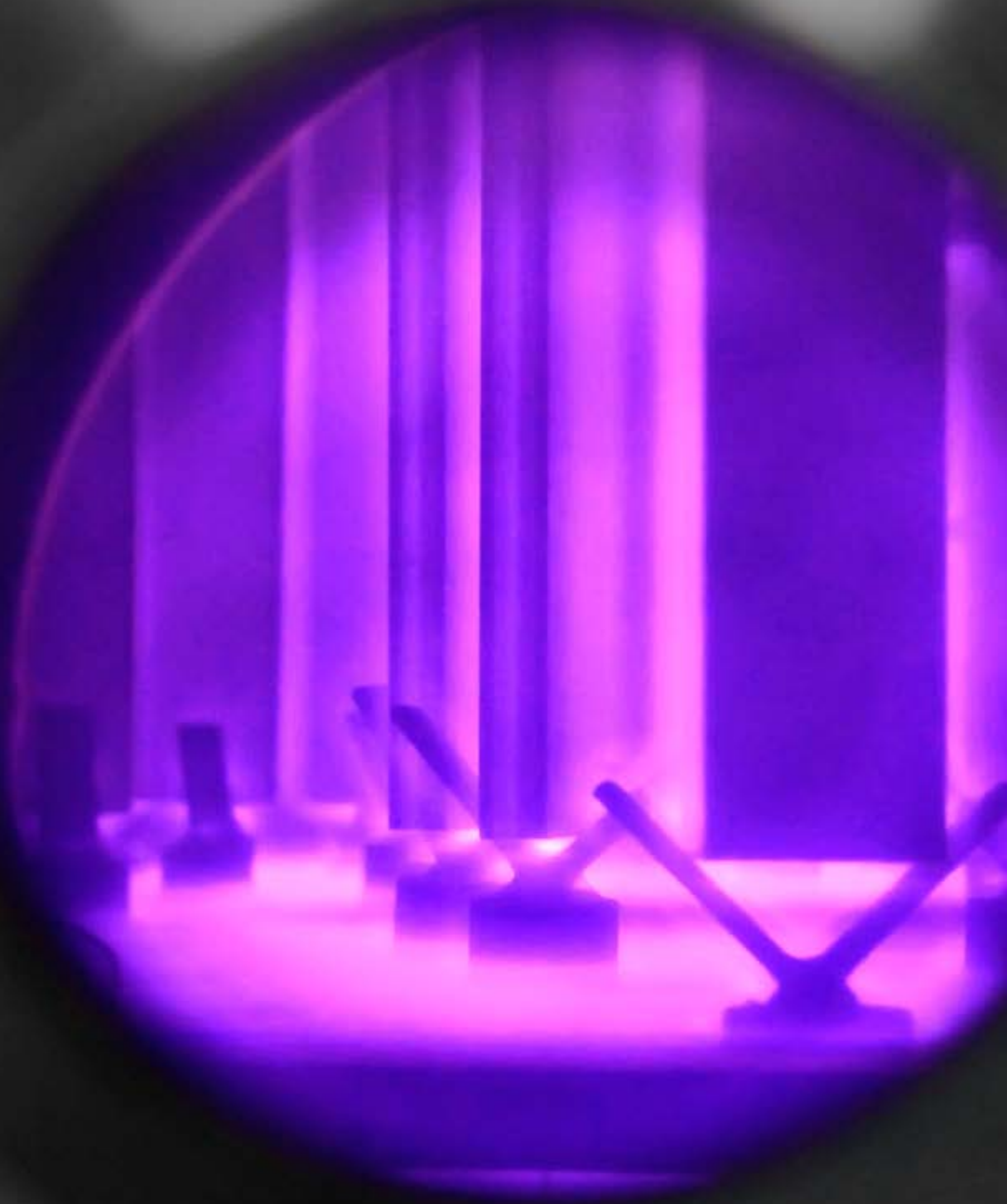
ADVANTAGES:

- Hard nitriding layer provides high wear resistance, corrosion resistance and resistance to sliding friction.
- Dimensional changes in the process are minimal.
- Upgrading with post-oxidation provides a very good corrosion resistance.
- Partial nitriding is possible.

APPLICATIONS:

- Parts for automotive industry
- Tools for tool industry
- Various machine parts (piston rods, spindles, cylinders, bushings, gears, etc.).

