Perfect quality, excellent service and building a long-term partnership – this is who we are – the SIJ Ravne Systems, your reliable partner.

WHY SIJ RAVNE SYSTEMS?

- Unique combination of metallurgical and engineering know-how
- The highest product quality as a result of tight integration into vertical chain, from steel-making to final product
- Rolls made of ultra clean steel as result of ESR method
- In-house accredited laboratories performing a wide range of calibrations, tests and inspections
- Ability to offer complete package of products and services for steel mills; from complete assembled equipment, subassemblies, components, spare parts, industrial knives for metal, to professional services, including maintenance, reconstruction and revamping
SIJ Ravne Systems has rich experience and long tradition in the production of forged rolls for cold rolling of sheet metal, strip and foil. We manufacture all kinds of through and surface hardened rolls for cold rolling and straightening of ferrous and non-ferrous qualities.
OPTIMIZE YOUR PRODUCTION PROCESS
More than 50 years of experience in mechanical and heat treatment of forged rolls

INCREASE PRODUCTIVITY
Optimal mechanical characteristics of forged rolls achieved by using our proprietary heat treatment facilities and first class steels for our products

INCREASE SAFETY OF OPERATION
Each roll is inspected six times throughout production process, including retained austenite and residual stresses to guarantee the highest reliability and safety of operation

EXCEED YOUR EXPECTATIONS
Strong in-house R&D department and wide applicational knowledge to find best solution for your needs
DIMENSIONAL RANGE OF ROLL PRODUCTION:

- From 20 (0.79”) to 830 (33”) mm diameter
- Up to 5500 (216”) mm length
- Up to 10,000 kg (22,000 lbs) weight

KEY CHARACTERISTICS OF ROLLS:

- Application from ultra clean steels
- Application of steels developed specifically for cold rolling
- Computerized guidance and control of the volume and surface heat treatment processes
- Production of high quality rolls based on rich experience
- Permanent and sustained efforts to improve quality and application of rolls in the form of research and development
- Application of modern ND inspection methods
- Independent quality assurance system
- Partnership relations with the customer based on experiences

Rolls are produced from special alloyed tool steels, which are made by vacuum technology processes EAF + (VD + LF) or by the process of electro slag remelting (ESR), and for the highest requirements of our customers - by process of powder metallurgy (PM/HIP). After forging, soft annealing and peeling, roll material is subjected to an overall inspection for surface defects with a combination of magnetic methods and inner defects using ultrasound, while metallographic methods are used for testing of steel structure and purity. Final inspection for dimensions and hardness follows. We guarantee uniformity of hardness in the range +/-1 HRC.

TYPES OF ROLLS:

- Through hardened – Sendzimir rolls
- Surface hardened rolls
SIJ Ravne Systems is an excellent supplier of all kinds of through hardened rolls for cluster (sendzimir) cold rolling mills. We provide all sorts of work and intermediate rolls. We use exclusively only highest quality tool, high speed and powder steel grades. Rolls are hardened across its full diameter to the hardness which corresponds to roll type and purpose.

**DIMENSIONAL RANGE OF ROLL PRODUCTION:**
- From 20 (0.79") mm diameter
- Up to 3,000 (118") mm length
- Up to 2,500 kg (5,600 lbs) weight

We produce for all cluster rolling mill types such as SMS, Andritz Sundwig, Siemens VAI, Mitsubishi-Hitachi, Danielli and others.

**MOST FREQUENTLY USED GRADES**

<table>
<thead>
<tr>
<th>MARKET GRADE</th>
<th>W.Nr.</th>
<th>DIN</th>
<th>AISI/SAE</th>
<th>Directional Chemical Composition (%)</th>
<th>Hardness HRC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>C  Cr  Mo V  W  Co  Si  Mn</td>
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<td></td>
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<tr>
<td>ASP2023</td>
<td>1.3395</td>
<td>PMHS6-5-3-8</td>
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<td>HS6-5-2</td>
<td>M2</td>
<td>0,9 4,15 5 1,9 6,5 0,2 0,2</td>
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<tr>
<td>SLEIPNER</td>
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<tr>
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<tr>
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<td>D2 mod</td>
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<td>S2100</td>
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<td>0,25 0,35</td>
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<td>X63CrMoV5-1</td>
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<td>1,2 0,9</td>
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</table>
SURFACE HARDENED ROLLS

- For all types of rolling mills, such as 2Hi, 4Hi, 6Hi, etc.
- Our surface hardened rolls withstand high area pressure and are characterized by uniform hardness and homogenous microstructure
- Guaranteed hardness throughout hardened layer depending on steel used and optimal mechanical properties.

