CTS MAKİNA A.Ş.

A GLOBAL PARTNER FOR KEY INDUSTRIES THAT SHAPE THE WORLD AS AN INTERNATIONAL OPERATING INDUSTRIAL EPC

IRON AND STEEL SECTOR
SEPT 2021

CREATIVE TECHNOLOGICAL SOLUTIONS

COMPETENCIES

Turn Key supply offers a unique responsibility for: engineering, technology performance, construction, commissioning and technical assistance, for metal and steel processing plants, with related auxiliary plants.

CTS MAKİNA A.Ş. is capable of the developing and executing projects such as;

- Turn-key Bar Mills
- Turn-key Section Mills
- Turn-Key Wire Rod Mills
- Turn-Key EAF Meltshop
- Turn-Key IF Meltshop
- Revamping Projects

ROLLING MILLS

CTS MAKİNA A.Ş. Offers a full range of solutions for increasing capacity and quality. CTS uses its experience and proficiency to supply engineering services and components of Rolling Mills. CTS designs and manufactures rolling mill equipment from furnace to packing and bundling area.

ROLLING MILL TRAIN
Pinch rolls
Rolling mill stands
Gearboxes
Shafts and its holders
Loopers
Guides
Crop and cobble shears
Snap shears
Flying shears
CQS

REHEATING FURNACES
Walking beam/hearth or pusher type
Furnace charging and discharging area
Furnace billet feeding station
Charging roller table
Billet charhing pusher type
Furnace discharging equipment
Furnace exit pinch roll
Furnace exit roller table
Billet rejecting table

COOLING BED AREA
Pinch rolls
Cut-to-length finishing shears
Connecting roller table
Run-in roller table with aprons
Cooling bed(rake/chain/twin types)
Cooling bed entry side equipment
Cooling bed exit side equipment (chain convetor or take-out system)

PACKING AND BUNDLING AREA
Cold shears (entry/exit transfer system)
Take-in car car system
Packing chain conveyor
Bundle forming station (semi or full automatic binding machine)
Automatic weighing and bundle collecting system
Straightener machines

ROLLING MILLS

- General sections in Rolling Mills:
  - Reheating Furnace
  - Gearboxes and Rolling stands
  - QCS
  - Pinch Rolls
  - Shears
  - Cooling Bed
  - Cut to Lenght
  - Bundle Forming

Turn-Key Rolling Mills consist of

- Furnace Group,
- Mill Train Group,
- Cooling Bed Group,
- Continuous Finishing Shop

TURN-KEY BAR MILLS

- **Starting stock**
  - Billets 160 x 160 x 6,000 mm or 12,000 mm
  - Up to 130 x 130 x 6,000 mm or 12,000 mm
- **Finished product**
  - Rebar Ø8 three-strand slit TMT
  - Rebar Ø10 Two-strand slit TMT
  - Rebar Ø12-40 mm TMT
  - Small flats, angles and channels are possible as well
  - Sub- bundles 100-400 kg
  - Master bundles 1-3 t
- **Furnace capacity** 40 t/h (80 t/h)
- **Capacity** up to 500,000 t/y
- **Finishing speed** up to 20 m/s

- **Material grades**
  - Carbon steels, alloyed structural steel grades
- **Furnace Group**
  - Charging grate, hot charging elevator, online induction heater
- **Mill train**
  - Single strand, H/V- arrangement, two stands are H/V type
  - Roughing train 4xModel 600, 2xModel 440
  - Intermediate train 4x Model 440, 3xModel 340
  - Finishing train 6x Model 340,
  - Associated shears
  - Loopers 8xVertical, 6xSingle strand, 2xMulti strand

- **Cooling Bed Group**
  - Water quenching line
  - Cooling bed shear
  - Cooling bed 66x10m
- **Continuous finishing shop**
  - Stationary cold shear 3,000 kN
  - Counting system
  - Small-bundle forming
  - Tying machines
  - Various associated equipment (stoppers, chain transfers, roller tables etc.)

TURN-KEY SECTION MILLS

Rolling mills for the production of different sections up to dimensions of 600 mm and the different rails. Depending on the desired capacity and dimensions three main types of rolling mills will be installed:

- Full continuous rolling mills
- Rolling mills with reversible Brake down mill stand and continuous finishing train
- Tandem rolling mills especially for big sections and rails.

Our modern rolling technologies enable the production of profiles of all international standards.

TURN-KEY SMALL SECTION MILLS

- **Starting stock**

  Billets

  100 x 100 x 12,000 mm

  200 x 200 x 12,000 mm

- **Finished product**

  Rounds Ø8-50 mm and equivalent squares, hexagons and rebars.

