

## Cold Rolling Mills

A complete selection of equipment  
for the ferrous and non-ferrous metals industry



Ternova is a worldwide supplier of advanced technologies, products and services for the metal and mining industries providing innovative integrated solutions.

Combined process automation and metallurgical know-how enhance the value delivered to the customers. Ternova is committed further to develop its technology in the areas that mostly impact the future of the industries it serves: quality of the products delivered by the customers, energy saving and environmental safeguard.

Ternova I2S is a leading manufacturer of state-of-the-art cold rolling mill equipment and control systems for the ferrous and non-ferrous metals industry. It offers a full range of high-quality products and services backed by specialist know-how and extensive experience of the entire cold-rolled production process.

## Global Presence

Tenova I2S is one of the world's most advanced and highly regarded cold rolling mill specialists.

Entry into the Tenova network has enhanced the company operations and created also significant commercial and technological synergies with the other Tenova business units active in the iron and steel industry.

The result is an integrated organization that develops plants and equipment for the metal industry.

Besides its engineering offices in the USA, China, Korea, and the Philippines, Tenova I2S relies also on the offices and the commercial network of Tenova. This allows the company to provide cutting-edge products, efficient customer support and the ability to closely monitor and service ongoing engineering projects worldwide.

## Heritage

Established in 1974, initially I2S offered its customers a variety of mill controls, mechanical and hydraulic modernizations. Today it is a full-featured original equipment manufacturer specializing in the design, technology, manufacturing, installation and service of new and modernized cold rolling mills for the ferrous and non-ferrous metals industry.

I2S is also one of the small group of companies offering licensed T. Sendzimir Inc. 20 High rolling mills, a multi-roll machine universally acknowledged as the best technology today for precision rolling of stainless steel strip.

Tenova I2S draws on its specialist expertise in rolling mill and control system design, manufacture and installation to offer high-performance products that have made it a worldwide industry leader.

PITTSBURGH - USA  
YALESVILLE - USA  
MONTERREY - MEXICO

WIEN - AUSTRIA  
LIEGE - BELGIUM  
DÜSSELDORF - GERMANY  
ESSEN - GERMANY  
GENOA - ITALY  
MILAN - ITALY  
VARESE - ITALY

KATOWICE - POLAND  
MOSCOW - RUSSIA

SOUTH KOREA - SEONGHAM-SI  
PHILIPPINES - BATANGAS

SÃO PAULO - BRAZIL

JOHANNESBURG - SOUTH AFRICA

BEIJING - CHINA  
SHANGHAI - CHINA  
TANGGU - CHINA  
TIANJIN - CHINA  
KOLKATA - INDIA  
MUMBAI - INDIA



## Business

Tenova I2S offers a full range of project services: design, manufacture, modernization, installation, commissioning and technical assistance for cold rolling mills and ancillary equipment. It also provides a highly efficient support service for existing installations.

Tenova I2S's success is based on its acknowledged ability to develop products that deliver outstanding efficiency and reliability, together with a passion for continuous improvement, meeting market challenges and offering customers the best possible service.

## Products

Tenova I2S production covers the following main sectors:

- 20 High Cluster Mills
- Gauging Systems
- Vertical Stack Mills
- Mill Modernization
- Automation and Control Technology

With rolling speeds from 10 to 1,500 mpm, and widths ranging from 100 to 2,800 mm, Tenova I2S technology can be applied to carbon steel, stainless steel, copper-based alloys, silicon steel and specialty steel and alloys.

The company also manages also revamping projects for existing rolling mills and offers a full range of customer support services.



## 20 Hi Cluster Mills

20 Hi mills roll both ferrous and non-ferrous metals and are designed to achieve heavy reductions at high speeds. Tenova I2S is one of a small group of companies with the world-class ability to produce licensed T. Sendzimir Inc. 20 Hi cluster mills. It has built up extensive experience in this field with more than 40 new system installations and about 130 plant modernization. The 20 Hi Cluster mill is a unique multi-roll system, whose specific configuration and the reduced roll dimensions permit rolling of particularly hard materials like stainless steel, for production of extremely fine strips. The system's impressive accuracy tolerances deliver performance levels unmatched by traditional vertical stack rolling mills.



