

CASE NOTE

ACS1000 variable speed drives increase energy efficiency at sugar plant



The sugar plant Santa Matilde belongs to Compañía Azucarera Hondureña S.A. one of the largest sugar companies in Honduras.

Five steam turbines, which were driving the cane mill, were replaced with ACS1000 variable speed drives and induction motors. The overall energy efficiency of the plant increased considerably.

Background

Compañía Azucarera Hondureña S.A., founded in 1938, is one of the largest sugar companies in Honduras, Central America. The company's sugar plant Santa Matilde operates 155 days per year and has a capacity of 10,200 tons of cane per day. The plant expects to increase its capacity to 12,000 tons of cane per day.

Energy from sugar cane

In order to generate electric energy sugar plants produce steam by combustion of bagasse, which is the principal waste product from sugar production. Part of the steam is used to run steam turbines, which in turn drive cane-crushing mills. The rest of the steam is used to generate electricity for use by the factory. Under normal operating conditions, sugar plants generate enough electricity to satisfy the plant's total energy requirements and at times even export energy to the grid.

Challenge

The cost of electricity in Honduras is relatively high because it is mainly produced by fuel oil. Thus, the opportunity to optimize the energy use in the plant to be able to deliver more energy to the grid becomes very attractive.

Highlights

- Increased revenues of one million USD / year
- Reduced maintenance costs
- Higher up-time
- Overload protection
- Optimized speed control
- Longer lifetime of equipment
- Reduced noise
- Payback on investment period: one year



View of the cane mill (862 kW) and ACS1000 controlling the cane mill at Santa Matilde mill of Compañía Azucarera Hondureña S.A.

Solution

To optimize the energy use in its Santa Matilde sugar plant, Compania Azucarera Hondureña S.A. replaced five steam turbines, which were driving the cane mill, with ACS1000 variable speed drives and induction motors. By controlling the cane mill with variable speed drives and electrical motors instead of steam turbines, the steam can now be used exclusively to generate electricity, which will feed the whole plant and can even be sold to the grid.

Benefits

Efficient use of power



In the past, the Santa Matilde sugar plant needed five 750 kW steam turbines to drive the cane mill, resulting in 3,750 kW total power. Considering the turbines' steam requirement of 35 pounds/kW, about 131,000 pounds of steam were required to drive the complete cane mill.

After replacing the steam turbines with electrical drives, the 131,000 pounds of steam, formerly used to drive the cane mill, can now be used to generate electricity at a rate of 12.7 pounds / kW^{*)}. This results in an additional energy generation of 10,300 kW/h, which is used to feed the drives. Furthermore, excess energy of about 6,550 kW can be sold to the grid. This creates about one million USD/year additional revenue for Compania Azucarera Hondureña S.A., resulting in a payback time for the MV drive investment of about one year.

Higher up time, less maintenance



ACS1000 medium voltage drives require only a fraction of maintenance compared to maintenance-intensive steam turbines. This results in a higher up time and lower maintenance costs.

Optimized speed control



The ACS1000 controls the speed of the mill depending on the amount of cane being crushed by the mill. Furthermore, it can generate the required torque to maintain the speed of the cane mill.

Overload protection



The ACS1000 variable speed drive protects the mill against an overload by estimating the shaft torque. In case of an overload,

the mill will be driven in reverse to get the excess cane out of the mill and resume normal operation with minimum production loss.

Faster return to operating conditions



After a shutdown, the cane mill driven by ACS1000 drives returns to operating conditions much faster than the steam turbine driven cane mill.

Longer lifetime of equipment



The smooth ramp up protects the mechanical equipment, thus prolonging its lifetime and reducing maintenance costs.

Reduced noise



ABB's ACS1000 variable speed drive permits a very high switching frequency, resulting in a considerable noise reduction. The noise from electrical machines is almost negligible compared to that of steam turbines.

Low impact of power supply disturbances



Due to its RideThrough function, the ACS1000 is able to withstand disturbances in power supply.

Customer satisfaction

Ing. Jorge Arriaga from the Santa Matilde plant, states: "We are very pleased with the performance of ABB's ACS1000 variable speed drives. The overall energy efficiency of the Santa Matilde plant increased tremendously since we replaced the steam turbines with the ACS1000 drives. Today, we are not only energy self-sufficient, we also increased our annual revenues by approx. one million USD by selling excess energy to the grid. Furthermore, the process runs much smoother than before."

ACS1000 key data

Inverter type	Three-level Voltage Source Inverter (VSI)
Power range	Air-cooled: 315 kW-2 MW Water-cooled: 1.8 MW-5 MW
Output voltage	2.3 kV, 3.3 kV, 4.0 kV, 4.16 kV
Maximum output frequency	0 to 82.5 Hz (higher on request)
Converter efficiency	>98%, external transformer >96%, integrated transformer
Type of motor	Induction motor

^{*)} Turbines with high-pressure boilers, used for power generation, require only 12.7 pounds of steam / kW.