



**MORGAN ROD
REDUCING/SIZING MILL**
SETTING THE STANDARD IN ROD
ROLLING FOR UNSURPASSED
PRODUCTIVITY, TOLERANCES AND
MECHANICAL PROPERTIES

UNMATCHED VERSATILITY GREATER PRODUCTIVITY. GREATER PRECISION.

THE KEY TO SUCCESS...

In any of today's markets around the world, having the most productive and versatile rolling mill is key to being successful in this competitive environment.

...OUTPACING THE COMPETITION...

Making your rod mill highly competitive depends on a number of considerations. How can you manufacture the maximum range of rod sizes to better serve your market? How can you boost production volume and set new standards in product quality? How can you achieve material properties that give you an edge over your competition?

...THROUGH VERSATILITY...

With more than two decades of operational know-how on more than 60 installed strands, our engineers have advanced the Morgan Rod Reducing/Sizing Mill into the most versatile, sought-after rolling technology available. There is no substitute on the market today that can compare with the Morgan Rod Reducing/Sizing Mill.

...AND PRODUCTIVITY

The advantages of the Morgan Rod Reducing/Sizing Mill are nearly unlimited. It can be integrated after a conventional finishing block, boosting mill productivity on small sizes by up to 60%. Its extreme precision has been proven in many practical applications. And the combination of advanced technologies allows very low-temperature rolling. This results in a more refined microstructure that can eliminate additional processes.

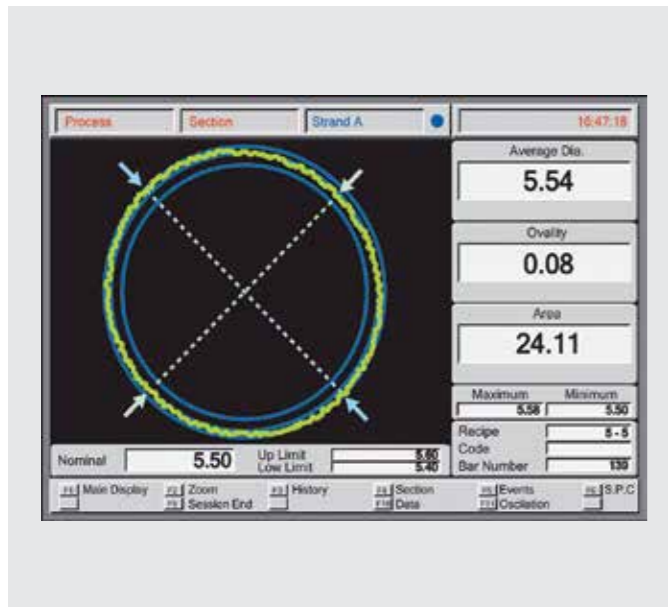
We invite you to put us to the test. In numerous applications around the world, the Morgan Rod Reducing/Sizing Mill has proven to be a world-class solution for the world's metal producers.

The expertise and long history of innovative Primetals Technologies engineering stands behind the Morgan Rod Reducing/Sizing Mill.

ADVANTAGES OF MORGAN ROD REDUCING/SIZING MILL

- Productivity on smaller sizes can be increased by as much as 60% when the Morgan Rod Reducing/Sizing Mill is added after a conventional finishing block.
- Size control meets or exceeds the most stringent requirements for tolerance. Grain refinement with thermomechanical rolling results in improved properties that can reduce or eliminate downstream processes.
- The Morgan Rod Reducing/Sizing Mill allows manufacturing of a wide product size range from 4.0 mm to 26 mm. Free size rolling capability enables an array of finite rod sizes from a nominal pass groove with the roll parting adjustment.
- A single unit provides both productivity and finished product quality improvements, simultaneously reducing operating costs and increasing product marketability.
- The rolling unit accommodates a single pass design from stand 1 through the last stand of the finishing block. Used in a combination bar and rod mill, both the Morgan Rod Reducing/Sizing Mill and Morgan Bar Reducing/Sizing Mill are integrated to work with the same single-family pass design. High mill efficiency can be maintained without regard to order of product size.
- The patented combination drive unit provides a compact footprint for tight installation conditions.





Ultra precision tolerances attainable



Close-centered sizing stands with new cooling headers

IMPROVED PROPERTIES – STATISTICALLY GUARANTEED TOLERANCES

All sizes can be produced to ultra precision tolerances, as low as +/- 0.1 mm, with ovality at 0.12 mm about the nominal pass and within 2 sigma statistical limits.