  Flats 38x5 -100x15 mm

  Angels 32x4-70x6 mm

  Angles 45x28x3 -68x40x8 mm

  Channels 50-80 mm

- **Furnace Capacity** up to 200 t/h

- **Annual Capacity** 1,000,000 t/y

- **Finishing speeds** up to 20 m/s

- **Furnace Group**

  Charging grates, weigh scale, descaler, insulated holding tunnel

- **Mill train**

  Single strand, H/V arrangement, 6mill stands H/V-type

  Roughing train 2xModel 670, 4xModel 440

  Intermediate train 6x Model 390,

  Finishing train 6x Model 390,

  Associated shears

  Loopers 6xVertical

- **Cooling Bed Group**

  Water quenching line, pinch roll unit

  Cooling bed shear

  Cooling bed 102x13 m

- **Continuous finishing shop**

  In-line straightening machine

  Flying cold shear

  Piling and stacking facilities

  Tying machines

  Various associated equipment

TURN-KEY MEDIUM SECTION MILLS

- **Starting stock**

  Blooms

  180 x 180 x 8,000 or 12,000 mm

  300 x 300 x 8,000 or 12,000 mm

- **Finished product**

Rebars	Ø28-40 mm
Rounds	630-100 mm
Hexagons	50-80 mm
Flats	8x30–60x150
H-Beams	100-180 mm
I-Beams	100-200 mm
T-sections	75-140 mm
Channels	100-200 mm
Angels	80x80– 200x200 mm

- **Bundle/stack length** 6-24 m

- **Bundle/stack weight** 2-5 t

- **Furnace Capacity** 116/143 t/h

- **Annual Capacity** 700,000 t/y

- **Finishing speeds** 6 m/s

- **Material grades**

  Carbon steels, alloyed structural steel grades, antifriction bearing steel

- **Furnace Group**

  Elevators, charging grate, weigh scale, descaler, insulated holding tunnel

- **Mill train**

  Single strand,

  Roughing train 4xModel 670, 1xModel 760

  Intermediate train 2x Model 760, 4xModel 670

  Finishing train 5x Model 670,

  Associated shears

  Loppers 4xVertical,

- **Cooling Bed Group**

  Water quenching line,pinch roll unit

  Cooling bed shear

  Cooling bed 84x19 m

  Short-bar collecting device

- **Continuous finishing shop**

  In-line straightening machine

  Hot saws

  Abrasive cutting machines

  Piling and stacking facilities

  Tying machines

  Various associated equipment

TURN-KEY STRUCTRURAL STEEL SECTION MILLS

- **Starting stock**

  Blooms

  180 x 180 x 8.000 or 12.000 mm
  300 x 300 x 8.000 – 12.000 mm

- **Finished product**

Rebars	28–40 mm
Rounds	30 – 100 mm dia.
Hexagons	50 – 80 mm
Flats	8 x 30–60 x 150
H-Beams	100 – 180 mm,
I-Beams	100 – 200 mm
T-sections	75 – 140 mm
Channels	100 – 200 mm
Angles	80x80– 200x200 mm

  U-type sections for mine timbering 18U, 25U, 29U

- **Bundle/stack length** 6-24 m
- **Bundle/stack weight** 2-5 t
- **Furnace capacity** 116-143 t/a
- **Annual Capacity** 700.000 t/y
- **Finishing Speed** 6 m/s

- **Material Grades**

  Carbon steels, Alloyed structural steel, Antifriction bearing steel

- **Furnace Group**

  Elevator (for hot charging), charging grate, weigh scale, descaler, insulated holding tunnel

- **Mill Train**

  Single strand,

  Roughing train 4 x Model 670, 1 x Model 760 (V-H-HV-H)

  Intermediate train: 2 x Model 760, 4 x Model 670 (H-H-H-UR-UR-HV)

  Finishing train: 5 x Model 670

  Associated shears

  Loppers: 4 x vertical

- **Cooling Bed Group**

  Water cooling line, pinch roll unit

  Cooling bed shear

  Cooling bed 84 x 19 m

  Short-bar collecting device

- **Continuous finishing shop**

  n-line straightening machine (10 rollers)

  Hot saws:

  Abrasive cutting machines

  Piling and stacking facilities

  Tying machines

  Various associated equipment

TURN-KEY HIGH-GRADE STEEL SECTION MILLS

- **Starting stock**

  Billets

  50 x 100 x 10,000 mm

  125 x 125 x 11,400 mm

- **Finished product**

  Rod 5,5 – 13,5 mm

  Bars Ø 11 – 57 mm

  Flats 22 – 120 mm, 5 – 12 mm dick

- **Bundle/stack length** 3-8,5 m
- **Bundle/stack weight** 20,5-3(5) t
- **Furnace capacity** bis 60 t/a

- **Material Grades**

  High-grade structural steels

- **Furnace Group**

  Charging grate, cross transfers, weigh scale, descaler (2x), heat- holding tunnel

- **Mill Train**

  Single strand, H/V – arrangement

  Roughing train: PSW and 6 x Model 440

  Intermediate train: 4 x Model 440, 2 x Model 340

  Finishing train: 4 x Model 340

  Kocks-block

  8-stand wire rod block for high grade steels 3 x 215/ 5 x 170

  Associated shears

  Loopers: 7 x vertical, 1 x horizontal

- **Cooling Bed Group**

  Water cooling line, pinch roll unit

  Cooling bed shear

  Cooling bed 57 x 5 m

- **Continuous finishing shop**

  Abrasive cutting machine

  Piling and stacking facilities (non-magnet type)

  Tying machines: 1 x fixed, 1 x movable

  various associated equipment, e.g. stoppers, chain transfers, roller tables etc.