**PLASMA NITRIDING -
NITROCARBURIZING**



During plasma nitriding, in a vacuum at a temperature between 350 °C and 600 °C, in the presence of nitrogen and electric field, a plasma of accelerated atoms develops which collide against steel surface at a very high speed. A hard compound layer of nitrides is formed, followed by a diffusion layer and tough core.

In Micropuls® plasma nitriding, we use the processes of PLASNIT® and PLASOX® to control different compositions and structures of nitriding layers. By setting the right parameters, it is possible to perform the nitriding process without a white compound layer and achieve its controlled growth.

ADVANTAGES:

- High surface hardness, better wear resistance, lower coefficient of friction, increased corrosion resistance
- A wide range of steels which can be nitrided - low and high-alloyed steels (high-speed steel, sintered steel, cast iron, stainless steel, ordinary construction steel, etc.)
- Less surface roughness in comparison with gas nitriding
- Anti-corrosion and decorative effect (surface oxidation)
- Automated process with controlled growth of the white compound layer
- High level of repeatability
- Partial nitriding is possible through mechanical covering or covering with paste.
- Shorter times and lower temperatures ensuring minimal dimensional changes
- Environmentally friendly process.

APPLICATIONS:

- Parts for the automotive industry
- Heavy-duty parts in mechanical engineering
- Tools for plastics
- Hot-work tools
- Cutting tools
- Die casting tools
- Various machine parts: piston rods, pistons, mandrel, connecting rods, shafts, gears, etc.

**VACUUM HARDENING -
TEMPERING**





During vacuum hardening, material is heated in the absence of oxygen by convection in the medium of inert gas (N_2) and / or heat radiation in the underpressure. Steel is hardened with a stream of nitrogen, whereby cooling rate can be determined by selecting the excess pressure. Depending on the workpiece shape it is possible also to choose the direction and time of nitrogen blowing. Optimization of time and steel temperature control are carried out during process with the use of pilot thermocouples which can be placed on a workpiece in the heating chamber. Steel that is heat treated in a vacuum furnace obtains the specified properties of strength and hardness throughout the entire cross-section, without surface decarburization. Austenitic grain is fine and it complies with international standards.

ADVANTAGES:

- Modern computer-controlled process regulation which ensures a high level of repeatability.
- Steel is not carburized or decarburised.
- Dimensional changes are minimal.
- Optimal times of process
- Flexibility
- Decorative effect (clean and bright surface)
- Environmentally friendly process.

APPLICATIONS:

- Hot- and cold-work tool steel products
- Tools for plastics
- Forging tools
- Cutting tools
- Die casting tools
- Pressing tools
- Cylinders, pistons, industrial knives
- High-speed steel products (drills, milling cutters, etc.).





LABORATORY

Heat treatment results are evaluated in the company laboratory that has the most advanced measuring equipment. Technical analyses and strict quality control guarantee quality in accordance with customers' requirements.

MEASUREMENTS INCLUDE:

- Dimensional control before and after heat treatment processes
- Hardness measurements (Rockwell, Vickers, Brinell)
- Microhardness measurements (Vickers)
- Metallographic examinations (the microstructure of case-hardening and nitriding layers, grain size, depth of nitriding and case-hardened layers, analyses of the structure of machine part fractures, etc.)
- Determination of material adequacy (spectroscope).

Highly qualified specialists advise customers in connection with examination of material, and the choice of material and suitable heat treatment processes.



MAXIMUM WORKPIECE DIMENSIONS

VACUUM HARDENING, ANNEALING, NORMALIZATION, TEMPERING (up to 1300 °C)

Maximum workpiece dimensions	Maximum workpiece weight	Medium (surrounding substance)
600 × 600 × 900	800 kg	N

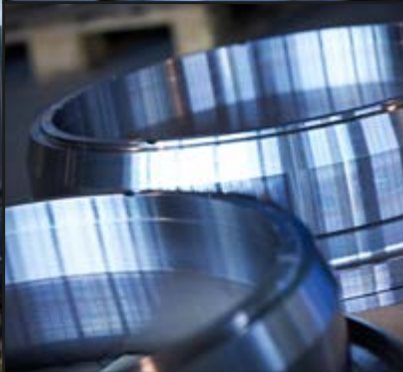


PROCESS CONTROL SYSTEM FOR CARBURIZING AND CARBONITRIDING

Maximum workpiece dimensions	Maximum workpiece weight	Medium (surrounding substance)
φ 720 × 950	500 kg	oil

