

## Case note

# ACS 6000 variable speed drive increases energy efficiency of metals plant

SSAB Oxelösund in Sweden is a world leader in the specialist field of quenched and tempered steels.

In order to increase the plant's efficiency SSAB Oxelösund replaced the steam turbine, which powered the blast furnace blower, with ABB's ACS 6000 variable speed drive.

SSAB Oxelösund estimates that the ACS 6000 saves about 16 GWh of energy each year.



View of the SSAB Oxelösund plant in Sweden.

### SSAB Oxelösund

SSAB Oxelösund is a member of Swedish SSAB Svenskt Stal AB. It is one of the largest Nordic manufacturers of heavy steel plate and is a world leader in the specialist field of quenched and tempered steels. SSAB Oxelösund, which is located on the east coast of Sweden about 120 km south of Stockholm, produces around 1,500,000 tons of steel per year, which includes 500,000 tons of heavy plate.

### Blast furnace

The purpose of a blast furnace in the steel production process is to produce molten iron from iron ore, coke and limestone. Blast air generated by a turbo blower is blown in from the bottom of the furnace. The hot air starts a chemical process that converts iron oxides into liquid iron, which is then processed into steel plates.

The turbo blower can be driven either by steam produced in boilers from various process gases or by electricity from a generator.

The basic requirements for a blower drive are reliability and efficiency since a shutdown of the blast furnace blower causes time-consuming condition checks or even repair of the equipment, each reducing production time.

### Highlights

Energy savings: 16 GWh

Reduced maintenance costs

Longer lifetime of equipment

Payback on investment period: 2 years

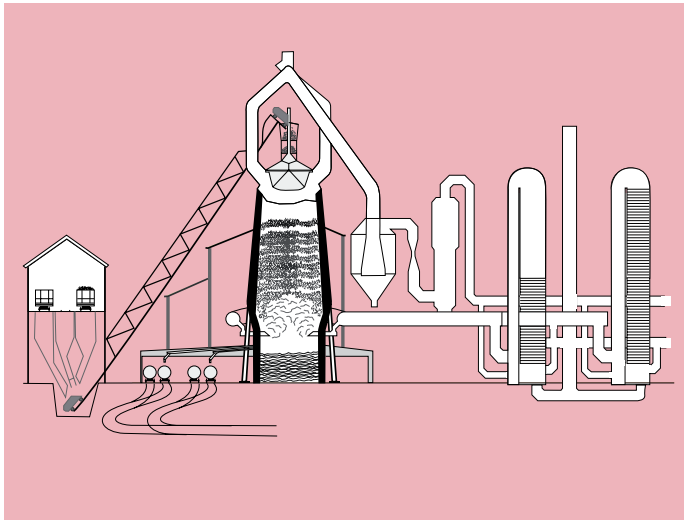


Diagram of blast furnace

### Challenge

The blast furnace blower no. 6 at SSAB Oxelösund had been powered by steam for decades. Despite a thorough maintenance and renovation every third year, signs of gradual wear and reduction in turbine efficiency were discovered. SSAB Oxelösund became concerned about the risk of a catastrophic turbine failure and the consequent repairing time with reduced production capacity.

### Steam turbine vs. Variable Speed Drive (VSD)

The investment alternatives, either a complete upgrade of the steam turbine drive or the replacement of the steam turbine with an electrical drive, were compared in 2002. The following issues were taken into consideration:

- Required direct and indirect investment costs
- Efficiency of the overall power chain, from fuel energy to shaft power
- Maintenance costs
- Availability

From the available alternatives given, ABB's ACS 6000 was chosen due to the following advantages:

- Investment payback period: 2 years
- High availability
- Possibility to use the existing blower equipment
- Minimum investment in other parts of the mill
- Short installation time
- Low operating and maintenance costs
- Increased output capacity

### Benefits

A continued use of the steam turbine driven blower would have required the upgrade of one of the boilers used for steam production. SSAB Oxelösund estimates that the ACS 6000 will save about 16 GWh of energy each year, compared to generating electricity with an upgraded steam turbine. Furthermore, the output of a VSD does not depend on the available condensing capacity which partly consists of seasonally varying district heating. Due to the simpler auxiliary and cooling systems of the VSD, the estimated annual maintenance costs are expected to be considerably lower than for the corresponding equipment of a steam turbine.

### Savings

SSAB Oxelösund estimates that the ACS 6000 will save 16 GWh each year.

### Increased lifetime of equipment

The blower could not be connected to a direct-on-line (DOL) motor, due to mechanical stress during the motor starting. By soft starting the motor with the ACS 6000, the lifetime of the blower will be extended.

### Direct Torque Control (DTC)

The ACS 6000 motor control is based on Direct Torque Control (DTC) which allows direct control of all core motor variables thus responding to process changes extremely fast. Short supply voltage interruptions, from a few cycles to a few hundred milliseconds, will have no effect on the blast furnace blower drive system, due to the Power Loss Ride-Through function of the ACS 6000. SSAB Oxelösund calculates that the feature will contribute to an increased production time by reducing the number of blast furnace shutdowns.

### 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:

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