- **Rod finishing equipment**

  Water cooling and equalizing sections, pinch roll unit, laying head

  Ring conveyor for retarded and accelerated cooling, reforming tub

  Pallet-type coil handling system, compacting & tying units, weigh scale, unloading station

TURN-KEY WIRE ROD MILLS

Wire-rod is an all-round talent. From components for the automotive industry. The chemical industry, power stations and machine engineering through to connecting elements such as nuts and bolts. Everything is based on wire rod. This is why CTS designs its solutions for wire rod mills with versatiliy in mind. All size ranges, materials and allots can be produced efficiently and with high productivity on the wire rod mills.

TURN-KEY WIRE ROD MILLS

- **Starting stock**

  Billets 120 x 120 x 12,000 mm

  Up to 150 x 150 x 12,000 mm

- **Finished product**

Wire Rod	Ø5,5-16 mm
Rebars in coil	nos. 3,4 and 5 (as per ASTM)
Bars in coil	160-42 mm

- **Furnace capacity** 70 t/h

- **Capacity** 300,000 t/y

- **Finishing speed**

  Wire rod line 100(120) m/s

  Bar in coil line 13,5 m/s

- **Material grades**

  Cold- heading steels, reinforcing steels, steels with a carbon content from low to medium, piano-wire, PC-wire, free-cutting steel

- **Furnace Group**

  Charging grate, weigh scale, descaler, heat-holding tunner

- **Mill train**

  Single strand, H/V- arrangement, associated shears,

  Roughing train 4xModel 600, 2xModel 440

  Intermediate train #1 3x Model 440, 3xModel 340

  Intermediate train #2 2x Model 340, 4xModel 2800

  10-stand wire rod block 5x215/ 5x7170

- **Rod finishing equipment**

  Water cooling and equalizing sections, pinch roll unit, laying head

  Ring conveyor for retarded and accelerated cooling, reforming tub

  Power & Free coil handling system including trimming station, compacting & tying units (2x), weigh scale, unloading station

- **Continuous finishing shop**

  Water cooling line, pinch roll units, bar reels (2x), coil transfer, chain conveyor with retarded and accelerated cooling facilities, transfer unit to Power&Free coil handling system

MODERNIZATIONS / REVAMPING

As a global machine and plant supplier for the iron and steel sector CTS Makina is not only experts for new plants, but also your best partner for revamping projects. That's because our modernization specialists draw on both longstanding experience and profound know-how. CTS customs and designs each revamp to your specific requirements and always use state-of-the-art technology. It's another plus that forward-looking, detailed planning goes into every project. Right from the get-go, you know for certain your plant is going to achieve the improvements and competitive boost you want.

Benefits of Modernization:

- Higher productivity / yield
- Superior product quality
- Larger product range
- More flexible production (Including profitable manufacturing of small batch sizes),
- Shorter downtimes
- Longer maintenance intervals
- Compliance with modern eco-standards, plus energy and resource savings
- Lower operating costs
- Better value creation and competitiveness

THE FURNACE GROUP

Reheating Furnace is the heart of any hot rolling mill where in the charge is heated to rolling temperature. The charge could be in the form of billets, blooms, slab or ingots.

The type of furnace could be Pusher Type, Walking Hearth or Walking Beam- either top fired or top and bottom fired according to the projects.

The furnace bas been determined with the aim to:

- Low heat consumption.
- Avoid the bending of billets due to differential heating of top/bottom and front/back faces.
- Ensure the billet pushing through the furnace on horizontal hearth, without trouble (i.e. jump-up billets due to the length of bed of billets combined with billet bending).
- Optimize the heating curves to achieve the desired temperature uniformity as well as minimize oxidation inside the furnace; in view of these main operational targets, the furnace design, which corresponds to an up-to-date and well proven technology featured by the following main characteristics.
- Top lateral and frontal burners in order to ensure the best uniformity (no hot spots) and moreover minimizing the burner's number.
- Separation screen between the fired zone and recuperative zone.

THE FURNACE GROUP

The furnace group includes all machines that are used to feed the heating furnace, the feed and the discharge of the heated billets up to including descaling. The arranged in this part of plant control and monitoring devices used to detect the respective switched-on (lock), for automatic operation and control of the execution.

The furnace group is considered two separate portions, namely:

- Equipment previous the furnace: The plant in front of the furnace is the cyclic feeding of single billets in the oven. The plant in front of the oven consists of: Charching grate, furnace approach roller table, roller table weigh bridge,
- Equipment behind the furnace: The plant behind the furnace consists of: roller table downstream of furnace, pressure water descaler

Some key points to reach mentioned specifications can be featured below in light of latest technological developments;

- Positioning burners laterally over the top and frontal to acquire uniform heating with fewer burners.
- Divide the hearth and recuperative zone with a screening barrier.

THE FURNACE GROUP

WALKING BEAM FURNACE

The walking beam furnace is suitable for reheating billets, blooms, beam blanks and slabs at throughput rates from 50t/h up to 200 t/h.

There are fixed and movable platform in order to move the billets inside of the furnace.

Attractive Features

- Simplicity of Design and Ease of Construction,
- Very effective heating and soaking of billets,
- Ability to cater for different billet sizes (within limits),
- Negligible water cooling energy losses

PUSHER TYPE FURNACE

After the casting process, slabs or billets are moved to the hot rolling mill and heated for rolling temperature to pusher-type furnaces. A pusher-type furnace operates semi-continuously and is characterized by high throughput rates and maximum heat transfer capacity. The slabs are pushed inside of the furnace that they initially slide on the rails, and then on an equalizing surface to the discharge side.

