NeoKoil® strip processing lines
Carbon (including AHSS, UHSS), stainless and silicon steels

1 600 installations worldwide

Fives’ steel technologies and equipment are trusted by the world industrial leaders:
ACERINOX GROUP — AK STEEL — ALCOA — APERAM — ARCELORMITTAL — ATI — BAOTOU — BAOWU — BEHAI CHENGDE —
BENXI IRON & STEEL — BLUESCOPE STEEL — BOOMERANG TUBE — BORCELIK — CSN — ERDEMIR — ESSAR STEEL — EVRAZ —
GERDAU — ISDEMIR — JINDAL STEEL — JSISCO — IUSCO/IDEX — MARCEGAGLIA — MASTeel — NLMK — NORTH AMERICAN STAINLESS —
NUCOR — OMK — OZKOKSU — POSCO — SAIL — SALZGITTER — SIEVASTAL — SHOUANGHUI TANG — STEEL DYNAMICS — SWISS —
TATA STEEL — TENARIS — TAINOX — TISCO — THYSSENKRUPP — USW/MAS — US STEEL — VALLOUREC — YAMAL — VOESTALPINE — YUSCO

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Steel
fives

Mastering technology
to help steelmakers achieve
performance excellence
FIVES in STEEL

Since 1867 serving the steel industry

10 design, R&D, test and manufacturing centers
1,050 employees

Locations:
France - Spain - Italy - UK - USA - China - India

1,600 installations worldwide

495 patents or pending patents
123 patent families in force

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World’s First

Neokoil® Smart line, automatic line management

The digital system Eyeron™ provides full traceability of all process steps and of all quality events from the melt shop down to the cold rolling and processing lines while delivering product qualification and certification within seconds after the product comes off the line. It automatically qualifies which products are good and which need to be reallocated in real-time.

EYERON™

The NeoKoil® smart line is a true automatic pilot which incorporates predictive models for all the key process steps as well as for the metallurgical behavior of the products. The computer is using, from the data management system, the mechanical characteristics of the coil that is coming into the line after cold rolling, as well as all other product characteristics (chemistry, etc.). It adjusts all the parameters for the furnace, the zinc pot, the air knives and the skin-pass automatically, in an optimized manner to achieve the best outcome in terms of product quality and yield.

DATA FLOW MANAGEMENT

- Process and metallurgical rules are regularly updated
- Smart line coordinates all the activities, prioritizing one model or the other according to the overall process requirements
- An operator acts only in case of alarms or events

The best possible product quality and productivity

Joint development of the smart line concept

The effective cooperation with Marcegaglia Carbon Steel led to a joint development of the smart line concept for continuous galvanizing lines in Italy.

The smart line takes into account a number of key process and quality rules which simultaneously apply to all the key process steps of the galvanizing line: the annealing cycle, the zinc coating and air-knife wiping, and the skin pass rolling – to establish the optimum set points for each of these critical process functions while optimizing the overall output of the line.

The financial benefit – €1.7 million

Eyeron™ was successfully implemented in the steel shop, the hot rolling mill 2000 and the plate rolling shop N2 of Severstal, Russia in 2018. It enables the shops to automatically manage more than 20,000 rules to make a decision on product quality.

Peter Mishnev, Technical Development and Quality Director of Severstal Russian Steel Division: “Following the results of 2018, the system allowed us to significantly reduce non-conforming products. The financial benefit totalled €1.7 million.”

Severstal and Fives receive an award at the Industry of the Future Forum in 2019

SMART SOLUTIONS
NeoKoil®, annealing and galvanizing lines for carbon steel

Continuous annealing and galvanizing lines to produce carbon steel, including advanced high-strength and ultra high-strength steels (AHSS and UHSS) for the automotive industry.

Over 50 new processing lines and vertical furnaces for annealing and galvanizing processes over the last 15 years.