Optimal mechanical characteristics are achieved by using our proprietary heat treatment. Rolls are quenched and tempered to basic hardness and then surface hardened to achieve optimal working hardness. This is done by using our own bi-frequency induction technology and equipment, developed, designed and produced in-house. To achieve the best mechanical characteristics also on roll necks, we use our own award winning 3D induction hardening machine.

Induction hardening is followed by cryogenic treatment. This is an additional step in the heat treatment hardening process. It completes the transformation of the steel’s microstructure from austenite to the stronger and harder martensitic structure. The hardness of the steel increases along with increasing the percentage of martensite in the structure. Hence, wear resistance increases as it correlates positively with hardness. Wear resistance, in addition, depends on the presence of carbides.

DIMENSIONAL RANGE OF ROLL PRODUCTION:
- Up to 830 (33”) mm diameter
- Up to 5.500 (216”) mm length
- Up to 10.000 kg (22,000 lbs) weight

Surface hardened rolls are made from high quality steels and in accordance with customer requirements.

MOST FREQUENTLY USED GRADES

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<tr>
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<th>Hardness HRC</th>
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<tbody>
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<td>SIHARD R240</td>
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<td>4140</td>
<td>C  0,4 Cr 1,1 Mo 0,2</td>
<td>&lt; 60</td>
</tr>
</tbody>
</table>
ROLLS PRODUCTION FLOWCHART

- Sendzimir Rolls Production Flowchart
- Surface Hardened Rolls Production Flowchart
EXTENSIVE RANGE OF MECHANICAL TREATMENT

MILLING
CNC milling centers
- max. workpiece weight 35 t
- up to 8,000 mm length
- up to 2,200 mm width
- up to 4,000 mm height

EXTERNAL GRINDING
- max. workpiece weight 10 t
- up to 800 mm diameter
- up to 6,500 mm length

EXTENSIVE RANGE OF MECHANICAL TREATMENT

TURNING
CNC vertical turning
- max. workpiece weight 32 t
- up to 4,300 mm diameter
- up to 1,600 mm height

CNC and conventional turning between centers
- max. workpiece weight 14 t
- up to 950 mm diameter
- up to 5,400 mm length
- max. workpiece weight 10 t
- up to 720 mm diameter
- up to 11,000 mm length

DRILLING
- max. workpiece weight 10 t
- up to 2,700 mm diameter
- up to 2,000 mm length
- up to 1,200 mm height

HONING
- max. workpiece weight 5 t
- from 50 up to 290 mm diameter
- up to 2,500 mm length

DEEP DRILLING
- max. workpiece weight 8 t
- up to 450 mm outside diameter
- up to 8,500 mm drilling length
- largest hole diameter up to 255 mm

3D-COORDINATE MEASURING MACHINE
- max. workpiece weight 15 t
- up to 3,500 mm length
- up to 3,000 mm width
- up to 1,500 mm height
- 5 micron accuracy
IN-HOUSE R&D DEPARTMENT

We are constantly striving to find optimal solutions for our customers, according to their needs and application. Our in-house R&D department with over 30 employees and modern testing equipment enable us to develop and implement turn-key capex projects to meet most complex and technically demanding tasks and need of our customers.

- Problem solving - unique products and solutions
- Innovative products outperforming average supplier on the market
- Development and testing of new steel grades as result of vertical integration in SIJ group

IN HOUSE ACCREDITED LABORATORIES

SIJ Ravne Systems among other departments consists of many well respected accredited laboratories with highly qualified staff, which perform a wide range of calibrations, tests and inspections according to ISO/IEC 17025 and ISO/IEC 17020. Services that laboratories provide are all performed following accredited internal procedures which conform to international standards.

Main services include:

- Calibration of length gauges and instruments, including shape and roughness testing
- Calibration of mechanical quantities: hardness, torque, force, etc.
- Non-destructive testing using RT, MT, PT, UT and VT methods
- Ultrasonic measuring instrument inspection
- Residual stress measuring
MERGER OF

• Ravne Knives
• Serpa
• Sistemska tehnika