The subjects concerning the heating process are the slab heating rate, the quantity of burners required and the influence of the rails on the skid marks, etc. the local temperature distribution, in the slab.

MILL STANDS

Basically, the mill stand with drive consists of:

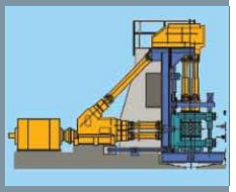
- Mill stand
- Drive unit
- Gear box
- Shafts and couplings
- Guides and other accessories

The drive system is carried out by one controlled DC motor via safety clutch, pinion bevel spur gearing and articulated spindles to the working rolls of the mill stand.

The mill stand can be shifted on the housing of the drive unit so that it can be coupled with the articulated spindles and the coupling. The electric spindle lifting device permits vertical movement of the mill stand. When it is in its working position, the mill stand is fixed with the clamping devices so that it is firmly seated on the housing.

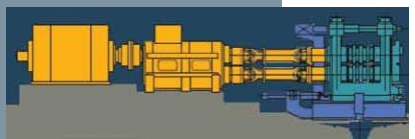
In the working position, the coupling connection for utility supply (water and oil) of the mill stand is established automatically. The shifting device serves for shifting the mill stand during stand change. The change is carried out with help of the workshop crane.

- HORIZONTAL MILL STANDS
  - Multigroove rolls
  - Grooves changed by shifting the stand
  - Stands changed by shop crane



- VERTICAL MILL STANDS
  - Top-driven rolls
  - Multigroove rolls
  - Stands changed on stand changing rig
  - Use of concrete supports

- HORIZONTAL / VERTICAL MILL STANDS
  - Multigroove rolls
  - Grooves changed by shifting the stand
  - Stands changed on stand changing rig



MILL STANDS

Universal Mill Stand Nominal Size				600	670	760
Roll center distance	Vertical direction	max.	mm	900	1.100	1.300
		min.	mm	480	520	660
Roll centre distance	Horizontal direction	max.	mm	300	900	1.550
		min.	mm	100	726	1.250
Rolling force (dynamic load) symmetrically	Vertical direction		kN	7.600	10.400	13.800
Rolling force (dynamic load) symmetrically	Horizontal direction		kN	2.300	3.000	4.500
Roll neck diameter	Horizontal rolls		mm	300	370	410
Axial roll adjustment			mm	±2.5	±3.5	±3.5
Rolling torque		max.	kNm	350	520	1.300
Roll diameter (horizontal rolls)	Universal mode	max.	mm	850	1.050	1.300
		min.	mm	750	860	1.150
Roll diameter (horizontal rolls)	Two high mode	max.	mm	670	1.050	1.300
		min.	mm	540	520	660
Roll diameter (vertical rolls)		max.	mm	550	660	900
		min.	mm	500	600	800
Roll body length (horizontal rolls)	Universal mode		mm	200	300-400	250-650
Roll body length (horizontal rolls)	Two high mode		mm	1.120	1.200	1.250
Roll body length (vertical rolls)	Universal mode		mm	140	240 (320)	340 (400)
Speed			min	120	100	90
Rigidity	Horizontal		kN/mm	2.000	2.769	3.000
Rigidity	Vertical		kN/mm	720	815	960

