

# Cold rolling mill technology

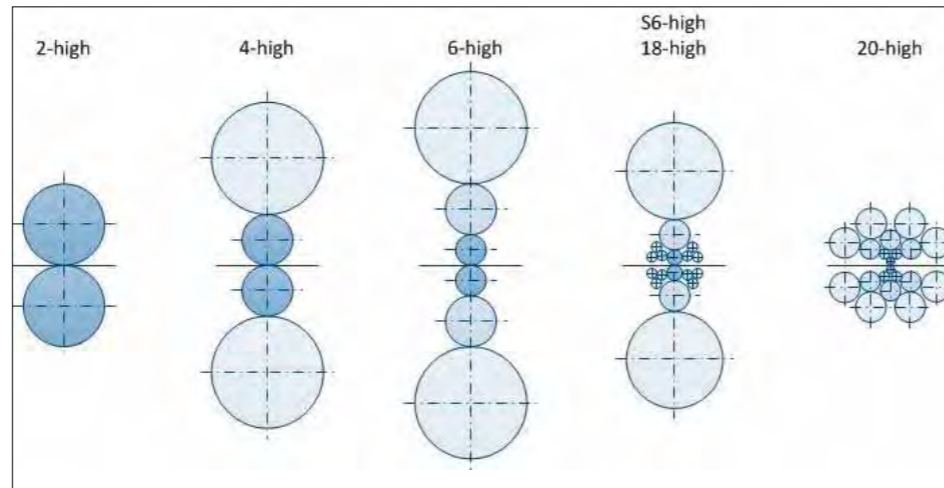
## Carbon steel products



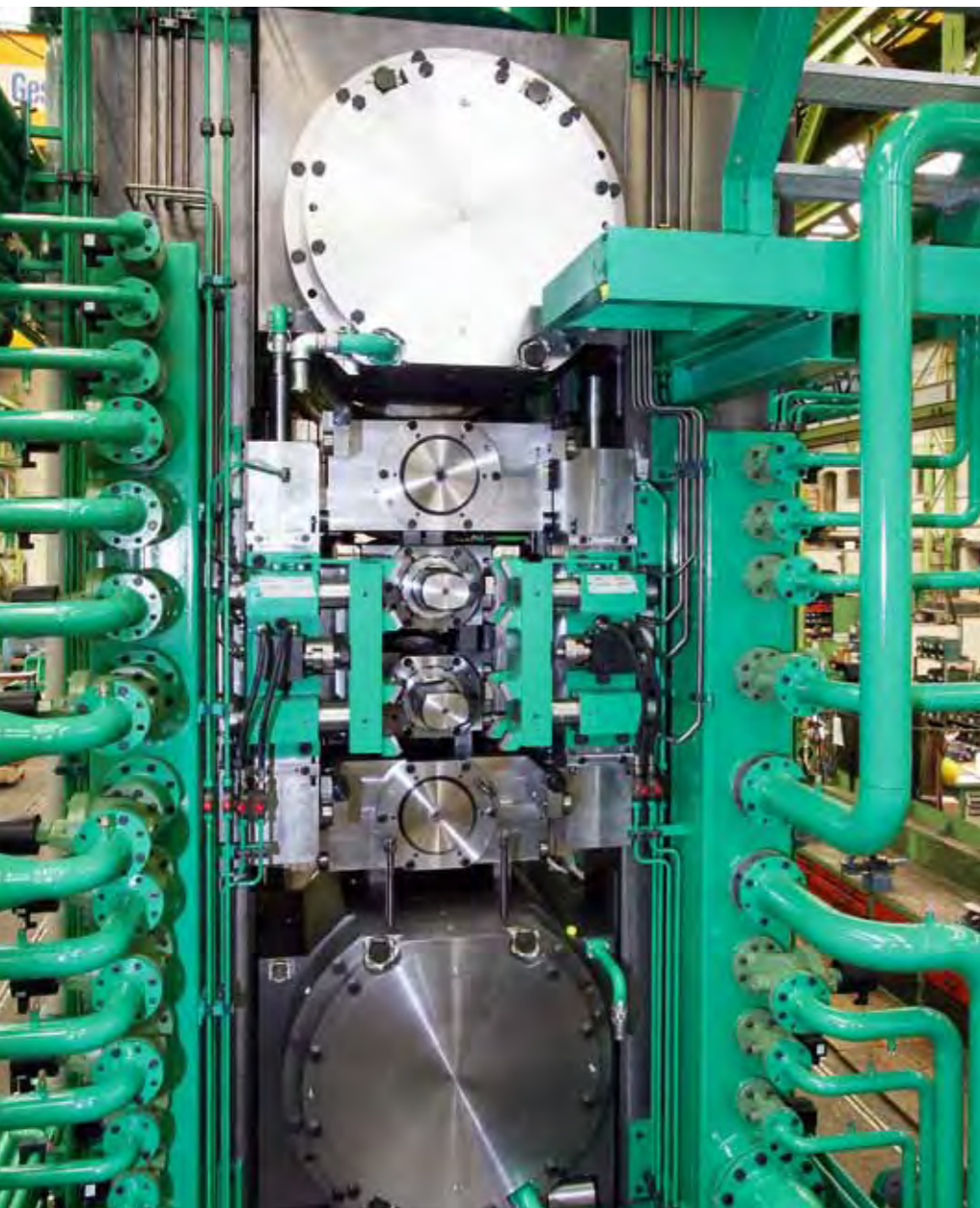


# Full-liner for cold rolling mill types

ANDRITZ METALS is one of the very few mill technology full-liners, who keeps the state-of-the-art-design competence with enhanced technology for the various mill functions. This allows to produce cold band quality with narrow tolerances.



▲ ANDRITZ METALS' portfolio of mill stand types for cold rolling



▲ Quarto/S6-high combination rolling mill for mixed product range with low and high carbon steel

◀ 6-high: drive side with emulsion distribution

## Mills for cold reduction

Cold rolling mill type	Typical mill stand types	Production capacity (t/y)*	Strip speed (m/min)*	Type
Single-stand reversing mill	4-high, 6-high, (S6-high)	150,000 – 450,000	up to 1,500	Discontinuous
2-stand reversing mill	4-high, 6-high, (S6-high)	350,000 – 850,000	up to 1,500	Discontinuous
Discontinuous tandem mill	4-high, 6-high, S6-high	1-1.6 mill.	up to 1,500	Discontinuous
Continuous tandem mill	4-high, 6-high, S6-high	1.6-2.4 mill.	up to 1,500	Continuous

\*) Typical values depending on customer's product mix

## Skin pass / temper mills

Cold rolling mill type	Field of application	Typical mill stand types	Production capacity (t/y)*	Strip speed (m/min)*	Type
Single-stand non-reversing mill	For adjusting material and strip surface quality	4-high	150,000 – 600,000	up to 1,500	Discontinuous
2-stand temper mill	For adjusting material and strip surface quality or tin plate	4-high	250,000 – 600,000	up to 1,500 (2,000)	Discontinuous
Inline temper mill	For continuous galvanizing, annealing, and push-pickling lines	4-high		CGL up to 220 CAL up to 450	Continuous
Hot skin pass mill	For adjusting material and strip surface quality, improving strip flatness and recoiling, dividing or inspection of coils	4-high	400,000 – 900,000	up to 700	Discontinuous

