

STEEL MILL
SUPPLY EXPERTS

Steel mills around the world run smoothly thanks to the tooling, capital equipment and technical expertise which API Engineering provides. Our cost effective solutions increase your efficiency and productivity without compromising on quality.

We cater to a wide range of product types including long and flat products as well as hot and cold rolling mills and seamless tube mills.

Our focus is on improving your reliability and efficiency whilst delivering cost benefits. This is achieved through our continuous improvement philosophy coupled with decades of experience.

Our quality management system is ISO 9001:2008 certified.



CAPABILITIES OVERVIEW

We have the capability to supply a range of tooling and capital equipment which is backed up by our application engineering and design services.

Supply

The tooling supplied for long products and centrifugal casting includes mandrel bars and pipe moulds. These are produced from integral forgings using specialist steels and are finished to tight tolerances.

Rolls are supplied to a range of steel mill types, from large depth-hardened piercer rolls through to stretch reducing and backup rolls. Capital equipment available includes cooling beds, rolling mill stands and continuous casting machines. This custom-built specialist equipment is designed to cater to the individual needs of each steel mill.

Technical Services

Technical services include CAD designs, FEA, in-depth failure analysis, application engineering and reverse engineering of replacements for obsolete products. We work closely with our customers to assess their needs and ensure the most appropriate solution is offered.





Our skilled engineers have extensive experience in everything from designing bespoke one-off solutions to delivering high volume manufacturing runs and managing projects for our customers in the heavy engineering industry.


ABOUT US

We are based in the UK and have been delivering a diverse range of high quality, low cost components and equipment to a global customer base for two decades. Our skilled engineers have extensive experience in everything from the design of bespoke one-off solutions to delivering high volume manufacturing runs and managing projects for our customers in the heavy engineering industry.

Our main activities are in the Steel Mill, Material Handling, Power Generation and Automotive sectors and range from pressed steel components to very large forgings and castings. API have fully owned subsidiary offices and permanent, qualified staff located in the Chinese Provinces of Hebei, Henan and also Shanghai. All of our products are manufactured to the latest international standards and fully inspected and tested before being shipped to our customers.

We understand the need for competitive prices and flexible lead times as well as close working relationships between customers and suppliers. Our engineers are therefore always at hand to respond to any design queries and to ensure that material specifications and process requirements are in line with international standards and customers' requests.

TECHNICAL SERVICES



At API Engineering we employ a large team of skilled and experienced mechanical and electrical engineers, design draughtsmen, mechanical and electrical designers and metallurgists who can provide you with expert technical advice on your heavy engineering problems. By working closely with our customers and manufacturing partners we are able to assess our customers' needs and design, specify, test and deliver individual components and whole projects from start to finish.

Our skilled team can also assist in one-off projects and provide everything from CAD designs and FEA (Finite Element Analysis) to design reviews, in-depth failure analysis and re-design of components.

Through reverse engineering we can design replacement components, re-engineer existing components, as well as produce complete replacements for obsolete equipment while ensuring the new equipment is compatible with the existing system. We study the existing material, including chemical analysis if required, and create an up to date equivalent product, guaranteed to meet the requirements of the application.

LONG PRODUCT OPERATIONS



BILLETS AND BLOOMS

Steel Billets and Blooms are produced by continuous casting through ceramic tubes and water-cooled copper moulds before being rolled to smaller cross-sectional areas. API Engineering supply a range of equipment used in the continuous casting and rolling process.

Equipment we supply includes:

- > Ladles
- > Ingot Casting moulds
- > Continuous Casting Tundish - and associated spare parts including gates and nozzles
- > Continuous Casting Rolls
 - Typical base materials include S355J2+N, 21CrMoV5 and 42CrMo4
 - Typical cladding materials include AISI 430 and AISI 414
- > Straightening Rolls
 - Typical materials include X153CrMoV12
- > Non-magnetic Rolls

MANDREL BARS

Mandrel Bars are one of the key pieces of tooling required during the production of Seamless Tubes and Pipes. Once the billet has been pierced, the Mandrel Bar supports the tube shell internally during elongation and wall thickness reduction.

Over the last two decades API Engineering has supplied thousands of mandrel bars to steel mills across the world, built great partnerships and developed a reputation as a trustworthy, high quality supplier.