MILL STANDS

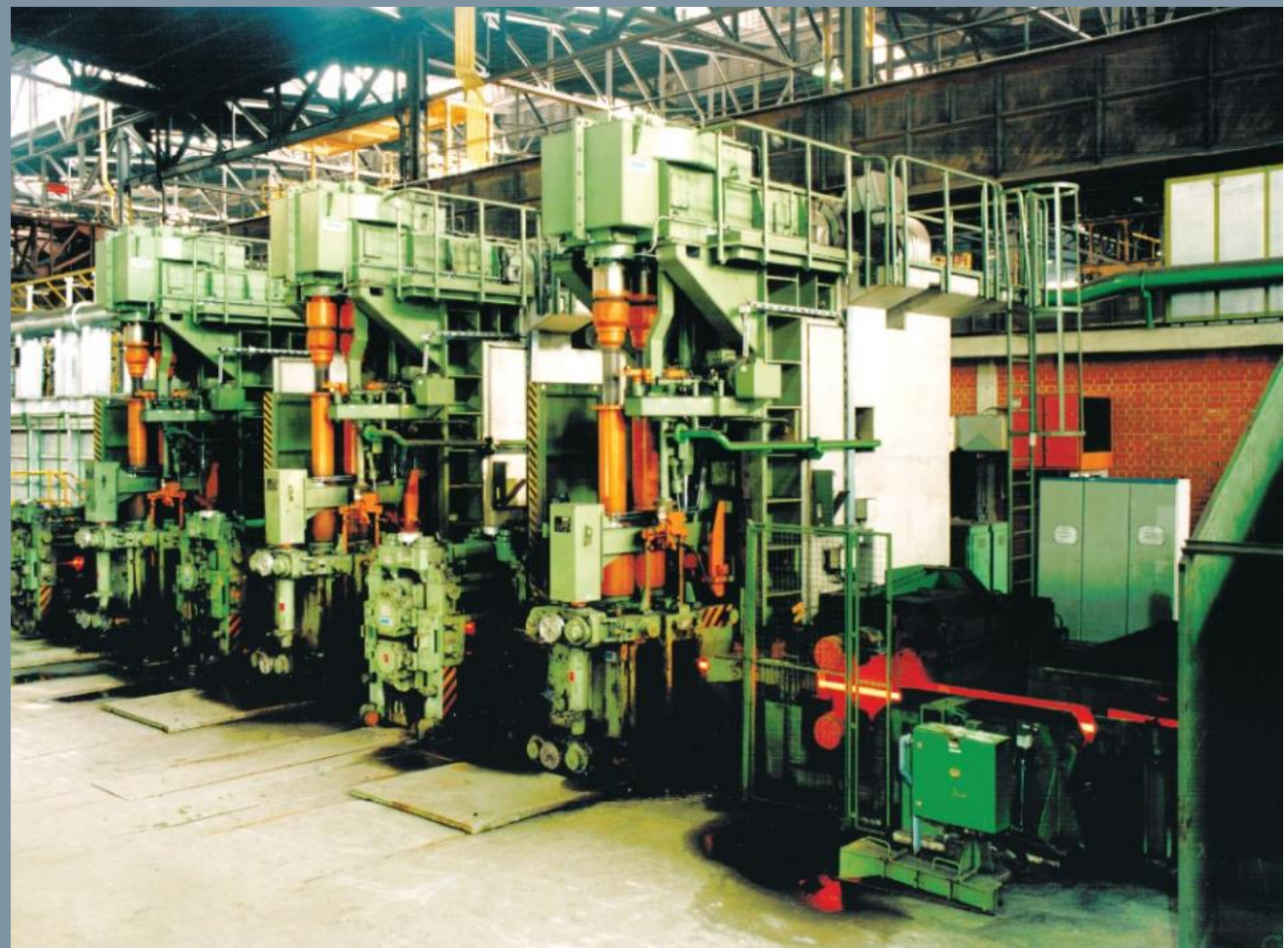
Housingless mill stand's rolls are mounted in:

- Tapered roller bearings for the radial adjustment of the rolls
- Cylindrical roller radial bearings in combination with axial groove ball bearing for the axial adjustment of the rolls

Therefore is ensured a faster and less complicated conversion of the rolling stands.

Main types of mill stands:

- **Two-high mill stands**
  - H-mill stands
  - V-mill stands
  - H/V-mill stands
- **Three- high mill stands**
- **Brake Down- high mill stands**
- **Two and Three- mill stands**
  - reversible
  - displaceable (only Two-high mill stands)
- **UNIVERSAL- mill stands be used as**
  - H- mill stands
  - UNI- mill stands



GEARBOXES

Gearboxes are used in a steelwork or rolling mills are exposed to extremely high loads. In addition to the high temperatures in a rolling mill, the 24-hour continuous operation and high individual loads on the gears are important factors that must be taken into consideration during the designing of the gears.

Where to use?

- Drives for longitudinal slitting lines
- Drives for transverse slitting lines
- Coiler gears
- Shaft mounted gears
- Decoiler gears
- Trimming shear drives
- Main drive rolling stands
- Levelling machine drives
- Dressing roller drives
- Roller bed gears
- Shearing drives / Shearing gears
- Spur gears
- Spur change-over gears for wire drawing machines
- Transfer cases
- Roller adjustment gears

SHEARS

Rolling mills are equipped with shears of a broad range of designs and construction to cope with most varied requirements.

CTS MAKİNA A.Ş. can supply shears for every application. From flying shears designed as crank or crank lever shears used in the mill train, shears employed in rod production at higher speeds, through to shears which serve to divide the rolled product strand into cooling-bed lengths.

Potential supplies include all the shears required for cutting rolled product into finished lengths, as either cold shears or flying shears in combination with straightening machines used in the process line.

Depending on the cutting application, the following types of shears are available:

- Snap Shears
- Pendulum Shears
- Crank Lever Shears
- Crank (Rotary) Shears
- Double Crank Shears
- Universal Shears
- Dual System Shears

SHEARS

Rolling mill shears are used to cut thin sheet, plates, billet and bars. Depending on the application, shearing machines typically employ a fixed lower blade and a moving upper blade to perform the cutting action. Shearing machines can be used to cut steel and other materials in any size or shape.

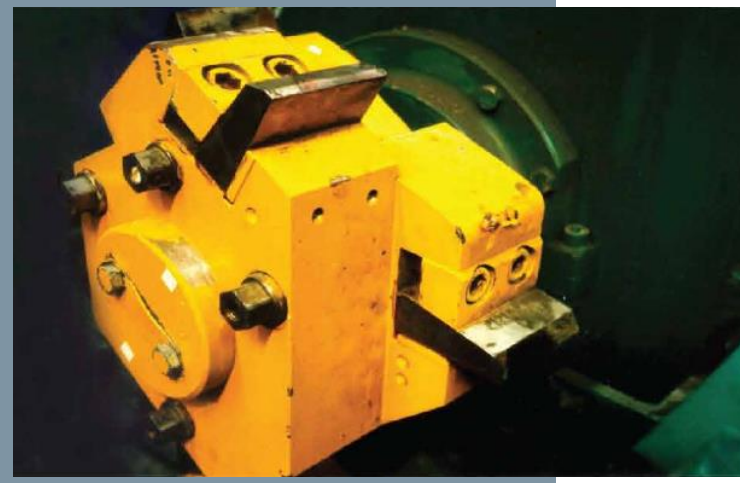
Flying shears

Rolling mills use Flying Shears for cutting profile metals and bars during the rolling mill process. These can be fully automated with a motor and a heat sensor depending on the application. Custom designed Flying Shears can be semi-automatic or fully automatic depending on customer needs. Custom designing ensures that their materials are cut precisely to their requirements, and will also save money by reducing maintenance.