## Gauges and Gauging Systems

The ability to accurately measure thickness without marking the surface of the material being measured is of prime importance to today's suppliers of precision cold rolled strip. Through our ongoing commitment to quality production, Tenova I2S is the first rolling mill builder to design and manufacture non-contact thickness gauges specifically designed for the mill environment. Rolling Mills are one of the harshest manufacturing environments. Factors such as heat, vibration, corrosive coolants, and high speed strip breaks have to be considered in our design. Tenova I2S has developed both X-Ray and Gamma Gauges that feature enhanced electronics where the internal components are protected from the harsh environment. Gauges are offered configured as stand-alone or completely integrated gauge control systems.



## 2 High, 4 High and 6 High Mills

Tenova I2S offers a proven record of excellence and experience in the design and supply cold reduction mills including:

2 High Mills are utilized for rolling applications where relatively large diameter work roll diameters are suitable, and a low to medium level of productivity required. Such applications may include reduction rolling of soft materials or reduction rolling of materials having a narrow width. 2 High Mills are also configurations for strip applications that require a specific temper, elongation, or surface finish.

4 High Mills are configured with a versatile combination of work roll and backup roll diameters that suit reduction rolling of harder and wider materials over a broad range of thicknesses at high production rates. 4 High Mills also have shape control capabilities, are considered general purpose and regarded as the industry standard of vertical stack mills.

6 High Mills offer the advantages of a 4 High Mill with the added capabilities of improved shape control at the low end of the thickness range. They are designed to accommodate specific applications for production of high quality materials at high production rates.

Bonding Mills are 2 High or 4 High Mills with material handling and control features specifically designed for fusing dissimilar metals into a single clad strip.

Temper and Skin Pass Mills are 2 High or 4 High Mills designed for light reductions where rolling imparts specific metallurgical properties and / or surface conditions into the product. Temper and Skin Pass Mills can be configured "In-Line" or "Off-Line" and are designed to include material handling and control features specific to the application. A Skin Pass Mill is often included in a galvanizing line.

Tenova I2S employs an analytical rolling mill design method to ensure an optimum mill solution to produce high quality products for the specific customer's product mix. We offer complete Mill solutions including state of the art coolant, hydraulic, drives and mill automation systems.



## Mill Modernization

Tenova I2S uses its experience and expertise in mill design and manufacture to modernize existing mill equipment. Mill modernizations are frequent components of the Tenova I2S mill relocation services, which cover foundation design, installation, start-up and commissioning.

A typical Tenova I2S modernization delivers enhancements for a full range of existing mill systems:

- Rebuilding/Replacement of Mechanical Components
- Hydraulic and Coolant System Upgrades
- Precision Thickness Measurement and Control
- Data Collection
- Motor Control and Drive Systems
- Automatic Flatness Controls
- Level I and II Systems

## Automation and Control Technology

All Tenova I2S control systems are seamlessly integrated into a cohesive, coordinated operating system.

Whether ordered with a new mill or as modernization of an existing mill, the networked architecture of our control system facilitates data sharing between all computer based components with the capability to add equipment and features in the future.

A single Man Machine Interface (MMI) may be configured to display information or control numerous systems, or several MMIs may be configured to display information and control processes from remote locations.

Typical coordinated mill systems offered by Tenova I2S include:

- Drives and Drive Controls
- Gauge Control Systems
- Material Handling Systems
- Mill Coolant Systems
- Mill Lubrication Systems
- Shape Control Systems

The Tenova I2S common software platform provides an intuitive approach for setup, process monitoring, information handling, fault finding and other troubleshooting capabilities resulting in simplified operation and increased production. Control ranges between Level 1 and Level 3 can be custom configured to satisfy specific product and process needs.