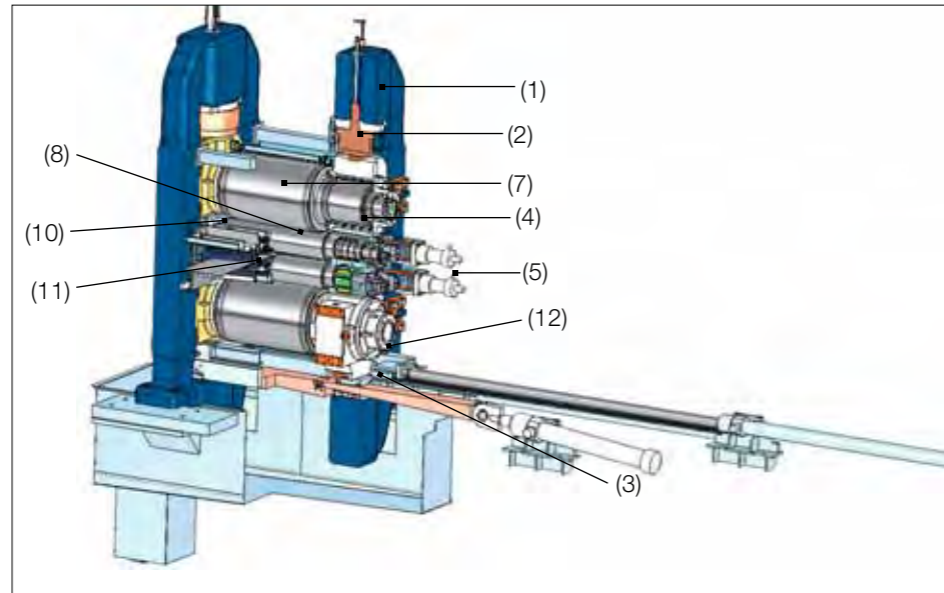
\*) Typical values depending on customer's product mix



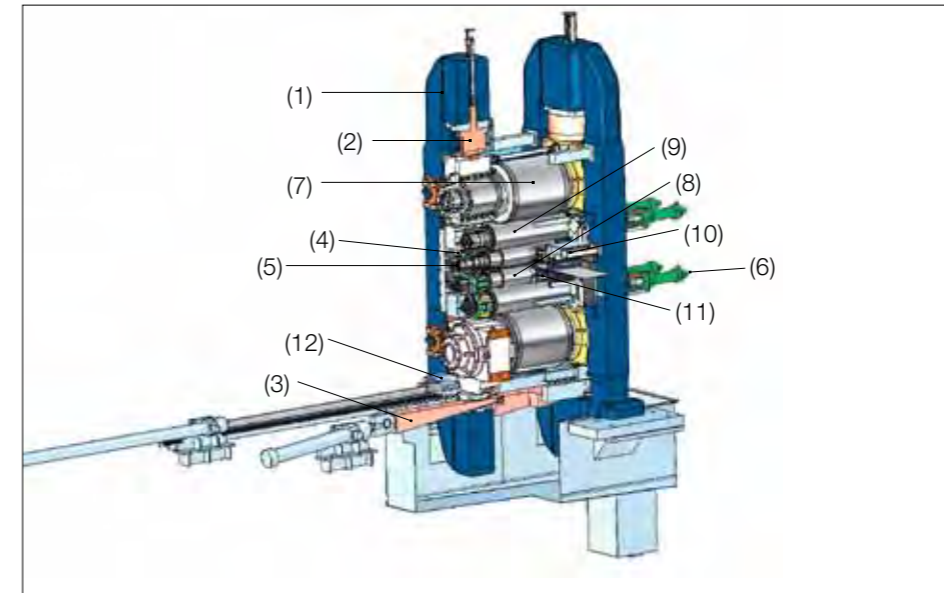
# Over 300 rolling mill references worldwide

ANDRITZ METALS provides rolling mills with particular attention to high production-efficiency, tight shape and strip thickness tolerances to produce high quality products.

ANDRITZ METALS has attached great importance to the mill stand equipment influencing these targets and is permanently improving and re-designing the equipment according to the design concept philosophy of modern cold rolling mills. The ANDRITZ METALS Carbon Steel Cold Mill (ACCoM) design concept is based on a well maintained parametric 3D master model, which is operated with a tailor-developed parameter matrix. This results in a reduced project engineering period for a tailor-made cold rolling mill adapted to the individual requirements of the customer's product mix.