Our Mandrel Bar capabilities include, but are not limited to:

- > Diameters up to 500mm
- > Lengths up to 25,000mm
- > A variety of seamless tube mill types including
 - MPM, PQF and FQM mills
 - Assel Mills – both floating and retained
 - Plug and Pilger mills
- > Material specification as required, including AISI H13, X35CrMo V51 and 4CrMoSi V1
- > Threading available to API, ACME or metric standards
- > Chrome plating
- > Both solid and hollow bars

CHEMICAL COMPOSITION

For the production of mandrel bars the material most commonly requested is AISI H13. Since we control the material production process almost any desirable chemical composition can be accommodated. **The specification for AISI H13 is:**

	C	SI	MN	S	P	CR	MO	MI	V	H	O
AISI H13 (4CR5MOSIV1)	0.32	0.80	0.20	<	<	4.75	1.10	<	0.80	<	<
	0.45	1.20	0.50	0.008	0.012	5.50	1.75	0.25	1.20	2PPm	20PPm

SIZE	TENSILE STRENGTH (MPA)	YIELD STRENGTH (MPA)	ELONGATION (%)	REDUCTION OF AREA (%)	IMPACT VALUE (J)	HARDNESS (HRC)
<200MM	1127-1274	>931	>8	>25	>20	60-62
>200MM	1078-1274	>882	>8	>25	>20	60-62

MANUFACTURING PROCESS

Our mandrel bars are manufactured using the following processes:

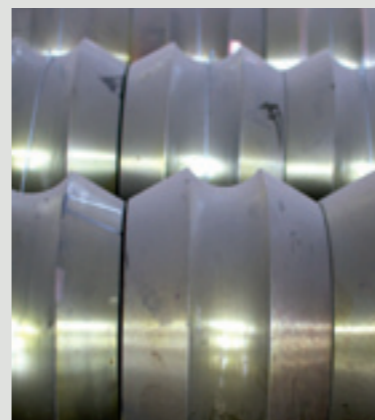
1. Steel making (EBT + LF (VD) + ESR)
2. Forged using both hydraulic press and rotary forging
3. Annealing
4. Rough machining
5. Magnetic testing
6. Heat treatment – either vertical or horizontal

7. Ultrasonic testing
8. Finish machining including threading if required
9. Chrome plating
10. Thread phosphating

Once the mandrel bars have passed inspection they are suitably packaged and shipped directly to the steel mill.

Full documentation is provided with every bar and third party inspection is available if required.

LONG PRODUCT OPERATIONS



ROLLING MILL STANDS

Rolling Mill Stands are used to control the outer diameter of the pipe during the elongation and diameter finishing processes. Mill Stands in rolling mills consist of several components and systems, all of which are subject to high temperatures, high loads and extreme conditions.

API Engineering has been involved in the design and supply of a variety of custom built rolling mill stands for Seamless Tube Mills around the world. We supply everything from whole sets of stands to individual stands as well as replacement components for various processes including flat-rolling and shape-rolling. Our Mill Stands are currently in use in a number of mills manufacturing high quality Seamless Tubes.

Previous projects include;

- > Stretch-Reducing / Sizing Mills for both single drive per stand and single drive per roller configurations
- > Elongation Mills including adjustable 3-roll stands

Our Mill Stand sizes vary in accordance with the required dimensions of rolls and necks, the groove design and the transmission and drive characteristics. Our engineers have the expertise and experience to develop and design Mill Stands to suit any steel mill's specific needs and requirements.

Both 2-roll and 3-roll configurations are available and existing stands can be reverse engineered to ensure the new stands will fit with customers' existing equipment.

We also supply spare components for rolling mills including rolls, roller bearings and other consumables, compatible with most international manufacturing standards.

SEAMLESS TUBULAR ROLLS AND SPARE PARTS

API Engineering supply rolls for almost any application in a modern seamless tube mill. Examples of rolls and spare parts typically supplied include:

CROSS-ROLL PIERCERS ROLLS

These are the large shaped rolls used in the initial piercing of the billet. Two rolls are positioned at an angle to the normal with guides or discs supporting the hollow between the rolls. The rolls are rotated in the same direction and the billet is forced between them with a piercer mandrel forming a hollow in the rotating billet.

GUIDES AND DIESCHER DISCS

Guide shoes and Diescher Discs are used to support the hollow during the piercing process. These wear parts need replacing at regular intervals and API Engineering supply custom-made replacements to the customers requirements.

MULTI-STAND MILL ROLLS

The rolls used on the mandrel stands are subjected to high forces and temperatures as the hollow and mandrel bar pass through. For this reason, they

are produced from a speciality hot work tool steel and heat treated to obtain the required surface hardness and depth.

STRETCH-REDUCING / SIZING MILL ROLLS

Downstream from the mandrel mill is the stretch-reducing mill which reduces the outer diameter and increases the length of the product.