**tenova** Roll Cluster 06-30 25353

Product Number: ABC\_123 Customer: My Steel Alloy: 304 Width: 750 Entry Gauge: 4.900 Exit Gauge: 0.000 Length: 0 Passes: 0 Current Pass: 0

Roll Grid  Geometry  Roll Use Info  Eccentric Motion  Options

SEQ	ROLL NAME	DIAMETER [mm]	SURFACE #RD	POSITION REF	ROLL TIME [min]
0	123-IMU	102.5	#00	P	
0	133-IMU	102.5	#00	P	
0	1newch	101.75			2008-07-1
1	A1	299.4			
1	A2	299.4			
1	A3	299.4			
1	A5	299.4			
1	A6	299.4			
0	AAA	64.5			2008-07-1
0	ABC-IMU	101.5			2008-07-1
1	B1	299.4			
2	B2	299.4			
0	B00	63.5			2008-07-1
1	C1	299.4			
3	C2	299.4			
1	D1	299.4			
4	D2	299.4			
1	E1	299.4			
5	E2	299.4			
3	E269	59.83	#120		2008-07-1

Grid Initialized

Refresh Insert View

Control Monitor Control Setup Mill Run In Mill Roll Cluster Gamma Gauge SPC Screwdown Utilities Pass Schedule

## Manufacturing Facility

The Tenova I2S factory is located in Yalesville, CT, USA and takes up an area of about 15,000 sq.m. The full-service machine shops and highly skilled workforce specialize in the production of a complete line of cold rolling mills aligned with the highest standards in design, manufacture and assembly.

The manufacturing process begins with 3D modeling. The engineering drawing is converted into machine code and downloaded directly to the individual fabricating machine. Once the part is processed, it is checked with precision standards. Component fit and function are again checked at final assembly. Since each new mill is fully assembled, site installation time is minimized, providing benefit to both Tenova I2S and its customers.

By combining quality manufacturing capability, a strong engineering foundation and the latest in controls technology, Tenova I2S excels in supplying state-of-the-art equipment providing perceptible added value for the most demanding customer.



## Service

Tenova I2S provides efficient post-installation customer support and the ability to closely monitor and service its mill projects worldwide. A telephone hotline is available 24 hours a day, and emergency call-outs, spare-parts management and training are all part of the Tenova I2S service offer.

All installation and start-up crews are members of the Tenova I2S engineering and service staff. Thanks to extensive in-house testing prior to delivery, each Tenova I2S crew is totally familiar with each system. This expedites system troubleshooting and equipment tuning during installation and start-up.

The company also provides training for customers on mill operation and control systems.

Training courses organized at Tenova I2S headquarters in Yalesville, CT, USA take a practical approach where emphasis is placed on key components, correct performance and indications of component failure. The customer equipment is powered up for a hands-on demonstration of the systems in a live environment.

Special topics, such as maintenance and operator training, can be provided at the customer site.

