Scope of Supply

Ingeteam Industry, S.A., is responsible for the complete turnkey electrical project:

- Supply of electrical equipment, drives and automation:
  - MV / LV Transformers
  - Low voltage distribution centre
  - Main motors - manufactured by INDAR -Group Ingeteam
  - Main drives - MOTOCON MP-BT (TEAM - Group Ingeteam)
  - Auxiliary drives - Micromaster
  - AC motor control centre
  - Sensors.
  - Integrated control equipment S7-400.
  - Control and supervision equipment (HMIs) IN-TOUCH.

- Erection supervision.

- Commissioning.

- In addition to the above, the following systems are also supplied:
  - Thickness gauge control (First Control)
  - Flatness roll and control (Vollmer-BFI)
  - TCS sensors (MHI)

After-Sales Services

- Hotline Service.
- Spare parts in 24 hours.
- Direct line with our technical staff.
- Remote communication from our offices to the factory automation network.

2 Reversing Cold Rolling Mill

OUTOKUMPU Långshyttan (Sweden)
**Project Description**

Mitsubishi Hitachi Metal Machinery, through its European subsidiary, awarded in the first semester of 2005 an order to Ingeteam Industry to undertake the electrical and automation equipment of a stainless steel Reversing Cold Rolling Mill. Cluster type, to be delivered to the client Outokumpu in Langshyttan (Sweden). This order served to consolidate our relationship with Outokumpu, initially established in 1996 with the supply of a similar type mill based on DC technology.

The mill, to be used for the reduction and elongation of coils of stainless steel sheets to obtain the required material quality, formats and thickness, comprises a Cluster-type Mill Stand with 12 intermediate, back-up and working rolls as well as two reversing coilers.

The equipment of the main drives is based on synchronous motors and converters at 690 Vac featuring IGBTs with digital control.

Ingetec is in charge of the mill automation using Simatic S7 hardware as well as ET-200-S and Eco for distributed signals. The AGC system for roll force and thickness control is developed and supplied by the company First Control, while the AFC system for flatness control is developed by Vollmer-BFI, (including control and measurement roll) while Ingetec delivers the X-ray thickness measuring gauges.

The automation incorporates various process operation and display systems (inTouch), which make it possible to easily manipulate and maintain the mill.

**Control Diagram**

**Technical Features**

*Type:* Reversing Rolling Mill, Cluster type  
*Mechanical Supplier:* MITSUBISHI HITACHI METAL MACHINERY  
*Entry material:* Stainless steel (AISI 301, 304, 316)  
*From hot or cold CAPL*

**Operation**

- Reduction: Max. 15% per pass  
- Working rolls diameter: 60 - 80 mm  
- Intermediate roll diameter: 170 - 180 mm  
- Mill speed: 250 - 800 m/min  
- Threading speed: 20 m/min  
- Mill force: 5.100 kN / 520 ton  
- Strip tension: Max. 350 kN  
- Min. 15 kN

**Coil characteristics**

- **Coil width:** 400-1100 mm  
- **Entry thickness:** 0.15 - 3.5 mm  
- **Exit thickness:** 0.1 - 2.0 mm  
- **Inside diameter:** 500 mm  
- **Outside diameter:** 2200 mm  
- **Maximum weight:** Max.: 17.5 Tn

**Main Motors**

Due to the wide weakening range that needed to be complied with and in order to avoid increasing the size and inertia of the motors, we opted for the Synchronous motors solution, improving the tension control, cos ph by 15%, and reducing Inverter rating.

Even though the mechanical torque and speed needs are different from those of the main motors (Coiler/Uncoiler and Mill Stand), we have opted for identical Synchronous motors, able to operate in accordance with the different needs, and thus minimizing spare parts stock.

The main motors are controlled by MOTOCON AC MP-BT modular equipment developed and manufactured by Team, S.A. (Grupo Ingeteam).

Each module is composed of 2 withdrawable and interchangeable, stacks with a power of 1 MW, and interconnected by means of optic fibre. Said power stacks are in this case water-cooled.

Within the 690Vac product family, by placing 2, 3 and 4 stacks in parallel it was possible to attain the power ranges of the Coilers/Uncoilers (3MW), Mill Stand (2MW) and AFE Rectifier (4MW).

The Control Architecture makes it possible to add on I/O modules, different Communication options, integration of PLCs and HMIs as well as making available a parameterization, configuration and monitoring system which can be easily handled by the operator.

**Main Drives**

Motors are cooled by Air-to-Water exchangers (ICW37A86), and are equipped sleeve bearings, with forced-feed oil lubrication.

A common baseframe houses the motor with a second shaft for connection of pulse generator and speed switch as well as disc brake capable of stopping the mill in <7 seconds.

**Main Pulpit E-Room**

Control

AGC 1

RS232

Control

AGC

Server

AGC

HMI 2

Parallel

Ethernet TCP/IP (Siemens, Industrial type)

OPC OPC

SIMATIC S7-400

TR1 MDR TR2

In touch

HMI 3

- Coiler eccentricity
- Tension control
- Speed control

Master

Sensors

AC MCC

Level III

Level 0

Level 2

Level 1

- t
- f
- v
- p
- h

<7 seconds.

Switch as well as disc brake capable of stopping the mill in second shaft for connection of pulse generator and speed switch as well as disc brake capable of stopping the mill in <7 seconds.

**Mill Lay-Out**