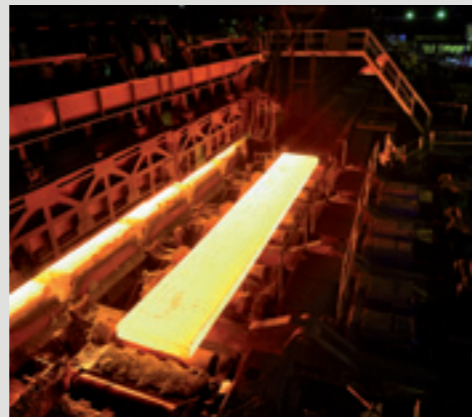
API Engineering supplies both the rolls and the rolling mill stands themselves.

PIERCER PLUGS

Piercer plugs are the first point of impact onto the furnace-hot-billet during the piercing process. As such they are a consumable item which sees incredibly high temperatures and forces. API Engineering supplies custom-designed forged piercer plugs with improved cooling characteristics.



FLAT PRODUCT OPERATIONS



SLABS

API Engineering supply components to slabbing mills for both continuously cast and rolled slabs. Key items include copper mould plates and continuous casting machines.

COPPER MOULD PLATES

Copper moulds are used in continuous casting machines to solidify the material into the desired shape as it passes through the mould. The size and shape of the mould is dependent on the casting machine and product shape required.

The mould must be capable of rapidly cooling the material as it passes through and must therefore exhibit excellent thermal conductivity. In addition it must be strong enough to withstand the high thermal and mechanical stresses involved.

Copper is the most economical choice for meeting these requirements and API Engineering offers a selection of copper and copper alloys:

- > Deoxidized Phosphorus Copper
- > CrZrCu
- > CuAg

Moulds are typically plated to avoid sticking and we offer all standard coatings including Cr, Ni, Ni-Fe and Ni-Co.

COILS

API Engineering offer a range of Coil Processing systems and equipment. These systems are built to the highest performance and safety standards in order to maximise your yield and productivity. We can cater to confined spaces and unusual plant layout.

Our equipment is suitable for a range of materials including:

- > All Ferrous Steels
- > Aluminium
- > Brass
- > Copper
- > Stainless Steel

All our equipment is totally computer controlled.

BLANKING LINES

Blanking Lines are used to convert a coil of material into flat sheets. This is done by uncoiling the material so that it is flat, cutting it to the required length and then stacking it. The blank which is produced can be a variety of shapes including rectangular, parallelogram or trapezoid depending on the way it is cut.

The tolerances on the length are often very precise. The equipment API Engineering supplies is suitable for width of up to 3000 mm, thicknesses of up to 25 mm and speeds of up to 150 m/min.

Shears types we offer include high-speed swinging shears, start-stop shears, flying shears or rotating shears. A variety of stackers are available.

SLITTING

Slitting lines are used to cut narrow coils from main coils. The main coil is uncoiled before being cut into strips which are then recoiled into narrow coils.

We offer a complete slitting line solution for light, medium and heavy gauge coils. Each solution is designed specifically for our customers' requirements.

PICKLING

Pickling is a process which uses strong acids to remove impurities from metal. This is done by moving the strip through

a large bath of hydrochloric acid. The factors governing the bath temperature, length of bath and acidic concentration are largely dependent on the chemical composition of the material.

Safety is the foremost consideration with all our equipment and our Pickling Lines are no exception. All the lines we supply comply with all applicable local and international regulations.

COOLING BEDS



Cooling beds are crucial to the steel manufacturing process, carefully moving and cooling the hot steel after the rolling process. Since this is an integral part of a Steel Mill's manufacturing process, any mechanical problems or failures to the cooling bed will have huge consequences for the mill. The cooling bed and components therefore need to be manufactured to the highest quality standards and thoroughly tested before installation.

Over the past decade, API Engineering has been heavily involved in the successful design and manufacture of cooling beds and cooling bed components for Steel Mills in the U.S and Canada.

API Engineering supplies all the components necessary for cooling bed overhauls, upgrades and renovations. Components are cast, forged or fabricated to the end users' requirements and electrical components are supplied through our sister company PPI Engineering.

The three most common designs of cooling bed are Walking Beam, Disc Type and Chain Type.

> Disc Type cooling beds carry sheet products using series of discs fixed to rotating shafts.

> Hot pipes and tubes are cooled on Chain Type cooling beds using raised links to keep each product separate. These beds tend to be longer than they are wide; a result of the product dimensions they typically cool.

> Walking Beam cooling beds utilise two sets of rakes, one moving and one fixed, to carry long bars and structural steel components across the bed.

