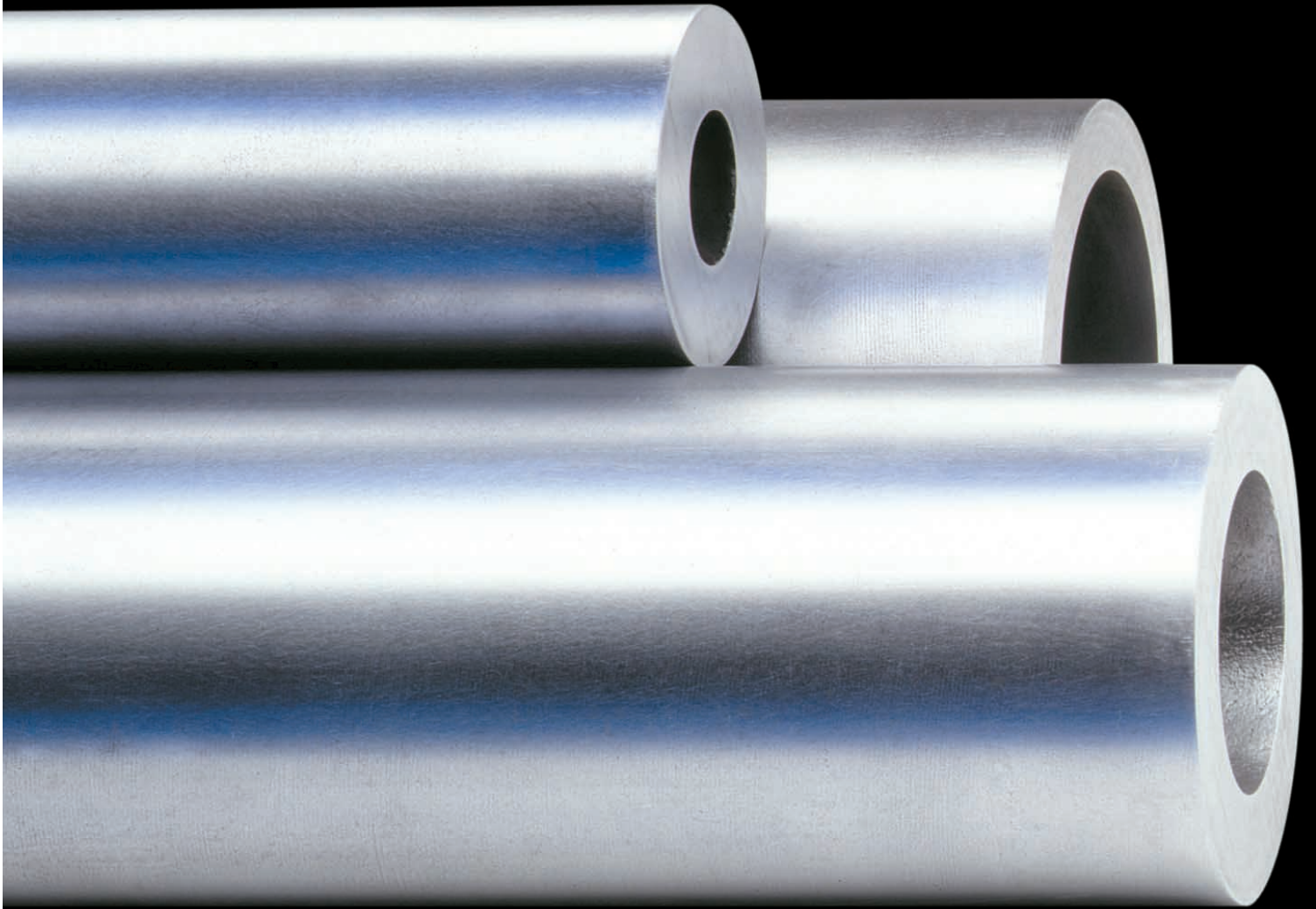


Seamless Mechanical Steel Tubing



transformingtomorrow



ArcelorMittal

Seamless Mechanical Steel Tubing

Tubular Products Division of ArcelorMittal: A Pioneer in Seamless Mechanical Tubing

Tubular Products produces high-quality seamless mechanical tubing at its modern manufacturing facility in Shelby, Ohio. Here, in 1890, a predecessor established the nation's first commercially successful seamless tube mill.