Cold Shears

Cold Shearing machines are used in Rolling mills to cut the finished product to a defined length. Steel facilities use Cold Shears system for all types of bars, rounds, and structural products.

- Benefits
- Increase production capacity,
- Improve cutting quality,
- Improve automation,
- Reduce maintenance costs,
- Reduce blade change downtime



COOLING BED

The cooling platform group is connected to the rolling stands in the rolling mill and performs the following functions;

- Transport of material from the shears to the cooling platform
- Braking of lengths and partial lengths at rolling speed
- Transfer for the lengths to the cooling platform
- Double elevation of T-profiles to the cooling platform as per to the task
- Cooling of all profiles in contact with the air with the grids on the cooling platform
- Cooling and holding of rolled profile in water
- Rotation of the double T-profile on the cooling platform during transport
- Transport of rolled angle to transfer the roller way
- Separation of rolled angles that cannot be transported on an uncorrected roll track
- Transfer of rolled material from the cooling platform to the flattening machine

The controlled quenching system is placed between the finishing table and the finishing shears and is used for cooling and tempering of the rolled bars in the production line. The controlled cooling line provides the following improvements in product mechanical properties:

- Increase in material yield strength
- Good weldability compared to non-controlled cooling (high alloy) products of similar strength
- Low material cost due to low alloy
- High plastic properties
- High rigidity

CONTROLLED QUENCHING SYSTEM

The controlled quenching unit consists of;

- Carrier frame that allows the body of the cooling unit with different cooling nozzles to be mounted on the chassis.
- Thermal photocell for temperature control and detection of the bar at the inlet/outlet of the cooling process
- Rod drying system
- Carrier chassis plate
- All kind of cooling platforms and packaging zone equipment are designed and manufactured depending on the factory capacity and customer requests. Cooling platform equipment;
- Drive rollers
- Shears
- Roller way with platform input
- Cassette platform with input relay path
- Platform Entry Braking Systems
- Cooling Platform

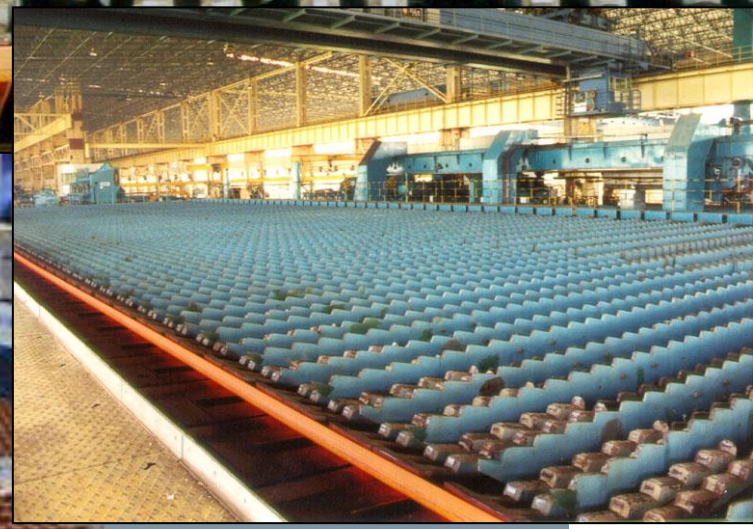
(Rack type/Chained Type/Twin Channel)

- Cooling Platform Outside Equipment

(Chain Transfer or Material Receiving System)

- Platform output relay path
- Cut-to-Length Shears
- Chain Transfers
- Packing Station
- Straightening machines

- Loadcell and marking systems



CONTINIOUS FINISHING SHOP

- The continuous finishing shop has the task to adjust the rolling stocks - which are supplied from the cooling bed group - dimension -specific and in the appropriate amount to shippable units.
- The process includes the following technological processes for profiles:
  - Single-core straightening of profiles supplied from the cooling bed
  - Collection of straightened profiles to drag of bars for further processing
  - Cropping of the drag of bars, parting to finished length, sampling, tail end cropping with cold saws, separating the rest ends depended on structural shapes
  - To separate of short lengths from the last layers of finished length of a cooling bed length
  - Process and prepare material with the finished length in batches for feeding the stacker and packet assembling
  - Stack of structural shapes into rectangular packages
  - Setting rectangular stack by means of binding wire and drill closure
  - Weighing the packets and embossing package tags with manual fixing of signs
  - Collecting the packets on a grate for removal with a crane
  - Equipment of the continuous finishing shop is designed to:
  - Cut the rolled material into final lengths
  - Straighten the rolled material, if required
  - Collect the rolled material into bundles, stacks or piles depending on material dimensions and customer‘ demands
  - Weigh the bundles etc. and to collect them for further shipping
  - The continuous finishing shop is divided into four control areas in connection to the technological processes.

