



Case Story – VLT® Solutions

200+ Danfoss VLT® drives boost reliability in a harsh working environment

The high efficiency and innovative backchannel cooling system of Danfoss VLT® High Power Drives made them the first choice for a 600,000 tons/ year calcium carbide plant in Inter-Mongolia, China. The tough C3C coating on the smaller drives' PCBs was critical due to the aggressive dust prevalent in the working environment. Overall, plant reliability and therefore production levels have been guaranteed by the choice of efficient and reliable Danfoss VLT® drives following commissioning and 6 months operation.

Reliability is the single most important criterion in the working life of a plant engineer. Poor reliability leads to frequent plant shut-downs and serious production losses, the costs of which can quickly become intolerable. Harsh working environments inevitably accelerate equipment breakdown and production losses unless the production plant and control equipment is selected with durability and high reliability as prime requirements in the first instance.

It was precisely this problem that was troubling the Erdos Chemical group at their lime kilns in Inter-Mongolia in China. At an existing plant, built some years earlier, where 300,000 tonnes of calcium carbide per year are produced, the installation site conditions are extremely severe. As well as an atmosphere laden with aggressive calcium carbide particles, the high temperatures in summer was proving too much for much of the installed base of inverter drives, resulting in

frequent, costly plant shut-downs. This necessitated the installation of additional cooling fans on many of the drives, again adding to costs, with limited improvement on overall reliability.

The lesson learned, for a new 600,000 tons/year project, Erdos, having received strong references from various end users in other industries, placed orders with Danfoss China for over 200 VLT® drives of ratings from 1.5kW to 500kW.



3C3

coated PCBs

protect the VLT® drives against carbon particles in the harsh working environment and makes for durability and reliability of the drives.



The new Erdos plant in Inter-Mongolia, China produces 600,000 tonnes of calcium carbide per year under extremely severe conditions.

3C3 coated PCBs and 300m motor cables

All of the drives have been supplied with a special durable 3C3 coating on the printed circuit boards to protect against carbon particles, present even within the control rooms and control cubicles. Over 160 of the drives are IP 20 VLT® AutomationDrive FC 302, rated from 1.5kW to 75kW.

Thirty-six bigger drives, rated from 110kW to 500kW, are also installed in control cubicles in a control room and the inbuilt chokes and their ability to operate with motor cables up to 300m long, was another feature that decided in Danfoss' favour.

For demanding hoist application

Seven of the drives, rated at 110kW each, were required for a demanding hoist application for lifting finished product, that necessitated accurate flux control and braking resistors, standard options for VLT® AutomationDrives.

Since many of the drives were supplied via Erdos' systems integrators, other options such as filters, fuses, and the VLT® General Purpose I/O MCB 101 modules offered significant advantages in reducing panel real-estate.

High efficient VLT® High Power drives

The larger VLT® High Power drives are all highly efficient which means they generate a lower heat profile. This combined with the innovative back-channel cooling system, which keeps the cooling air separate from the internal electronics, made these drives especially suitable for the high

summer temperatures on the site. The converters are cooled by directly exhausting cooling air via a separate backchannel cooling system, which ensures that no impurities are sucked into the electronics.

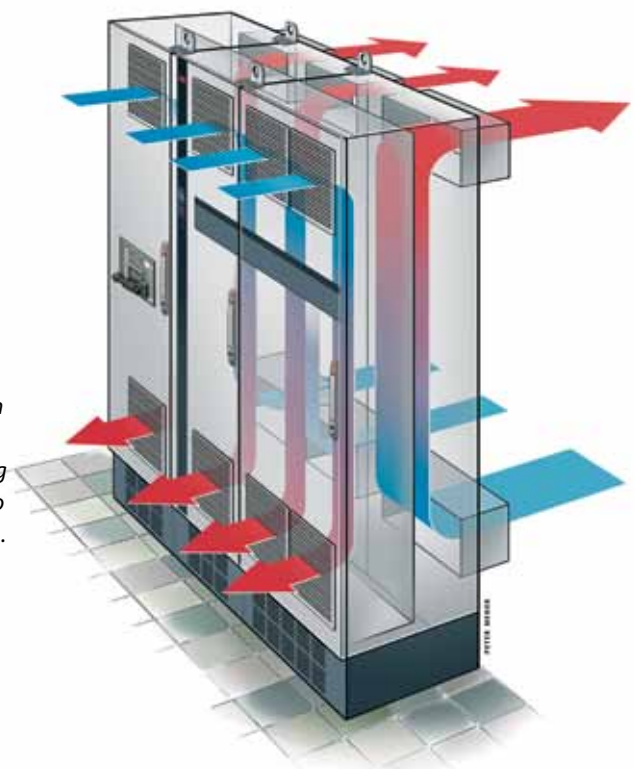
User-friendly local control panel

The award winning local control panel (LCP), with its Chinese language menu option, was particularly well received by the plant electrical engineering staff as it simplifies commissioning and operation of the drives by the local engineers. The high efficiency of these larger exhaust-fan, blower and compressor drives, totalling over 7MW, will also make a significant contribution to reducing the plant's energy profile and carbon footprint.

After-sales service

Global service is a key Danfoss commitment but with high reliability equipment, frequently the customer has little opportunity to judge the quality of after-sales service. In this case however, since one of the 500kW drives was damaged during delivery, Danfoss was called upon to return the drive to full operational condition as soon as possible and the engineer from the local Danfoss service centre was very soon on site and the drive repaired and commissioned to the customer's entire satisfaction.

Back-channel cooling minimises heat loss, increasing energy efficiency, a significant benefit at high powers. 85% of the heat losses in the drive are deviated by the cooling channel fan of the drive directly into the control room ventilation system. The remaining 15% of heat generated by the drive is removed via the temperature controlled fans in the front doors of the drive.





Mr. Guan Mingqiang, electricity engineer at Erdos Chemical Group and Mr. Zhao Wanjun from Danfoss in front of the installed VLT® drives.

Danfoss' local partner has also been involved with the commissioning of every one of the new drives on this difficult site over the past 6 months.

Training for the site maintenance staff has also been provided by Danfoss China during and after the installation and commissioning of the drives and the customer has expressed great satisfaction at the speed and quality of Danfoss after-sales commitment, so much so that Danfoss China are now in pole position for two further projects planned for the future.

Facts about the VLT® back-channel cooling system

Inevitably, even at 98% efficiency, VLT® High Power drives generate a significant amount of heat. A 500kW drive will generate some 10kW of heat while operating at full power and this heat must be removed from the drive to ensure correct operation of the control circuits.

Danfoss devised the innovative back-channel cooling strategy as the most effective means of removing heat energy from the drives while maintaining their world-beating compact format.

By passing air through a rear cooling channel and over the cooling fins of the power switching devices, some 85% of the drive's heat is removed without exposing the internal electronics to potential contaminants. This exhaust air can either be vented via ducting through an exterior wall to the outside environment or can be recovered by ducting into the control room ventilation system.

This leaves only some 15% of the heat generated to be removed via filtered temperature controlled fans on the drive's doors. This is a major benefit in hostile environments where contaminants might compromise drive life and reliability.

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