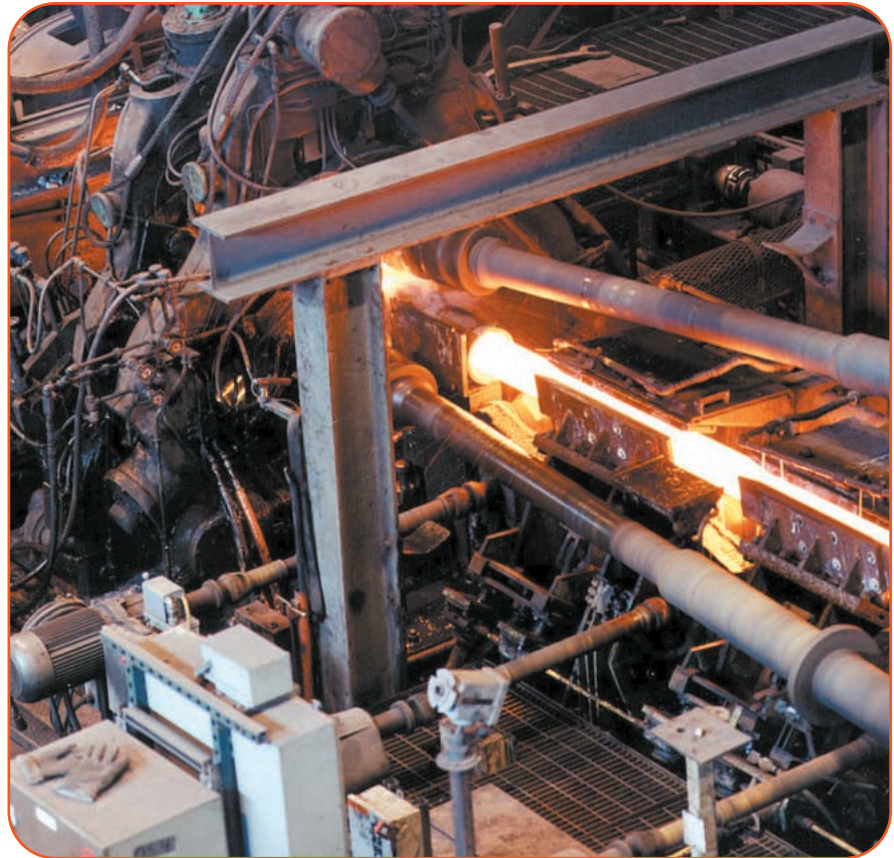
The Shelby plant's seamless tubing production facilities have been continually upgraded over the years, most recently through a \$24-million project completed in the early 1990s.

Tubular Products furnishes seamless tubing both in cold-drawn and hot-finished form. The product is available in a wide spectrum of carbon and alloy grades manufactured to ASTM, AMS, MIL, SAE, AISI and DIN specifications.

All of our seamless tubing meets the specifications of ASTM A519 and is custom-made to specific requirements. Customer specifications for mechanical properties, dimensional tolerances and other characteristics critical to specific applications will be met. And you can be sure of product consistency—from tube to tube within a shipment, and from one shipment to the next.

Special seamless steel tubing configurations are available in a variety of sizes, grades and properties. They can eliminate or reduce machining and replace more costly fabricated parts.

In addition, a number of final heat treating options are offered including annealing, normalizing and quenching and tempering.



Custom-Made Tubing

Because Tubular Products' seamless tubing is made to meet your specific application requirements, controlled modifications and adjustments need to be made to the tubemaking process for each order. Thus, it's important that we

have complete information concerning the end use and all finishing operations (including heat treatment) that will be performed after receipt by the customer. Your Tubular Products representative will be happy to work with you to develop this information.



