

Case Study | VLT® HVAC Drive FC 102

# MS Cinderella **saves more than 1000 tpa marine diesel** with new ventilation control

Aboard the Viking Lines cruise ship M/S Cinderella, Danfoss AC variable speed drives specified and installed by eMarine Engineering Nordic AB are delivering fuel savings so large that the cost of installing the drives will be fully recovered in less than eighteen months. In addition, the improved energy efficiency made possible by the installation of the drives will reduce the vessel's CO<sub>2</sub> emissions by an estimated 3,000 tonnes per year.

**18** monthspayback time for  
ventilation control  
with Danfoss drives

# Cleaner cruising on board MS Cinderella

M/S Cinderella was built in 1989 and can carry up to 2,560 passengers in its 1,250 cabins and 100 cars on its vehicle deck. Every evening, it departs Stockholm in Sweden and travels to Mariehamn in the Åland Islands, before performing the return journey the following day.

To provide its passengers with the highest standards of comfort, the ship is equipped with a very effective heating, ventilation and air-conditioning (HVAC) system. When the vessel was built, the energy efficiency of such systems was not a primary concern and, as a result, only basic control was provided for the system's air handling units (AHUs).

In 2016, however, Viking Lines, the owners and operators of M/S Cinderella, approached eMarine Engineering Nordic AB with a request for guidance on whether it would be possible to increase the energy efficiency of the on-board systems. Although it is relatively new company, eMarine Engineering has wide experience of the marine sector and of land-based HVAC systems. The company sees great opportunities for

adapting some of the innovative techniques developed for these systems to provide big benefits in shipboard applications.

## Focus on AHU efficiency

In response to the request from Viking Lines, engineers from eMarine Engineering spent several days on the M/S Cinderella carrying out an exhaustive pre-project study. Their conclusion was that there were several areas where relatively straightforward changes would yield worthwhile energy efficiency gains, but the single most important improvement could be achieved by fitting AC variable speed drives to the vessel's AHUs.





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**Per Brønning, Project Manager at eMarine Engineering**

After further careful evaluation of the requirements and the operating environment, eMarine Engineering chose products from the Danfoss VLT® HVAC Drive FC 102 range for this important project.

### **Quality, reliability and efficiency**

“We had many reasons for choosing Danfoss drives,” says Per Brønning, project manager at eMarine Engineering. “Perhaps the most important was that we already had experience of the quality, reliability and efficiency of the Danfoss products, and of the excellent support provided by the company. In addition, the Danfoss VLT® HVAC Drive FC 102 range includes IP55 versions, which were essential in this application, and

the range also has maritime approvals. Finally, the drives are compact, easy to install and easy to set up.”

### **Easy integration**

Over a period of two months, eMarine Engineering installed Danfoss drives to provide energy-efficient control of 49 AHUs. All of the drives operate from a 690 V supply and, for the most part, they have ratings from 11 kW to 35 kW. The drives are interfaced with the ship’s control systems using analogue techniques. eMarine Engineering found that the drives were easy to integrate, with the control system needing only minor program adjustments to accommodate them.





VLT® HVAC Drive FC 102.

### Reduced generator loads save fuel

The ship remained in service, carrying out its normal daily schedule, throughout the whole period over which the drive installation and commissioning work was being carried out. On completion of the work, the results could be quantified easily and accurately, as M/S Cinderella is equipped with comprehensive measuring equipment to monitor the performance and loading of its on-board generators. This confirmed that the loading had been reduced to an extent that would make possible fuel savings of no less than 1,000 tonnes per year. While some of this saving was attributable to other improvements made by eMarine Engineering at the same time as they were installing the Danfoss drives, by far the largest proportion was attributable directly to the drives. Based on current fuel prices, this fuel saving means that Viking Lines will fully recover the cost of fitting the drives in less than eighteen months.

“This project has been very successful,” explains Per Brønning, “but it’s by no means finished. We’re continuing to work on M/S Cinderella, devising and implementing further energy efficiency improvements. Recently, for example, we’ve fitted variable speed drives to the chiller units used to store food for the restaurants on board. Naturally, the drives we’ve selected are all from Danfoss – mostly VLT® types, but also a number of VACON® units for the smaller applications”.

“Danfoss has great products, competitive prices and the Danfoss engineers are really nice people to deal with,” he continued. “What possible reason could we have for going anywhere else?”