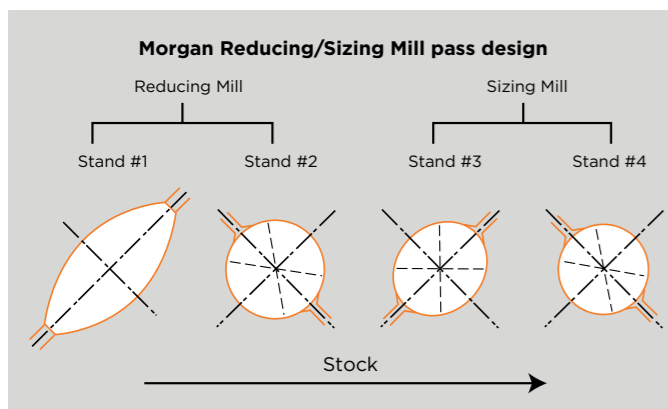
The patented oval-round-round-round roll pass sequence delivers high-reduction rolling for normalized and thermomechanical processing while enhancing surface quality and extending roll life.

CONSISTENCY AND FLEXIBILITY

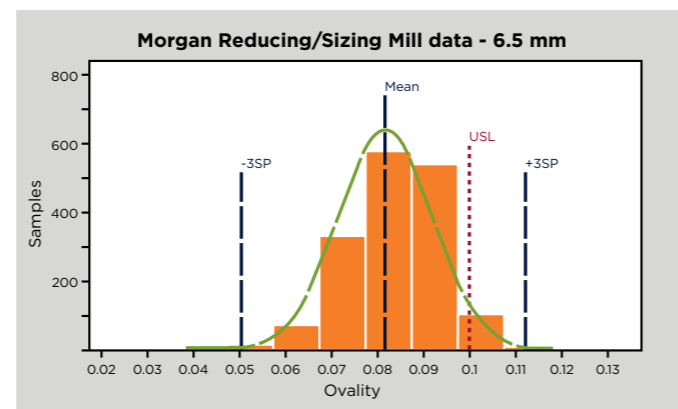
The Morgan Rod Reducing/Sizing Mill has been proven to deliver excellent size tolerance and ovality throughout the coil, from coil to coil and heat to heat. The capacity to roll sizes from 4.0 mm up to 26.0 mm, together with the capability for free size rolling, makes it the most flexible rod finishing block system on the market.

QUALITY AT HIGH FINISHING SPEEDS

Obtaining excellent dimensional accuracy of rolled products from the Morgan Rod Reducing/Sizing Mill is further enhanced by its ability to achieve this accuracy at speeds up to 120 m/s on 5.5 mm, resulting in the highest production rates possible in the industry today.



Proven oval-round-round-round roll pass sequence



Ovality can be achieved within +/- 2 sigma statistical limits



Heavy duty roll housing for thermomechanical rolling capability

SUPERIOR METALLURGICAL PROPERTIES

With the Morgan Rod Reducing/Sizing Mill located between the finishing block and laying head, water cooling and equalization zones provide controlled entry temperatures, as low as 750°C, to achieve fine grain structure. The resulting improved properties can reduce or eliminate costly downstream annealing processes.

Various steel grades can benefit from low temperature rolling.

COLD HEADING PRODUCT BENEFITS

- Less peeling required, reducing losses
- When peeling, material losses can be reduced by up to 30% for certain stainless steels and titanium grade products
- Improved formability and excellent tolerance can result in scrap savings of up to 50% for downstream processes like bolt making