▲ Quarter-section of a 4-high mill stand with axial work roll shifting



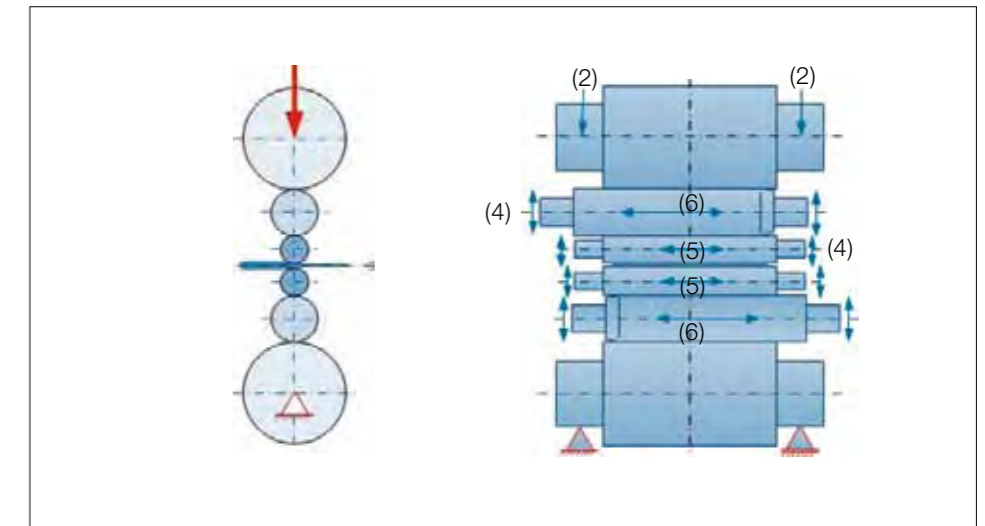
▲ Quarter-section of a 6-high mill stand with axial longstroke intermediate roll shifting

## Mill key components:

- (1) Finite element optimized mill housing
- (2) Top mounted hydraulic roll load cylinders with high accuracy position measurement and pressure transducer
- (3) Stepless bottom mounted passline adjustment
- (4) Powerful positive and negative roll bending and balancing system attached to the mill housing
- (5) Modular work roll shifting system
- (6) Longstroke intermediate roll shifting system
- (7) Back-up roll set with oil air lubricated roller bearings
- (8) Workroll set with grease lubricated roller bearings
- (9) Intermediate roll set with grease lubricated roller bearings
- (10) Strip blow-off system
- (11) Selective roll multizone cooling and emulsion system
- (12) Back-up roll change device



▲ 6-high mill at pre-assembly



▲ Full range flatness actuators for all cold rolling mill types ▲



# Modernization

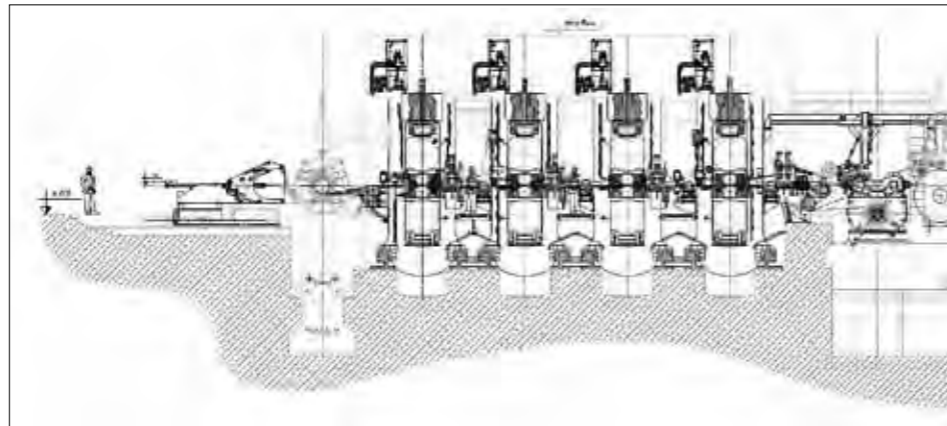
We strive to support customers in extending the efficiency and value of their equipment by offering maintenance, repair and modernization packages over the entire plant lifetime.