Latest references:
- A new advanced CGL to produce the 3rd Gen AHSS - USA
- Two complete CGLs and CAL furnaces - Baotou Group, China
- CAL and CGL thermal sections - Baowu, China

Fives’ services to meet the special demands of the automotive steel industry:
- Market analysis
- Assistance in obtaining carmaker certification and quality management system certification
- Training courses
- Support for production ramp-up and new product development
- Equipment, quality and process fine-tuning
Key terminal equipment

Entry coil handling section
The entry coil handling section is engineered to handle the coil very carefully, ensuring minimal waste and optimal product quality.

It includes:
- Entry coil skid and car
- Pay off reel
- Threading pinch roll and flattener
- Shearing section
- Coil joining section (welder and notcher)

Exit coil handling section
The exit coil handling section includes DMS Flying Shear, DMS SideTrim, surface inspection system, tuning, sampling and scrap management systems.

DMS Flying Shear cuts the strip while it’s moving, eradicating weld seams and preparing the strip head and tail for perfect rendering.

DMS SideTrim is available with single or double heads. It promises a clean finish for better strip quality using precision equipment.

NeoKlean™, electrolytic degreasing system

Innovative design:
- Efficient combination of spraying and dipping of the strip to enhance heat transfer and cleaning effect
- A more effective and reliable system for separation of the metal fines from the process media
- Automatic brush machine control with quick change brush rolls
- High turbulent circulation to prevent solids from building up in the line tanks
- Unique design of the spray bars and tanks to allow rapid and safe maintenance of the spray bars while the line is running

Application: exposed automotive coils or when the highest level of cleanliness is required.

DMS SkinPass

- Process steel sheets up to 1,880mm wide and up to a speed of 1,000 m/min
- Can be coupled with DMS StripLeveler, a tension leveler
- Quick work roll change via a go-through system

DMS SkinPass 6Hi
- Two additional intermediate rolls enable better flatness under any conditions
- It is supplied with two work roll diameter ranges and is equipped with a shifting system

DMS StripLeveler
- Designed for high-yield strength
- Available with 1 or 2 elongation units
- Wet or dry configurations
- Anti-rust treatment and stainless back-up bearings for extended lifetime in wet configuration
- Change the cassettes in operation

Key Design Elements
- Dual power source, polarity reversing
- High current density & coulomb load
- Strip width / speed current control
- Smart chemical control based on production
Stein Digiflex® furnace

Main features
— Compact and efficient jet preheat furnace, reactive direct-fired furnace
— Low inertia radiant tube heating furnace
— AdvanTek® combustion system: up to 20% less fuel consumption
— Unique FlashCooling® system for ultra rapid cooling solutions
— Virtuo® thermal optimization software for enhanced thermal control

Disruptive technology for ultra-rapid cooling
AHSS and UHSS steel grades require more complex heating and cooling cycles for CALs and CGLs.

Dry FlashCooling®
— 50 to 200°C/sec (1mm thick) cooling rate
— High operation flexibility with atmosphere gas blowing 5-75% H₂
— Cooling intensity control across both the width and length
— Symmetrical blowing and rear central exhaust for perfect strip stability

Wet FlashCooling®
— Very high cooling rate in a controlled manner up to 1,200°C/sec (1mm thick) for Gen3 AHSS
— High cooling rate flexibility: range 1 - 10
— Unique capability to control all process parameters including exit strip temperature (600°C to 100°C)

Aeris® after-pot cooling technology
The system improves strip stability by enabling the reduction of the cooling length while maintaining capacity.

Aeris® technology advantages:
— Production capacity increase
— New coating applications
— Drastic reduction of a tower height
— Optimized air and fog cooling length
— Energy consumption improvement

Virtuo®, thermal performance optimizer
— Complete automatic control
— Perform enhanced thermal calculations
— Provide greater flexibility
— Reduce fuel consumption
— Prevent overheating
— Avoid strip ‘out of tolerance’, heat buckles and misguiding
— Reduce transition duration
— Enhance smooth control

AdvantageTk WRT (radial W-tube) combustion system
— Fuel flexibility: mixed gas, coke oven gas or natural gas
— Combustion efficiency: higher than 80% with natural gas
— NOx emissions: down to 30 ppm with natural gas
— Unique control system for better efficiency at any production rate
CELES induction heaters

Major advantage of induction heating technology:
the strip can be processed in a shorter time period with increased throughput.

