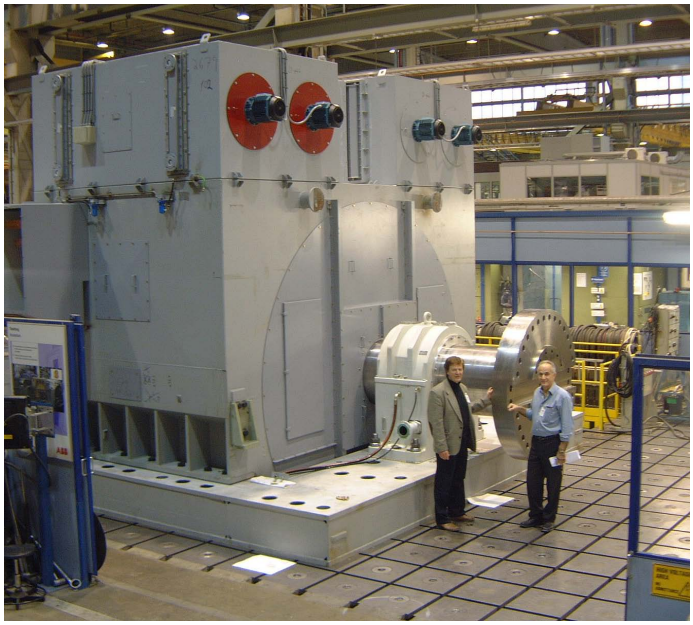
Case note
ACS 6000 variable speed drives provide fast and accurate control of 5 meter wide plate rolling mill

A plate mill is one of the most powerful rolling mills in the metals industry. The control must be fast and accurate in order to produce high-quality steel.

In order to fulfill these requirements Zhangjiagang Hongchang Plate Co., Ltd., installed two ACS 6000 single drives to control the mill's working roll motors (each rated at 10 MW) and one ACS 6000 multidrive to control two 1.2 MW edger motors.



One of the two synchronous AMZ motors (each 10 MW) which are controlled by two ACS 6000 single drives.

Zhangjiagang Hongchang Plate Co., Ltd.

Zhangjiagang Hongchang Plate Co., Ltd. belongs to the Jiangsu Shagang Group Ltd., one of China's leading manufacturers of steel. Its plant is located in Jiangsu province, close to Shanghai.

In 2005 the company increased its yearly capacity of rolled steel to 10 million tons by investing in a new rolling mill which produces 5 meter wide steel plates. The use of wide steel plates in building, ship and oil & gas industries reduces dramatically the number of welding operations.

Plate mill

A plate mill is a reversing mill which reduces the thickness of the heated steel material. The material is rolled several times between two heavy rolls in reversing directions. At one stage during the process the material is also turned 90° and rolled sideways. Each pass gradually changes the size of the steel until the required delivery size has been reached.

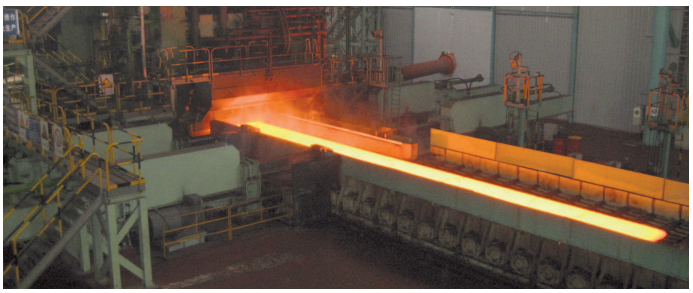
Challenge

A plate mill is one of the most powerful rolling mills in the metals industry. The control must be fast and accurate in order to produce high-quality steel required for demanding applications. The thickness of the incoming hot steel varies from 220 to 320 mm, and the hardness of the material differs for different final products.

Highlights

- High performance
- High reliability and availability
- User and network friendly

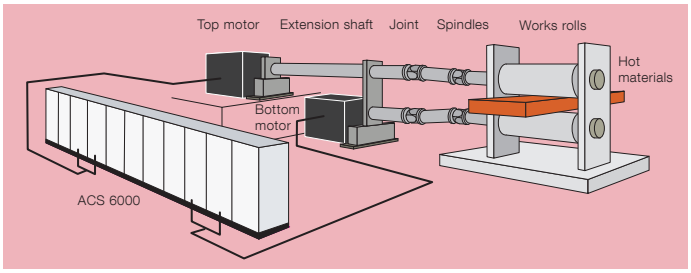
The material enters the mill with thread speed and is accelerated up to rolling speed in a few seconds. The rolling process is done in several passes - for some products 22 passes - until the final size is achieved. The large and rapid power variations from no-load to overload conditions put a high strain on the supply network. The dimensioning of the motors, transformers and variable speed drives for these demanding conditions is a challenging task. ABB has extensive experience and technological know-how to assure the highest performance of plate mills with regard to product quality, output and production flexibility.



Zhangjiagang Hongchang's plate mill, producing 5 meter wide plates

Solution

The required very high torque for the working rolls of the plate mill is produced by two powerful synchronous AMZ machines each of 10 MW, each rotating a roll in twin-drive configuration. These machines are among the biggest electrical machines in the world today. They are designed for 250% overload, providing a maximum power of 25 MW for 10 seconds. They are controlled by two ACS 6000 single drives.



Twin-drive installation

The speed and torque of the two vertical edger motors (each 1.2 MW plus 250% overload for 20 seconds) is controlled by one ACS 6000 multidrive. Its Direct Torque Control (DTC) control platform, patented by ABB, results in the highest torque and speed performance ever achieved in medium voltage drives. Control of the drive is immediate and smooth under all conditions.

The control is integrated into the automation system; communication is done via a simple fieldbus connection.

The variable speed drives are connected to the network via input transformers.

Benefits

Improved process control

DTC makes it possible to control the full torque within a few milliseconds, eliminating possible resonance problems and reducing the impact of load shocks. The high static and dynamic accuracy guarantees the best quality of the final product.

Minimized network harmonics

The ACS 6000 variable speed drive generates the needed reactive power and eliminates its own harmonics. This means that the supply network is operating without sensitive voltage drops and that no separate filtering equipment is needed.

High reliability and availability

The fuseless design and the low parts count of the ACS 6000 result in a very high reliability and availability of the drive.

Reduced maintenance

The drive system includes a sophisticated self-diagnostic system and the operation of the drive system is easy. The functions of the drive system are continuously supervised and controlled. Besides a few planned maintenance operations the involvement of personnel is only needed in case of warning or fault situations.

Remote monitoring option

The ACS 6000 can be equipped with an intelligent monitoring and diagnostics system which allows remote real-time access to the drive using Internet connections. Long-term monitoring functions deliver important information on equipment status, tasks needed and possible performance improvements. It will speed up faultfinding and reduce downtime thus increasing the total production time.

ACS 6000 key data	
Inverter type	Three-level Voltage Source Inverter (VSI)
Converter cooling	Water cooling
Power range	3 - 27 MW (water cooling)
Output voltage	3.0 - 3.3 kV (optional: 2.3 kV)
Maximum output frequency	75 Hz (higher on request)
Converter efficiency	Typically > 98.5% (incl. all auxiliaries)
Type of motor	Induction, synchronous and/or permanent magnet motor
Special feature	Available as single or multidrive

For more information please contact:

www.abb.com/drives
www.sha-steel.com