## Maximize output from your investment

- Improvement of strip thickness accuracy
- Improvement of strip flatness
- Increase of strip surface quality (incl. strip cleanness, rust prevention)
- Improvement of mill availability
- Improvement of production capacity
- Improvement of strip threading procedure
- Reduction of operation costs (rolls, emulsion rolling oil, etc.)
- Reduction of off-gauge length
- Reduction of strip and coil damages (due to handling, threading, etc.)

## Rolling mill upgrade for

- Mill drive-train systems
- Work roll bending systems
- Hydraulic roll load cylinders
- Pass line adjustment devices e.g. wedge-design
- Roll change devices
- Emulsion systems (revamp or new)
- Roll cooling systems
- Selective roll cooling spray headers



▲ Plant layout: Typical example of a tailor-made revamp project for a 4-stand discontinuous tandem mill containing modernization of e.g. HGC, bending, AC-drives, emulsion system, automatic workroll change with focus on quality improvement, and production increase.

- Strip blow-off systems
- Roll cleaning (high pressure or dry)
- Strip thickness, flatness, and tension measurement and control systems
- Reels, mandrels and belt wrappers
- Coil handling systems (revamp or new, incl. automatic coil strap removal, coil marking, strapping, labeling, internal winding welding)
- Roll handling incl. roll lifting devices
- Mill safety systems (adaptation to meet safety requirements)
- Fume exhaust systems (adaptation to cover environmental protection requirements)



▲ Hydraulic roll force cylinder with direct mounted valve block for high dynamic control characteristic