CELES induction heaters are a versatile, compact and economical solution to save energy consumption, which in turn reduces costs and pollutants, while still providing effective, uniform heating for preheating, annealing, curing or coating in the strip process lines.

Technical advantages
— Compact, modular system with easy integration into existing lines
— Reduced capital cost
— Compatibility with high level of retained austenite (50%)
— Limited maintenance requirements
— High power density
— No preheating required
— Proven heating accuracy

Applications
Post treatment / Strip drying
— Chemical coating
— Passivation
— Organic and inorganic coating: carbon and silicon steels
— Anti-finger print coatings
— Primer and finish color coating
— Temperature range: 90°C - 300°C

Annealing & galvanizing
— Pre-heat at furnace entry
— In-furnace thermal cycle transition booster
— Boost to zinc pot temperature to facilitate over-aging cycle
— After-cooling section
— Temperature: up to 700°C (annealing) & 550°C (galvannealing)

Heat-to-coat thermal booster
— Can be installed before and after the furnace
— Fully engineered heating in controlled atmosphere
— Fully uniform temperature distribution
— Temperatures: 20-600°C, in reducing or air atmosphere

Technical advantages
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— Reduced capital cost
— Compatibility with high level of retained austenite (50%)
— Limited maintenance requirements
— High power density
— No preheating required
— Proven heating accuracy

Final product advantages
— Improved mechanical resistance (+5-10%)
— Preservation of elongation capability
— Significant weight reduction of car parts, therefore reduced fuel consumption and emissions

CELES EcoTransFlux™, high power transverse flux

CELES EcoTransFlux™ systems, dedicated to the production of AHSS, UHSS and silicon steel grades are supplied to major steel producers in the USA, Asia and Russia.

Technical advantages
CELES EcoTransFlux™ is designed for rapid heating cycles to produce Gen3 AHSS:
— Higher treatment temperature up to 1200°C
— Optimized steel grade metallurgical properties
— Higher temperature increase up to 400°C/sec
— Excellent efficiency ~75% even above Curie point
— Suitable for any protective atmosphere
— Compact design for easier integration
— Minimized environmental impact
— Low OPEX

Final product advantages
— Improved mechanical resistance (+5-10%)
— Preservation of elongation capability
— Significant weight reduction of car parts, therefore reduced fuel consumption and emissions

Demonstration unit
CELES EcoTransFlux™ demonstration unit (scale 1) has been installed in Fives’ workshop in Lautenbach, France. It’s completely available for steelmakers to carry out fast heating tests with 900-1600mm width steel strips for process qualification purposes.

The sturdy design, extended component lifetime and a modular layout reduces maintenance requirements.
Neokoil®, galvanizing lines with a horizontal furnace

The Stein horizontal furnace for a CGL consists of a non-oxidizing furnace (NOF), a radiant tube furnace (RTF), soaking / over-aging sections and rapid cooling.

Advantek® DFR (direct fired reducing) combustion system
- Homogeneous strip temperature crosswise
- Proven ability to process low temperature (full hard and hot rolled strips)
- Proven ability to process strips for automotive parts
- Excellent air/gas ratio control

Non-oxidizing furnace features
- Recuperative zone for better fuel consumption
- Strip cleaning effect to avoid a complex upstream cleaning section
- Water cooled rolls to prevent an impact on the strip surface quality
- Safe operation due to the entry seal and other features

Rapid cooling section offers a flexible and compact way to perfectly cool the strip and significantly save energy. Aeris®, after-pot cooling technology improves strip stability by enabling the reduction of the cooling length.

Stein minispangle is installed downstream of the zinc coating bath and applies zinc dust to the strip where it crystallizes to achieve the high surface quality needed for precoated and color-coated strips. It is best paired with a skin-pass mill, but will give the product a satin smooth finish.