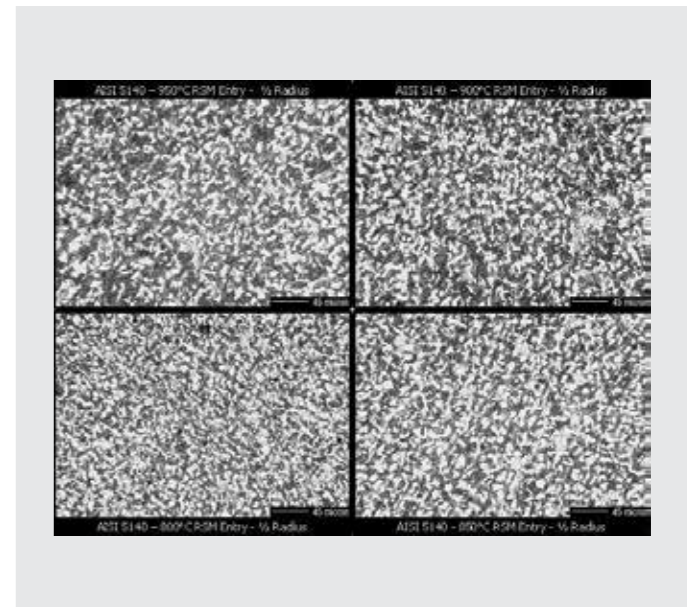
SPRING STEEL PRODUCT BENEFITS

- Reduction in martensite formation, particularly in small diameters

- Less frequent pre-drawing heat treatment

WELDING ROD PRODUCT BENEFITS

- Refined microstructure enables better drawability
- Fine grain size suppresses martensite formation



Microstructure refinement on AISI 5140 with different rolling temperatures

BEARING STEEL PRODUCT BENEFITS

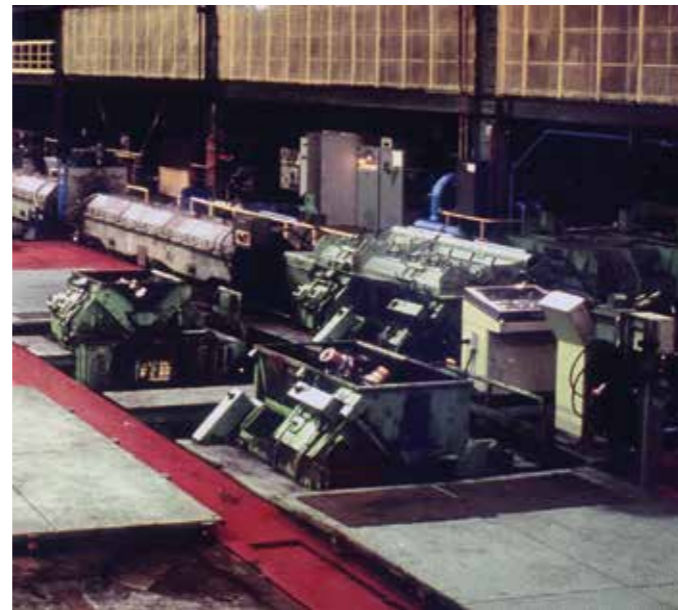
- Pseudo-spheroidized microstructure with fine, well-dispersed carbides
- Avoids most downstream spheroidize annealing - totally eliminating or reducing soak temperatures and times
- Reduced hardenability eliminates martensite formation

WIRE DRAWING BENEFITS

- Processing at low temperatures through the Morgan Reducing/Sizing Mill can provide advantages to the downstream wire drawing plant
- Better mechanical descaling, with uniform breakage of scale, reduction of martensite on rod surface and decreased wire breaks
- Improved tensile uniformity as a result of excellent size tolerance and ovality
- Increased die life, with better lubrication and even drafting
- Optimized die configuration with non-standard rod sizes through free-size rolling



Work side of Morgan Reducing/Sizing Mill



Off-line units for quick change capability

HIGHER MILL UTILIZATION

The Morgan Rod Reducing/Sizing Mill is designed for high throughput and high machine utilization. The practical design and innovative features allow quick, time-optimized setup. Examples include:

- Single family rolling - the combination of pass design and multiple gear ratios in the external gear drive allow for multiple products to be produced from a single feed, greatly reducing product change times throughout the mill as well as minimizing roll inventory and roll shop costs
- Quick-change transfer car - optional off-line roll units installed independently from the rolling operation ensures rapid and error-free setup
- By-pass troughs - patented built-in feature provides immediate setup for dummie roll units
- Maintenance - the use of off-line units enables maintenance to be performed on the extra units without loss of production time
- Guideless rolling - sizing stands employ guideless rolling for quick and efficient roll parting adjustments during grade or temperature changes and free size rolling
- Quickcool™ headers on sizing stands

IMPROVED EXTERNAL GEAR DRIVE

The latest generation Morgan Reducing/Sizing Mill incorporates new features for higher speeds, better reliability and reduced maintenance.