CONTINIOUS FINISHING SHOP

- The continuous finishing shop is divided into four control areas in connection to the technological processes.
  - Control area 1; straightening and collecting
  - Control area 2; sawing
  - Control area 3; collecting and stacking
  - Control area 4; binding, weighing and loading
- The focus of our technology in this very demanding area is on the reduction of manpower. In fact, all operations have been mechanised and automated, such as the removal of short bars or the labelling the bundles with the tags with all relevant information. Particular care is given to the final shape of the bundles, with optimum arrangement of the bars and sections, even in smal sectional size products.
  - Stackers have different designs, depending on the customer needs:
  - For precise stacking of light sections, the overhead pendulum system
  - For light-medium sections, the stacking system with magnets underneath

PACKING AND BUNDLING AREA

CREATIVE TECHNOLOGICAL SOLUTIONS

MELTSHOPS

CTS Makina A.Ş. is supplying steel melt shops on the turn key basis, including all auxiliary units and all individual plant equipment or units as well as spare parts.
Steel melt shops consist of following equipment and systems.
Core Production Equipment:

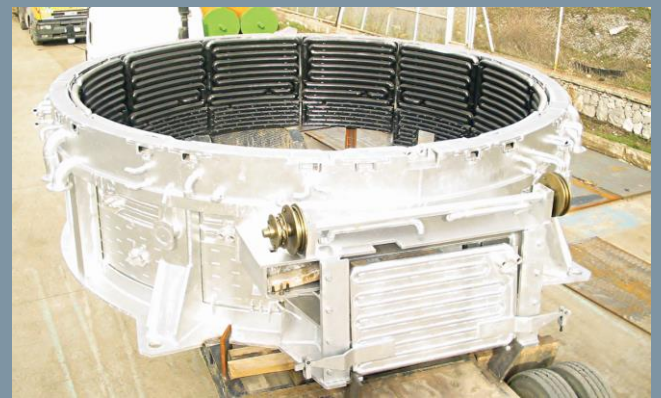
- Electrical Arc Furnace or Induction Furnace
- Ladle Furnace
- VD/VOD (Vacuum Degasser/Vacuum Oxygen Degasser)
- Casting Machine

Auxiliary Equipment and Systems:

- Scrapyard systems and scrap handling equipment
- Liquid Steel Handling Equipment
- Slag Handling Equipment
- WTP and Cooling Water Systems
- Material Handling Systems
- Fume Treatment Systems
- Measurement and Laboratory Equipment
- Air Separation Plants and/or Storage and Back-up Systems
- Compressed air production and distribution systems
- Cranes
- Electrical and Automation systems
- Work Shops

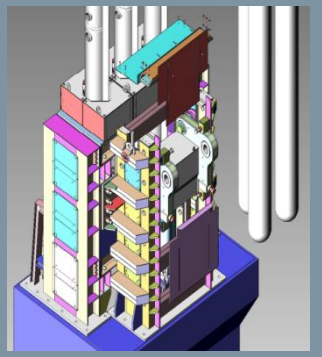
ELECTRICAL ARC FURNACE (EAF)

- Arc furnaces are essentially sole melting equipment and only limited metallurgical processes takes place in melting stage. Refining and alloying of steel is done in the secondary metallurgical unit called ladle furnace. VD/VOD units are steel cleaning and refining units used for producing various high quality steels.
- The primary power source for EAF melting is electrical power. The EAF transformer capacities are about 0,8 -1,5 MVA/t. tapping capacity.
- The second melting power source in EAF's is wall mounted oxy/fuel combined burner-injectors. Total Burner power for an arc furnace can be 20- 40 % of the transformer power depending on the furnace size. Consumable lance manipulators for oxygen and carbon injection through slag door are also used in some applications.
- In addition to oxy/fuel combined burner-injectors, wall mounted carbon injectors, and different type of lime injection systems are also used in arc furnaces for slag foaming purpose which enables long arc operation leading to increasing productivity and reducing consumptions.
- There are different tapping systems of arc furnaces and the most common and preferred one is EBT (eccentric bottom tapping).



ELECTRICAL ARC FURNACE (EAF)

- **MAIN ADVANTAGES**
  - Low production costs
  - Higher process flexibility,
  - Increasing productivity with improving energy efficiency
  - Low consumption levels
  - Better coordination of process / environmental requirements
  - Processing fine materials and dusts
  - High metal recoveries
  - Extended sidewall life with high-intensity copper cooling panels
- **GENERAL FEATURES**
  - AC Type UHP design
  - State of the art electrode control system
  - EBT slag free tapping
  - Energy efficient low refractory consumption
  - DRI/HBI feeding system up to 90 %



LADLE FURNACE

- Ladle Furnaces are secondary metallurgical treatment units, where de-oxidation, alloying and heating of liquid steel to casting temperature is performed.
- The transformer power for ladle furnaces is about 0,15 to 0,20 MVA/ton of EAF tapping size depending on production rate of the plant, heat size, product quality etc.
- During ladle furnace operation gas purging through purging plug on the ladle bottom is applied for temperature / composition homogenization, slag metal reactions and inclusion cleaning.
- Another application in ladle furnaces is so called wire feeding for further de-oxidation and inclusion morphology control.
- The main purpose of the LF is to raise steel temperature and to control the chemical composition between tapping and casting, removing and/or modifying inclusions and acting as a buffer in melt shop logistics. Many different solutions have been developed, such as: LF with inert roof, supported on one side only for optimal accessibility; Twin LF with two treatment positions and swivelling electrodes; handling in the ladle furnace by ladle cars or turret; capacity: 5 – 350 ton. or more.