The Stein horizontal furnace for a CGL consists of a non-oxidizing furnace (NOF), a radiant tube furnace (RTF), soaking / over-aging sections and rapid cooling.

Advantek® DFR (direct fired reducing) combustion system
- Homogeneous strip temperature crosswise
- Proven ability to process low temperature (full hard and hot rolled strips)
- Proven ability to process strips for automotive parts
- Excellent air/gas ratio control

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- Recuperative zone for better fuel consumption
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- Water cooled rolls to prevent an impact on the strip surface quality
- Safe operation due to the entry seal and other features

DMS OptiLine™ for efficient operation and reduced downtime
This software tool simulates the complete operation of a strip processing line. It calculates the requested characteristics of each motor of the line to guarantee the required line tension during operation at the targeted increased speed, as well as during line acceleration and deceleration.

Steel Dynamics, Inc. awarded Fives the design and supply of a new continuous galvanizing line (CGL №3) with a production capacity of 400,000 tpy for the Columbus plant in Mississippi, USA. The line is dedicated to produce unexposed automotive steel, as well as other commercial and specialized steel grades.

Fives will provide design and supply of entry & exit coil handling sections, a degreasing section, a horizontal annealing furnace, hot dip galvanizing and cooling equipment, a skin-pass mill and strip leveler, inspection, metallurgical assistance for different steel grades and types of coating, as well as construction and commissioning assistance. The new line is expected to be commissioned in the middle of 2020. At the same plant, Fives was entrusted to upgrade a continuous galvanizing line (CGL №2) to increase production capacity.
NeoKoil® offers a range of strip coating lines: combined galvanizing and painting lines (CGPL), color coating lines (CCL), film coating and laminating lines to process high quality strip coating for different applications.

**Coated product composition**
- Entry section
- Non-oxidizing furnace
- Soaking section
- Degreasing
- Radiant tube furnace
- Rapid cooling
- After-pot cooling and minispangle
- Post treatment
- Accumulator
- Skin-pass
- Side trimmer
- Strip leveler
- Induction and coating
- Exit section

**Available coatings:**
- Thin organic coating (TOC): trivalent chrome & chrome free
- Water based paint
- Polyester & silicon polyester
- Poly-vinyl-difluoride (PVDF)
- Epoxy
- Polyurethane, acrylic and plastisol
- PTFE
- Plastic heavy thickness film
- PET film
- Finger print protection

**Painting lines**
- Applications: house appliance, construction
- Speed: 200m/min

**Film coating lines**
- Applications: home appliances, furniture, bakeware
- Speed: 40m/min

**Laminating lines**
- Applications: food and packaging industries
- Speed: up to 250m/min

**References**
- 79 installations worldwide, including new and revamped strip coating lines with catenary, induction or infrared ovens:
  - Painting and phosphating line for zinc & aluminium at Asturiana de Laminados, Spain
  - Combined galvanizing and painting line for steel at Galvasid, Monterrey, Mexico
  - Combined galvanizing and painting line (induction technology) for steel in Spain
  - Film coating line for stainless steel, galvanized steel and aluminium in Spain
  - Co-lamination line for tin plate in Europe

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**CGPL vs CGL or CCL**
- Investment cost reduction: 20-25%
- Operational cost reduction: 15%
- Quality improvement, as the coil is not damaged before painting:
  - No intermediate handling
  - No intermediate storage
  - No intermediate strip protection

**Patented solution to improve safety**
A bypass circuit with a burner is added to the strip coating lines to burn off paint solvents that deposited along the ducts in order to increase operating safety and provide greater flexibility.

**Post treatment, hot air or induction heaters**
Stein drying ovens: different types of heating and cooling
CELES induction heater: temperature range: 90 - 300°C
Stein curing ovens: high versatility and flexibility

**NeoKoil®, a new color coating line in Spain**
Asturiana de Laminados, Spain, contracted Fives to design and supply curing ovens for its new phosphating and painting line. It’s the first line to produce both zinc and aluminium color coil coated and the second to produce zinc coil coated worldwide.

