

## Case story

# Efficient VLT® control of boiler saves substantial amount of CO<sub>2</sub> at **Indian paper plant**

**Installation of VLT® drives on the utility equipment has improved productivity while reducing the overall power consumption by 15% and carbon emissions significantly.**

Danfoss is now the preferred vendor for the Trident Group. To date, there are nearly 400 VLT® drives installed at the group's plants for a multitude of applications including energy, paper & textiles. During the last two years, Trident has placed repeat orders for drives, the latest for a 400 kW drive system with soft starter for a forced draft fan in the recovery boiler section. This alone has saved substantial amounts of energy, not only in running the fan but also in primary fuel costs by more efficient control of the boiler. Installing VLT® drives on the boiler ID\* and FD \*\*fans, of capacity 350 kW & 400 kW respectively, has resulted in CO<sub>2</sub> emission savings of 190 tonnes per annum on each fan.

The Trident Group of Industries is a well established corporate entity in North India with diverse business interests which include Paper, Energy and Yarn. Abhishek Industries Limited, the group's flagship company decided to expand the capacity of its paper plant at Barnala, located 300 km north-west of Delhi, in the Punjab State, from 60,000 TPA to 1,50,00 TPA (tons per annum), by installing a second paper machine. The technology used here for papermaking utilizes an environmentally friendly mix of wheat straw & wood as the basic raw material. All drives in the existing paper plant were supplied by a major competitor.

#### Equipment of the new plant

For the new plant, there was a requirement for 82 drives, including 10 off high power drives with capacities ranging from 0.25 kW to 350 kW. The applications included drives for the fibre line, wood fibre line,

paper machine, digester plant, recovery boiler and other utilities. It was a challenging task for Danfoss to break into a competitor's stronghold, considering that the main section drives and drive motors had previously been supplied by them.

#### Value selling pays handsome dividends

The Danfoss sales team met the challenge by employing value selling techniques to beat the competition. They adopted a strategy of working closely with the customer from day one and educating him on the benefits of using VLT® Drives for the applications under consideration. The fact that successful Danfoss drives supplied previously for the group's textile plant, supplied by LMW, a reputed OEM of textile machinery, also added weight to the offer.

VLT® control of boiler ID and FD fans  
saves 190 tonnes CO<sub>2</sub> per annum on each fan



The efforts of the sales team in highlighting these substantial benefits to the end user resulted in the award of the drives supply contract to Danfoss in February 2007.

#### Service – the key to long term success

Installation and commissioning activities commenced towards the end of 2007.

The service team encountered a problem of unusually high pitched sound coming from the drive motors with VLT® High Power Drives at a noise level of  $\approx 100\text{db}$ . Increasing the carrier frequency was not the answer to the problem, since that would result in increased power losses in the modules.

With help from the Danfoss Drives US and Danish factories, the problem was rapidly solved. Basically it was a resonance issue, with the motor and mechanical system forming a resonant circuit which resulted in abnormal noise being generated in the motor. The audible noise was reduced to  $<80\text{db}$  with proper damping of the circuit. The following parameter changes were made in all the HPD's to reduce the noise level:

Resonance damping gain	reduced from 100% to 80%
Resonance time constant	increased from 5 ms to 10 ms
Switching pattern	changed from SFAVM to 60°AVM
Dynamic DC Link Compensation	disabled

Commissioning of all drives was completed by March 2008 and Trident has experienced trouble free operation to date.

*\* ID Fan = Induced Draft Fan - the fan exhausts the gases from the boiler*

*\*\* FD Fan = Forced Draft Fan - the fan forces air into the boiler for combustion*

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#### Some of the key selling points:

VLT® series drives are more energy efficient and have lower heat loss figures, especially in the  $>90\text{kW}$  high capacity range. An FC302 400kW CT rated drive for the 400kW FD Fan Motor in the recovery boiler section, for example, has a heat loss figure which is only 87.5% of that offered by the competition (7964W vs. 9100W). This translates into reduced installation costs, significantly lower running costs and reduced carbon emissions for the user.

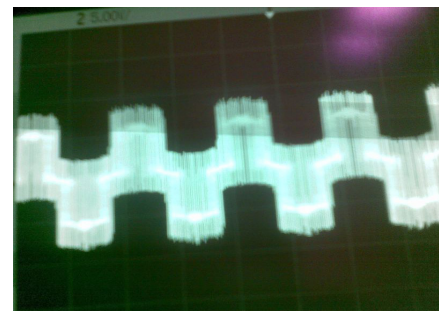
VLT® Drives are designed for 45/50°C ambient operating temperature as standard (depending upon the capacity), whereas the competition drives are rated only for 40°C. They are therefore designed to withstand higher operating ambient without derating or reduced reliability.

VLT® Drives permit unlimited switching at the inverter output without damaging the IGBT's. This is not the case with the competition so again Danfoss drives offer enhanced reliability and uptime.

VLT® Drives do not need special cables to connect to the drive motor. A 3C armoured cable can be used safely with the VLT® drive up to a cabling distance of 150m. The competition recommends use of symmetrical shielded cables for motors beyond 30 kW.



Line-up of VLT® drive panels



315 kW Feed Pump Motor  
Voltage waveform