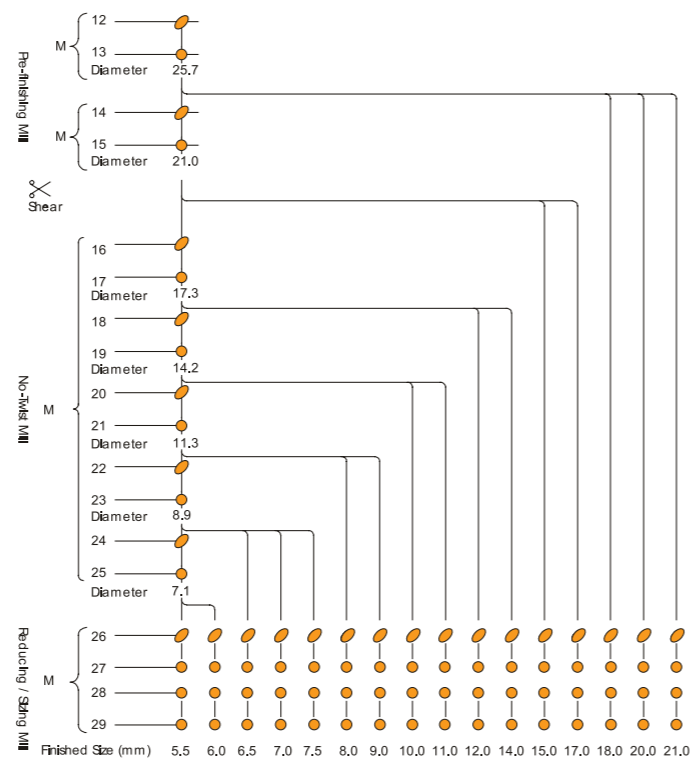
- New bearing arrangement at critical location in the drive system
- Improved clutching components for gear changes

HIGH LOAD CAPACITY AND INTERCHANGEABILITY

Ultra heavy-duty roll housings in the reducing stands enable high separating forces when rolling difficult alloys or rolling at low temperatures. The reducing stand housings (250 mm, 230 mm and 160 mm) are also interchangeable throughout the complete family of Morgan Vee No-Twist mills and Morgan Vee Mini-Blocks for high speed pre-finishing and post-finishing mills.

ADJUSTMENT UNDER LOAD

With this optional feature, roll partings can be adjusted from the operator station during rolling, with roll gap feedback provided to verify the changes.



Single family rolling pass schedule for increased utilization

EXCELLENCE FROM EXPERIENCE

SELECTED SUCCESS STORIES WITH MORGAN ROD REDUCING/SIZING MILLS



BETTER TOLERANCE, BETTER QUALITY

Customer
POSCO Specialty Steel Co. Ltd.,
Changwon Republic of Korea

Plant type
Rod outlet

Our solution
Modernize existing rod outlet on a combination mill by adding a Morgan Rod Reducing/Sizing Mill for high quality production.

Technical data
120 m/s maximum speed, 5.0 mm - 17.5 mm in alloy, stainless and quality carbon steels

The result
The rod outlet revamp improved the quality and tolerance of the entire range of rod products, and offers rod future capability for larger sizes.



COMBINATION MILL RAISES QUALITY, PRODUCTIVITY

Customer
ArcelorMittal Acindar, Villa
Constitución, Argentina

Plant type
Bar and rod combination mill

Our solution
New combination bar and rod mill with cooling bed and Morgan Stelmor Controlled Cooling Conveyor, with a Morgan Bar Reducing/Sizing Mill for finish rolling of bar to the cooling bed and a Morgan Rod Reducing/Sizing Mill for finish rolling of rod to the Stelmor conveyor.

Technical data
500,000 tpy, 120 m/s maximum speed, 5.0 mm - 25.0 mm through Morgan Rod Reducing/Sizing Mill

The result
New mill's combined use of Morgan Rod and Morgan Bar Reducing/Sizing Mills produces high quality rod and SBQ bar products in a facility now capable of exceptional productivity and utilization levels through integrated single family rolling.



HIGHER SPEEDS, IMPROVED QUALITY

Customer
Třinecké Železárny, Třinec, Czech
Republic

Plant type
Two strand wire rod mill

Our solution
To meet anticipated future market demands, a major modernization incorporated new pre-finishing stands, Morgan Water Boxes, Morgan Rod Reducing/Sizing Mills and Morgan High Speed Laying Heads.

Technical data
110 m/s maximum finishing speeds, 162.5 tph, plain rod from 5.0 mm - 20.0 mm, plain carbon, welding rod, spring steel, high carbon, bearing and cold heading qualities

The result
The modernized mill provides an improved and expanded product mix, at faster speeds and with greater mill utilization.

Primetals Technologies USA LLC

A joint venture of Mitsubishi Heavy Industries and partners

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