Fives is supplying two Stein curing ovens, each with three zones, for the primer and finishing coats, as well as fume treatment and energy recovery systems with a recuperative thermal oxidizer to eliminate VOCs. Curing ovens, used in painting and pretreatment sections, aim to cure a strip paint at proper temperature with good homogeneity to ensure a perfect final strip coating quality.
Advanced cold rolling workshops

NeoKoil® strip processing lines and equipment to cover the entire cold rolling workshop for stainless steel processing:
- DMS 20Hi cold rolling mills
- Hot and cold annealing and pickling lines (HAPL / CAPL)
- Bright annealing lines (BAL) and induction bright annealing lines (I-BAL)
- In-line/offline skin-pass mills

A full range of finished products – N1, 2E, 2D, 2B and BA quality

References include 17 HAPLs, 19 CAPLs and skin-pass mills (2B/2D), 80 cold rolling mills and 8 BALs

Recent references:
- POSCO: seven new and three revamped DMS 20Hi cold rolling mills over the last 15 years
- TISCO: five annealing and pickling lines and five DMS 20Hi cold rolling mills
- Ningbo Baoxin Stainless Steel: five complete lines and five DMS 20Hi cold rolling mills, enabling the steelmaker to become a leader in bright annealed products in China
- Outokumpu: two CAPLs, revamping of the monobloc 20Hi mills in Tornio, Finland and three DMS 20Hi cold rolling mills for the Calvert facility, USA
- Shanghai Stal: two DMS 20Hi precision cold rolling mills

DMS 20Hi cold rolling mill

The DMS 20Hi cold rolling mills are designed using advanced strip wiping and cooling technologies to increase strip productivity by up to 10%, enhancing surface quality.
- Maximum rolling speed: 1,200 mpm
- Minimum strip thickness: 0.04mm
- Maximum strip width: 1,880mm
- Push-push 1st intermediate roll shifting system to reduce the risk of broken parts
- Advanced strip cooling and flatness control system
- All wear parts are easy access to ensure quick and safe maintenance with minimal downtime

The 3rd generation of the wiping system - DMS Wiper SCP 3.0 enhances the performance of rolling mills by enabling higher rolling speed and reduced maintenance downtime.

The first DMS 20Hi EcoMill to produce ultra-thin stainless steels for high-end applications was designed and installed by Fives at Shanghai Stal Precision Stainless Steel, China.

The new DMS EcoMill is able to roll strip down to 0.04mm on the full width of 1,200mm. The mill is capable of producing just over 80,000 metric tons per year, and the first coil was produced in July 2018.
The DMS ScaleBreaker was developed to increase the performance of a strip processing line by breaking the oxidation (scale) layer at the surface of the strip and improving its flatness. Cracking the scale layer at this stage speeds up the pickling process. Numerical presets make it easy to operate.

The NeoPik™ system is a custom-engineered and optimized pickling system featuring a robust and safe design with minimum chemical consumption and an intuitive operator interface. Every line is designed with an automatic acid monitoring and dosing control that guarantees reliable and repeatable processing that is safe and efficient.

Kinex®, hot annealing and pickling lines

In stainless steel cold rolling workshops, the hot annealing and pickling line (HAPL) is the first continuous process used to heat treat and pickle the hot rolled coils to obtain so called white coils (also called №1). Depending on the grades, in-line heat treatment can be applicable or not.

Fives has designed more than 12 NeoKoil® hot annealing and pickling lines worldwide to be both efficient and environmentally responsible with minimum waste generation.

The entry and exit coil handling sections are engineered to handle the coil very carefully, ensuring minimal waste and optimal product quality. It includes entry coil skid and car, pay off reel, threading pinch roll and flattener, shearing section and coil joining section (welder and notcher). At the exit, it covers side trimming and SIS tuning.

Stein Direct Fired Furnace
Stein DFF offers flexibility of operation and high quality of strip heating due to the furnace insulation and combustion control design. The furnace is equipped with AdvanTek® direct fired burners which uniformly heat the strip under accurate oxygen level control.