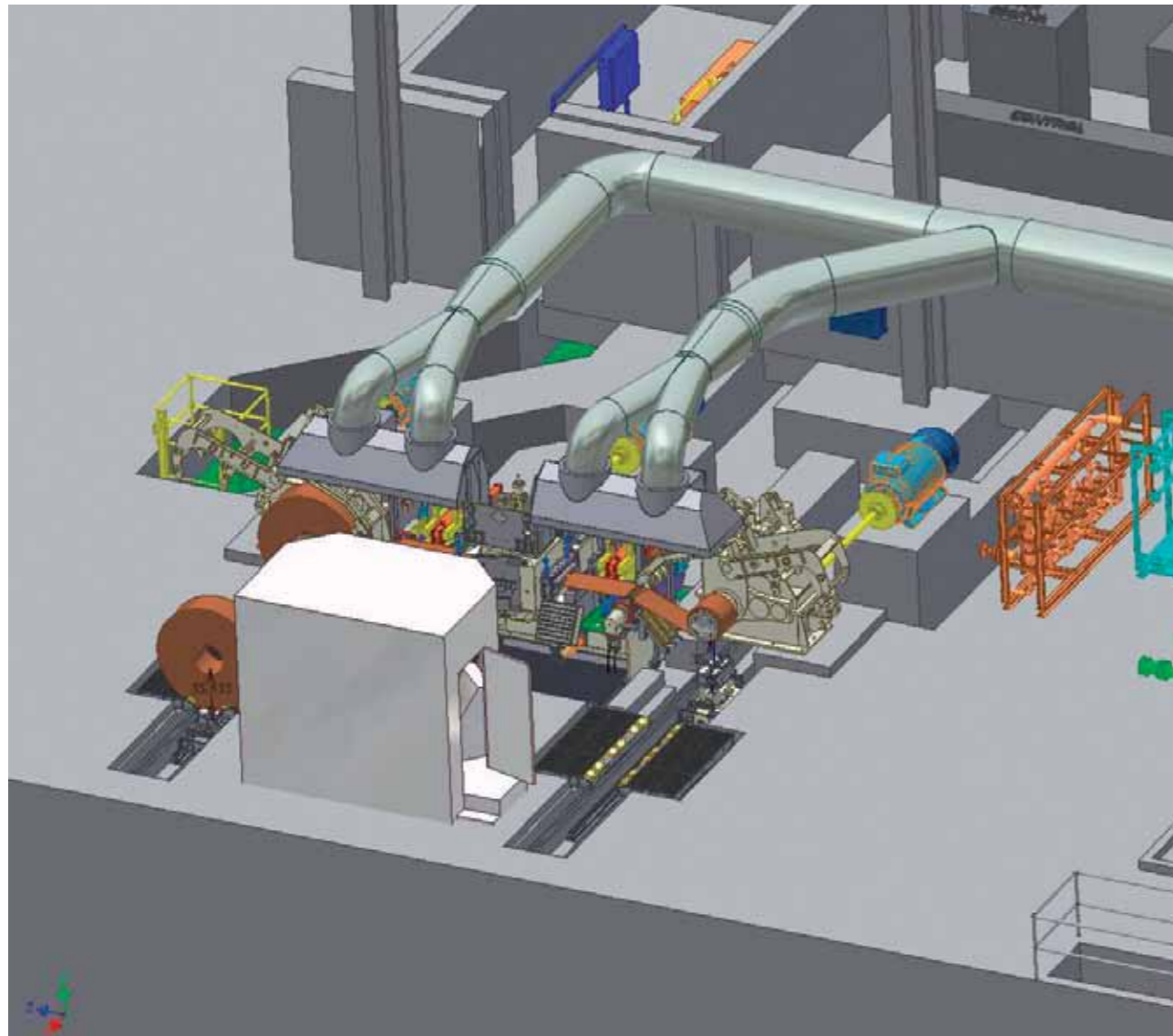


## Research & Development

Technological innovation is the main pillar of Tenova I2S competitiveness. Tenova I2S has always been an innovator, introducing major industry developments including: the first 100% digital roll force / screwdown cylinder servo controls, the first application of color touchscreen user interface technologies for rolling mill systems, and the first automatic gauge control based on Field Programmable Gate Array (FPGA) technologies.

Tenova I2S is constantly monitoring innovations in web-based technology, electronic control systems and key system component development. The recent addition of FPGA components has moved the company forward in its quest to deliver 100% commercial off-the-shelf control systems. Other advances include 3D modeling combined with finite element analysis to enhance and improve the mechanical components of the actual mill and associated subsystems.

Metalworking industry standards continue to tighten requirements for tolerances and metallurgical quality. To assist in the production of high quality materials, an ongoing program of mill and mill-related equipment improvement and innovation allows Tenova I2S to keep abreast of the latest technological advances in the industry and remain at the forefront of the mill equipment industry.



## Focus on People

People are vital to the success and growth of Tenova I2S. Qualified engineers and technicians are the lifeblood of the company network. Over 30% of the total employees are in the engineering department. Outstanding technical and management expertise in every area of activity, a strong focus on the customer, a passion for innovation and continuous flexibility: these are the features that distinguish Tenova I2S professionals. Tenova I2S specialists, coming from about 20 different countries and execute projects all over the world, where their multicultural backgrounds equip them to take on new challenges in any location. Tenova I2S enhances and optimizes the talents of the individual, for the good of the team and the benefit of the customer. By supervising every stage of professional growth and providing on-going knowledge and skills training, Tenova I2S guarantees the expertise of its people.





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I2S





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