GAS NITRIDING AND NITROCARBURIZING (VERTICAL)

Maximum workpiece dimensions	Maximum workpiece weight	Medium (surrounding substance)
φ 1200 × 1500	4000 kg	NH ₃ +N ₂ +CO ₂ +H ₂ O
φ 900 × 1600	900 kg	

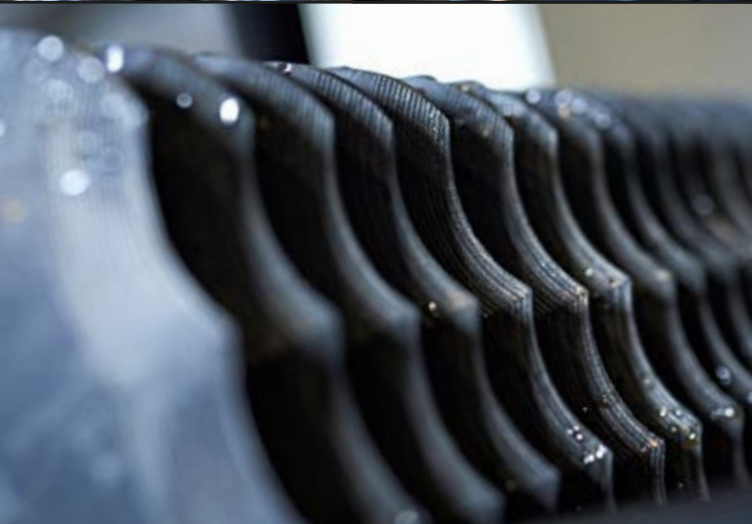


PLASMA NITRIDING AND NITROCARBURIZING (VERTICAL)

Maximum workpiece dimensions	Maximum workpiece weight	Medium (surrounding substance)
φ 850 × 2000	2000 kg	N ₂ +H ₂ +Ar+CH ₄ +H ₂ O
φ 1000 × 1800	5000 kg	

PIT FURNACE HARDENING, ANNEALING, NORMALIZATION, TEMPERING UNDER PROTECTIVE ATMOSPHERE (OIL, WATER, COMPRESSED AIR)

Maximum workpiece dimensions	Maximum workpiece weight	Medium (surrounding substance)
φ 700 × 1300	500 kg	oil
φ 700 × 1300	500 kg	water
φ 700 × 1300	500 kg	air



CNC PROCESSING

Type of processing	Maximum workpiece dimensions	Number of machines
CNC milling	800 × 1500 × 400	5
CNC flat grinding	1800 × 750 × 650	2
Segmented grinding	4000 × 450 × 500	2
NC flat grinding	1500 × 500 × 350	1

ADDITIONAL SERVICES

Sandblasting

Sandblasting removes impurities from workpiece which cannot be removed by other cleaning methods. Sandblasting can be used as a pretreatment of products intended for further processing as well as for end products.

Bluing

Bluing is a corrosion preventive method based on chemical modification of the surface. Unlike galvanic coatings, there is no additional coating on the workpiece surface, neither are there any hardness nor dimensional changes of material. The long-term protection and better corrosion resistance are achieved by adding a special emulsion or oil on the workpiece surface after bluing. The process of bluing results also in a decorative black color but is not intended for extreme outdoor use. In such cases, we recommend the Plasox® protection.

Dimensional control and straightening

Some products may bend during the process of heat treatment due to their specific geometric shape. We can avoid this by clamping them into special tools already during heat treatment process. In the same way, we can also straighten workpiece distortions that may occur during the process of tempering. If necessary, we can provide further treatment on specific precision presses.

CNC solutions

In order to make the offer of services as flexible as possible for our customers, we also provide precise and cost-effective CNC solutions. These include cutting, milling and grinding - flat as well as segmented grinding.

Steel is processed in CNC machining centers up to 4 000 mm in length and within the tolerance of +/- 0.01 mm (1000 mm).

Logistics

We are aware of the importance of logistical support that ensures optimal delivery times of finished products to our customers. Therefore we also offer transport solutions for products that are heat treated in our company.



HEADQUARTERS:

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