LADLE FURNACE

- Advantages of CTS Ladle Furnaces
  - Saving of ferroalloys
  - Saving of energy
  - Increasing productivity
  - Decreasing refining time of EAF
  - Decreasing tapping temperature at EAF
  - Precise temperature control
  - Improving cleanliness of the steel
  - Removal of inclusions
  - To achieve strict tolerances for chemical analysis

TUNDISH

The tundish has an important role in casting operations as fluid flow, heat transfer and chemical reactions taking place within it have a strong influence on the quality of steel delivered to the molds.

TURRET

Ladle turret provides lifting and rotation of steel-teeming ladle at continuous caster. Handling ladles full of molten steel in a steel mill involves slow rotating speeds, 180° rotations, impact loads and high tilting forces.

Ladle turret can be butterfly type with two lifting arms where individual lifting facility is provided for smooth operations. The lifting /lowering is done by standard hydraulic cylinder and load cell weighing facilities are provided to monitor the flow of the metal from the ladle to the tundish.

DUMMY BAR

Need to be sealed the bottom of the mold with a dummy bar before casting begins and use it to pour hot molten steel inside.

Slowly calibrated and withdraw partially solidified steel. It acts as a molten steel guide to continuously cast molten steel at a constant speed without spilling it. When a certain amount of billets have been reached, the billet is disconnected from the dummy bar and continuous casting extraction begins. Need to be kept in storage until the next readjustment.

In order to avoid the deformation of the dummy bar body by heating, the cooling water pipe is provided inside to reduce the deformation and increase the service life.

VD AND VOD UNITS

- Vacuum degassers are used for removal of dissolved gasses in steel like hydrogen, CO and nitrogen. The principle of VD is to create a vacuum in a closed steel shell constructed chamber in where the heat is processed after LF treatment. During this process a controlled rate purging gas (Ar) flow and in some applications material feeding are also applied. In VOD applications ,in addition to VD, Electrical power heating, Oxygen lancing and material feeding are also available.
- The VOD (Vacuum Oxygen Decarburization) is used mainly for production of stainless steel. The unit is basically a degassing unit equipped with an oxygen blowing lance and other related equipment such as material feeding (for alloying and fluxes), gas purging etc. Due to the reduced CO partial pressure under vacuum conditions, decarburization of steel to very low carbon contents is possible.
- Advantages of CTS Vacuum Systems (VD/VOD)
  - No water contamination
  - Dust concentration in exhaust gas < 5mg/m 3
  - Global Steel Industry Requirement of Reduced Green House Emission is fully achieved by using Dry Pumping Technology instead of Steam Ejectors
  - Saving Energy Effect on Reduced Carbon Footprint

CONTINUOUS CASTING MACHINE

- In bulk steel production plants most generally used casting equipment is so called continuous casting machines (CCM) are used. These machines have various radius dimensions and different number of strands depending on parameters like capacity, product dimensions, casting speed and steel grade.
- CCM can be designed to produce square billets in the sections between 100 to 200 mm2 , and blooms between 180 to 260 mm2 . Special designs for beam blank and round sections between 160 to 440 mm can be done. Radius of 5-12 meter and mould length of 750-1000 mm can be designed according to project requirement
- CCM is generally equipped with the necessary equipment to produce good quality casted products, such as tundish of delta type to reduce inclusions in the mould, long copper tube to improve primary cooling on the billet surface, automatic mould level control and lubrication systems, high casting radius to reduce stress during unbending, secondary spray cooling divided in three zone for a better cooling effect and control, walking beam cooling bed for the straightening of the long billets. Besides from these electromagnetic stirrers are used for quality steels.
- CCM can be designed to produce square billets in the sections between 100 to 200 mm² and blooms between 180 to 260 mm².

- Special designs for beam blank and round sections between 160 to 440 mm can be done.
- Radius of 5-12 m and mould length of 750-1000 mm can be designed according to project requirement.
- The CCM can be fitted with up to eight casting strands in order to match with the production capacity of big sized EAF.

CONTINUOUS CASTING MACHINE

- A Continuous casting machine contains the following equipment:
  - Ladle Turrets / Ladle Cars
  - Tundishes and Tundish cars
  - Moulds
  - Mould Oscillation Systems
  - Mould Level Control Systems
  - Withdrawal & Straightener
  - Pinch Rolls
  - Mechanical or Torch Cutting Systems
  - Rigid Dummy Bar
  - Roller Tables
  - Cross Transfer
  - Cooling Bed (pusher type or turn-over)
  - Mould Cooling and Secondary Cooling systems
  - Hydraulic, Pneumatic and lubrication systems
  - Electrical and Automation
  - Optionally weighing systems
  - Optionally EMS

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