▲ Automatic work roll change equipment



▲ Combined multizone cooling and strip blow-off system



▲ Dry-temper roll cleaning equipment

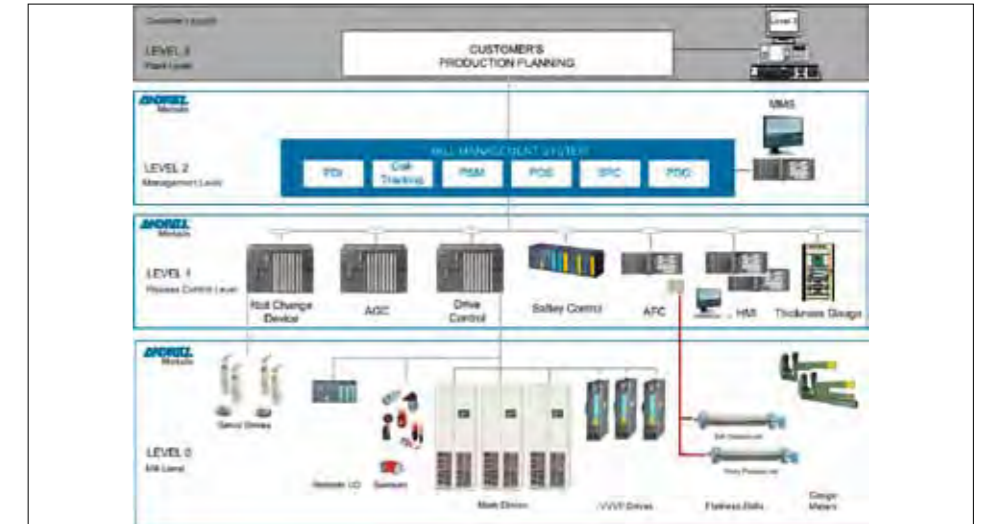
# Electric and Automation

## Equipment supply

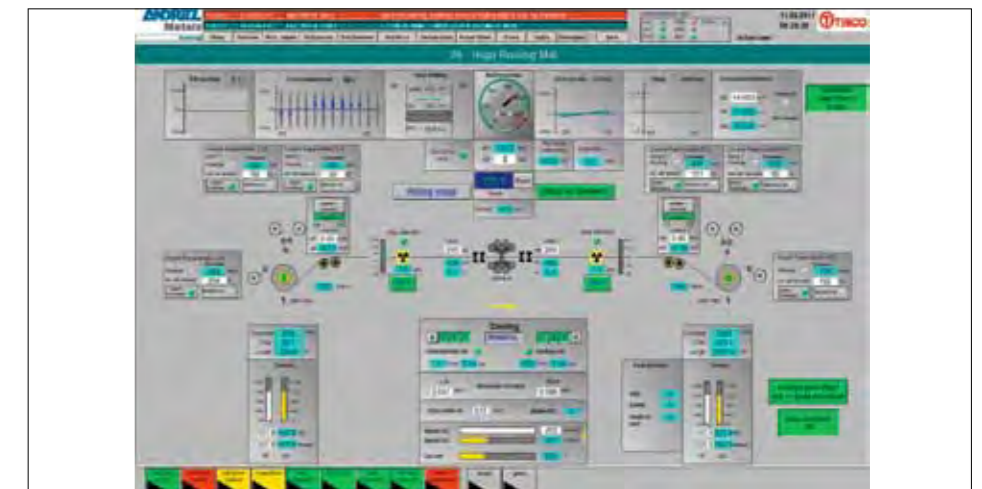
- High/medium and low (PCC) voltage equipment and distribution
- Mill main drive systems
- Auxilliary drive systems
- Motor control centers (MCC)
- Instrumentation and sensors for process and terminal equipment
- Level 1 automation systems – PLC, HMI, TCS
- Level 2 process computer systems modelling
- ITV, intercom, lighting, etc.

## Products

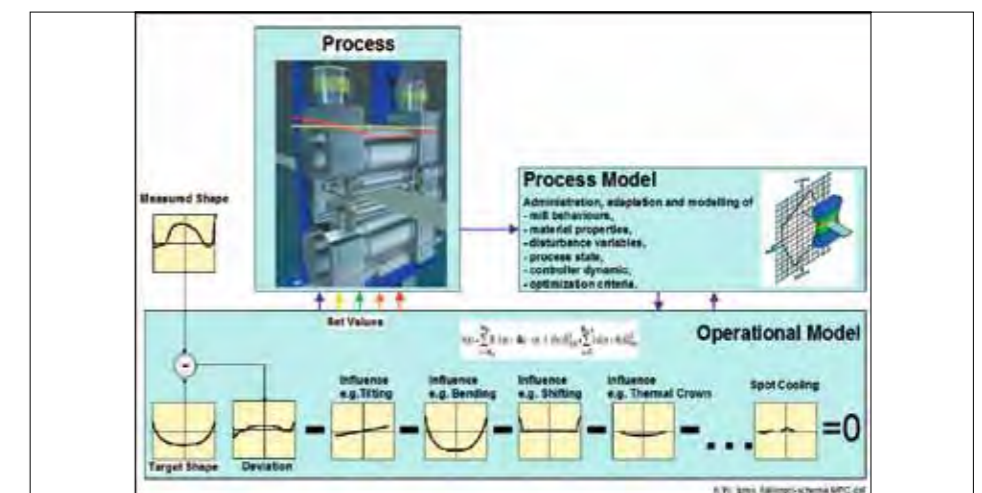
- Technological control systems (TCS) for ANDRITZ METALS products
  - Hydraulic gauge control (HGC)
  - Automatic speed / tension control
  - Automatic gauge control (AGC)
- Automatic flatness control (AFC)
  - Shapemeter rolls
  - One time calibration rolls
  - Model predictive controller (MPC)
- Level 2 system – process optimization
  - POS – Process optimization system
  - PSM – Pass schedule memory
  - SPC – Statistical process control
  - MMS – Mill management system
  - RSMS – Roll shop management



▲ Overview automation levels for cold rolling mills



▲ Visualization and HMI



▲ Model predictive control system (MPC)

# Technical service and consulting

## Examples

- Production optimization services:
  - Pass schedule optimization
  - Production capacity simulation
  - Production efficiency study
  - Product mix studies
  - Handling times optimization
- Logistic investigation services (studies)
- Optimization of mill drive-train system
- Strip quality optimization
- Study of linked process sections
- Layout studies
- Safety analysis
- Mill window study
- Roll crown optimization
- Training for operation and maintenance personnel
- Project management
- Engineering and start-up services



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