Advantages of Tubular Products' Seamless Mechanical Tubing

Both cold-drawn and hot-finished Tubular Products seamless tubing are appropriate for a wide range of applications, due to the broad range of chemistries in which they're available. Each offers a number of distinct advantages:

Cold-Drawn Seamless Tubing • Cold-drawn tubing inherently possesses a high strength-to-weight ratio and can be processed to provide a combination of desired characteristics: dimensional accuracy, good surface quality, excellent micro-structure uniformity, good machinability and high tensile properties. It is also suited for such post-treatments as carburizing and heat treating.

Hot-Finished Seamless Tubing • This type of tubing is normally used in applications where precise dimensions and surface quality are secondary considerations, or where finish and final mechanical qualities can be obtained through machining and heat treatment.

Applications of Tubular Products' Seamless Mechanical Tubing

Tubular Products' seamless mechanical tubing is employed in a variety of uses, particularly when heavy wall thicknesses, specific steel alloys or both are required.

Specific applications include bushings, spacers, bearings and other mechanical parts in automobiles, trucks, aircraft and construction, agricultural and drilling equipment, as well as hydraulic cylinders.



Markets served include transportation (autos, trucks, buses, trains and aircraft), construction equipment, agricultural equipment and oil and gas production equipment. Tubular Products tubing may also be purchased – in less than mill production quantities – from leading steel service centers throughout North America and abroad.

Building Quality Into Tubular Products' Seamless Tubing

The seamless mechanical tubing facilities at Tubular Products' Shelby plant are certified as meeting both ISO 9002 and auto industry TS:16949 quality standards.

A major contributor to this quality performance is our use of Statistical Process Control (SPC). Our short-run SPC methodology has been accepted

by the federal government and was instrumental in achieving QS-9000 certification.

Short-run SPC has been adapted, for example, to control sizing in cold drawing. Target values transform dimensional data so that a single continuous control chart can be utilized at each drawing bench. A multitude of sizes in our "job shop" environment are controlled by the same SPC chart.

Extensive laboratory testing of pierced billets and tube samples further assures quality. These include metallographic examinations and tests for such properties as yield strength, ultimate tensile strength, percent of elongation, and hardness.



Seamless Mechanical Steel Tubing

The Manufacturing Process For Tubular Products' Seamless Tubing

Tubular Products' seamless mechanical tubing is produced from solid round billets by rotary piercing and then is rolled in an Assel mill equipped with a no-end-loss unit that permits an extremely broad range of diameter/wall thickness ratios. Tubes are then processed through a multiple-pass sizing reducing mill and a rotary sizer.

Tube lengths from the hot mill are slowly air cooled or—depending on size, steel grade and order requirements—moved directly to a unique isothermal annealing furnace.

Customer Service Hot Line at Tubular Products

From there they travel individually through five chambers in a series of controlled cooling and holding steps to achieve uniform hardness and microstructure to promote excellent machinability. This process contrasts with conventional slow-cool furnaces, where tubes are cooled in bundles. That can result in variations in microstructure and hardness from tube to tube and even within a tube itself.

After cooling, tubes are pickled in an acid bath to remove mill scale and are carefully inspected. Minor imperfections are removed by grinding prior to cold drawing and additional processing.

Tubes to be cold-drawn are normalized or annealed, depending upon application requirements, and are then pickled, washed, rinsed and coated with a drawing compound.

Tubular Products operates a highly efficient customer service organization for the convenience of seamless mechanical tubing customers. The number to call is 800-345-8823.

They are then cold-drawn through a die and over a mandrel. Next they may receive a final or stress relief anneal and are straightened to established tolerances on a specially-designed, seven-roll straightener. Finally they are cut to length, and burrs are removed from the ends. Tubes then are inspected for dimensional accuracy and surface finish.

Cold working, applied to both inside and outside surfaces, improves surface finish, increases tensile properties, improves machinability in many grades and results in more precise dimensions. OD and wall thickness tolerances of cold-drawn seamless are approximately 50% better than the equivalent hot-finished sizes.

MECHANICAL TUBING BUSINESS

Contact us at the following location:

132 West Main Street, Shelby, OH 44875-1471
Telephone 800-345-8823 • Fax 800-552-9943

www.arcelormittal.com/tubular



ArcelorMittal