The cooling technologies include combined air and water or pure water cooling (including cooling control crosswise); and mist cooling and drying technologies for the last stage cooling.

In a world first, Fives in cooperation with Chugai Ro Co., Japan designed and commissioned a HAPL for a 14mm thick x 2,100mm wide strip for TISCO (China):
- Capacity 1.1 million tonnes per year
- Steel grades: ferritic & austenitic
- Output quality: 2D, 2E

Following this successful collaboration, TISCO awarded Fives with another major contract to build two of the world’s largest integrated cold annealing and pickling lines in 2014, each with a rated capacity of 600,000 tpy and 650m length.

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NeoKoil®, cold annealing and pickling lines

Entry and exit handling sections

The entry coil handling section is engineered to handle the coil very carefully, ensuring minimal waste and optimal product quality.

It includes entry coil skid and car, pay off reel, threading pinch roll and flattener, shearing section and coil joining section. At the exit, it covers side trimming and SIS tuning.

NeoKlean™ system

Fives customizes degreasing systems for cold annealing and pickling lines utilizing hot water, alkaline or a combination of both.

NeoKlean™ system is compact, efficient and built to minimize water consumption as well as utilize waste heat for an environmentally-friendly and cost-effective operation.

Stein Direct Fired Furnace

Stein DFF offers flexibility of operation and high quality of strip heating due to the furnace insulation and combustion control design.

The furnace is equipped with AdvanTek® direct fired burners which uniformly heat the strip under accurate oxygen level control.

The cooling technologies include: combined air and water or pure water cooling (including cooling control crosswise), and mist cooling and associated drying technologies.

DMS SkinPass

A skin-pass mill is essential for high quality finishing. It removes the yield-point elongation effect and greatly improves the strip surface aspect to reach the 2B standard.

The new DMS SkinPass 2Hi from Fives can process steel sheets up to 1600mm wide at a high speed. Both in-line and off-line configuration are available, depending on addressed grade portfolio.

NeoPik™ system

Fives’ solutions for strip pickling systems for cold annealing and pickling lines use a pre-pickling stage to fracture the oxide layer in order to produce the high quality surface finish that end users expect.

The proprietary technology includes Scale-X™ for oxide removal which utilizes an aqueous salt solution to replace electrolytic sodium sulphate.

Foshan Chengde New Material Co., China selected Fives to project manage its new stainless steel cold annealing and pickling line.

The 500,000 tpy line is to produce 200, 300 and 400 series stainless steel products intended for a broad range of applications, from construction to aviation.

Fives’ responsibilities included engineering, purchase supervision and commissioning, as well as design and supply of Fives’ proprietary equipment, such as Stein annealing furnace and DMS SkinPass 2Hi.

The first coil was produced in June 2018 and met all the requirements in terms of quality and performance.
Bright annealed steel is used for applications requiring a high-shine finish. Special conditions in the vertical furnace avoid oxidation, meaning the mirror-like surface quality is ensured without the need for a pickling section. In this line, the annealing process follows the cold rolling mill as an alternative to the cold annealing and pickling line in order to achieve BA surface quality standard for high-end applications.

Entry and exit sections
The entry coil handling section includes fully automatic coil loading and handling, coil joining with welding process and notching. It enables the transportation of the strip into the process section with full control of the strip tension and smooth strip handling (no slippage, thus no marks).

NeoKlean™ system
Each custom-engineered degreasing system for bright annealing lines incorporates technology to ensure the highest surface finish quality.

NeoKlean™ system utilizes advanced degreasing bath oil removal technology and filtration equipment. Fully automatic chemical control combined with maintenance-minded machine design provides user-friendly operation.

Annealing
The special conditions in the furnace enable the high mirror surface finish to be achieved without a pickling section.

The CELES EcoTransFlux™, a high power transverse flux induction heating, offers an innovative annealing technology that can achieve the high mirror surface finish and capacities up to 350,000 tpy.

Exit coil handling section
At the exit of the line, special tension reel mandrel technology combined with belt wrapper specific design enable the guaranteed safe and smooth winding of the final coil.