The hot side of the bed will begin with grid castings to absorb much of the initial heat from the product whilst offering additional support as the product is still malleable. Moving rakes then lift the product from the grid castings and carry it across the cooling bed to the cool side.

Aligning Rolls are used close to the cool side of the bed to align the product with the yard end of the rake setup.

> Rakes

- Moving and fixed;
- Machined or water cut;
- Including stainless steel welded additions;
- Materials include ASTM A516 Grade 70, BS1501-224-490A/B, EN10028 P355GH or equivalent.

> Castings

- Including: Aprons, Grid Castings and Rolls;
- Materials include grey iron and steel with heat treatment to customer's requirements;
- Available casting methods include aluminium patterns and lost foam casting.

> Fabrications

- Structural fabrications are used to support the castings and rakes;
- Other fabrications are used in the walking mechanism and auxiliary systems.

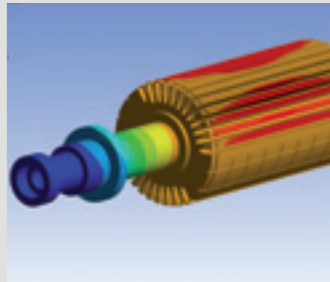
ADDITIONAL ITEMS

Each type of cooling bed requires an entry and exit solution which ensures minimal damage to the product. Some cooling beds are more complex than others, integrating advanced arranging and cooling equipment. Safety systems including cobble protection systems are of particular importance.

Wear items and spare parts supplied by API Engineering include:

- > Wear plates;
- > Roller sleeves;
- > Rakes;
- > Discs.

ROLLS



DUCTILE IRON PIPE MOLDS

ELECTRICAL EQUIPMENT

As an integral part of the workings of Steel Mills, API Engineering supply high quality forged and cast ferrous and non-ferrous rolls for a variety of hot and cold rolling applications.

Rolls supplied include:

- > Forged Steel Rolls;
- > Nodular Cast Iron Rolls;
- > Grey Iron Rolls.

Our work rolls can be supplied fully finished and hardened in a wide range of international standard material grades and dimensions to suit the required application. Quality parameters such as straightness, concentricity and dimensional tolerances are critical

and all our components are therefore carefully inspected and supplied with full inspection reports.

Backup rolls are supplied either cast or forged in different material grades and chemical contents to meet the customer's specific hardness and wear resistance requirements.

Our engineering department is able to advise customers in selecting grades and parameters to achieve optimal performance.

Seamless Tube mill rolls can be either finish machined on the working surface or left rough machined for the customer to finish.

Ductile Iron Pipe is produced by centrifugal casting. Pipe Moulds made from tool steel are rotated at high speed before molten ductile iron is poured in, such that centrifugal action forces the material to line the inside evenly. Once the ductile iron has cooled sufficiently the pipe can then be removed from the mould for further processing.

PIPE MOLDS

API Engineering supply the world's most discerning Ductile Iron Pipe manufacturers. Our pipe moulds are available in the full range of sizes from DN 80 up to DN 1000.

MATERIAL

Pipe moulds are produced from a hot work tool steel such as 21CrMo10. A typical chemical composition would be:

C	SI	MN	P MAX.	S MAX.	CR	MO	CU MAX.
0.16 - 0.23	0.16 - 0.23	0.16 - 0.23	0.16 - 0.23	0.16 - 0.23	0.16 - 0.23	0.16 - 0.23	0.16 - 0.23

Extra control for Pb, As, Sn, Sb and Bi may be implemented if required.

Since we are in full control of material production, other grades and compositions are available.

INSPECTION OF THE TAPER

The internal diameter of a pipe mould has a shallow taper along its length to allow for easy removal of the product after casting. This taper is vital to ensure fast continuous production and under no circumstances can there be a reversal in the taper direction.

API Engineering use a variety of inspection techniques to ensure that this is the case. This includes dimensional inspection by laser.

Through our sister company PPI Engineering we offer a range of electrical machines and equipment. In addition, our team of highly qualified personnel are on hand to install, commission and repair equipment at customers premises world-wide.

Rotating electrical machines and their associated equipment are a vital part of virtually every modern steel mill. PPI Engineering can specify, design and supply machines from the small motors seen in long product run-in troughs to large piercing roll motors and multi-megawatt generators.

PPI Engineering also provide a range of transformers and switchgear, including those which are used to supply the very high secondary currents required for melt shop furnaces. These transformers are designed for use in the challenging environment of steel mill conditions and are suitable for use at very high ambient temperatures.

All modern steel mills require control and automation systems for almost every operation in the production and inspection process. Our team of engineers can design, supply and install all necessary field sensors, actuators, instrumentation and control panels.



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