For specific applications, DMS 2Hi SkinPass can be fitted in line, together with DMS SideTrim in order to deliver a ready-to-sell product.

NeoKoil®, bright annealing lines
Fives' ground-breaking technology, I-BAL, where the high power transverse flux induction heating technology, CELES EcoTransFlux™, replaces a gas-heated furnace, offers:
• High capacity production rates of up to 350,000 tpy due to its high energy density
• Energy consumption of less than 250 kWh/t, whereas a gas-heated BAL will be above 350 kWh/t
• Reduced environmental impact
• Compact design

The I-BAL, with a combination of CELES EcoTransFlux™ and rapid cooling technology FlashCooling®, enables the processing of as much as 350,000 tons per year of bright annealed stainless steel strips.
Fives was awarded the contract to design and supply a unique cold rolling mill to process NGO silicon steel for Wisdri (Xinyu) Cold Processing Engineering Co., Ltd., China.

Electrical steel is a special steel tailored to produce specific magnetic properties, resulting in low power loss per cycle, low core loss, and high permeability. It is extremely sensitive to produce.

Fives will design and supply a DMS 20Hi cold rolling mill with an annual capacity of 100,000 tons to process NGO high grade 210. The mill is intended for a very demanding application: electric car motors that require extremely high quality.

Silicon steel rolling faces the following challenges:
- Flatness control is crucial due to brittleness of the material, mainly for steel with content of 3.5% Si or more
- Rolling under high temperature requires a controlled and homogenous emulsion coolant flow and advanced roll gap lubrication

The DMS 20Hi cold rolling mill is designed to offer:
- Optimum strip productivity
- High rolling speeds
- Minimum strip thickness of 0.04 mm
- Simple and safe operation and maintenance
- Recent developments:
  - Improved strip flatness tolerances for GO, NGO or HiB quality
  - Fast and reliable mill/wiper roll change
  - Cleaner operating environment

Silicon steel is tailored to produce specific magnetic properties, making it suitable for various electrical applications, such as the production of transformers, inductors, motors, electric cars and modern generator/transformer markets.

NeoKoil®, strip processing lines for silicon steel

Silicon steel degreasing systems are engineered according to individual process requirements. NeoKlean™ system can include hot water spraying, alkaline degreasing, abrasive brushing and electrolytic degreasing.

Thermal part
Fives offers horizontal type furnaces with the AdvanTek® combustion system and compact jet coolers, Stein curing ovens and induction heating technologies to follow stringent thermal process requirements.

It includes the best available technology for furnace atmosphere management with proprietary seal gates and analysis systems for high H₂ and wet/dry atmospheres to reach the required properties of silicon steels.

Entry coil handling section
The entry coil handling section is engineered to handle the coil very carefully, ensuring minimal waste and optimal product quality.

It includes entry coil skid and car, pay off reel, threading pinch roll and flattener, shearing section (entry shear and scrap evacuation system) and coil joining section (welder and notcher).

References:
- Wisdri (Xinyu), China: new DMS 20Hi mill for NGO (electric car motors)
- Aperam, Brazil: revamping of DMS 20Hi mill for silicon and stainless steels (flatness control improvement)
- WISCO, China: 4 new DMS 20Hi mills (2 for GO, 2 for HGO) and 2 revamped mills for HGO grades
- TKES (ex Ugine Grain Orienté UGO), France: 3 DMS 20Hi mills for GO and HGO grades

Fives was awarded the contract to design and supply a unique cold rolling mill to process NGO silicon steel for Wisdri (Xinyu) Cold Processing Engineering Co., Ltd., China.

Electrical steel is a special steel tailored to produce specific magnetic properties, resulting in low power loss per cycle, low core loss, and high permeability. It is extremely sensitive to produce.

Fives will design and supply a DMS 20Hi cold rolling mill with an annual capacity of 100,000 tons to process NGO high grade 210. The mill is intended for a very demanding application: electric car motors that require extremely high quality.