

Case story | VLT® Solutions

New energy-efficient pump solution at Danish heating plant

A significant enhancement in pump system efficiency, due to a combination of a permanent magnet motor, a specially designed pump and a VLT® frequency converter from Danfoss.

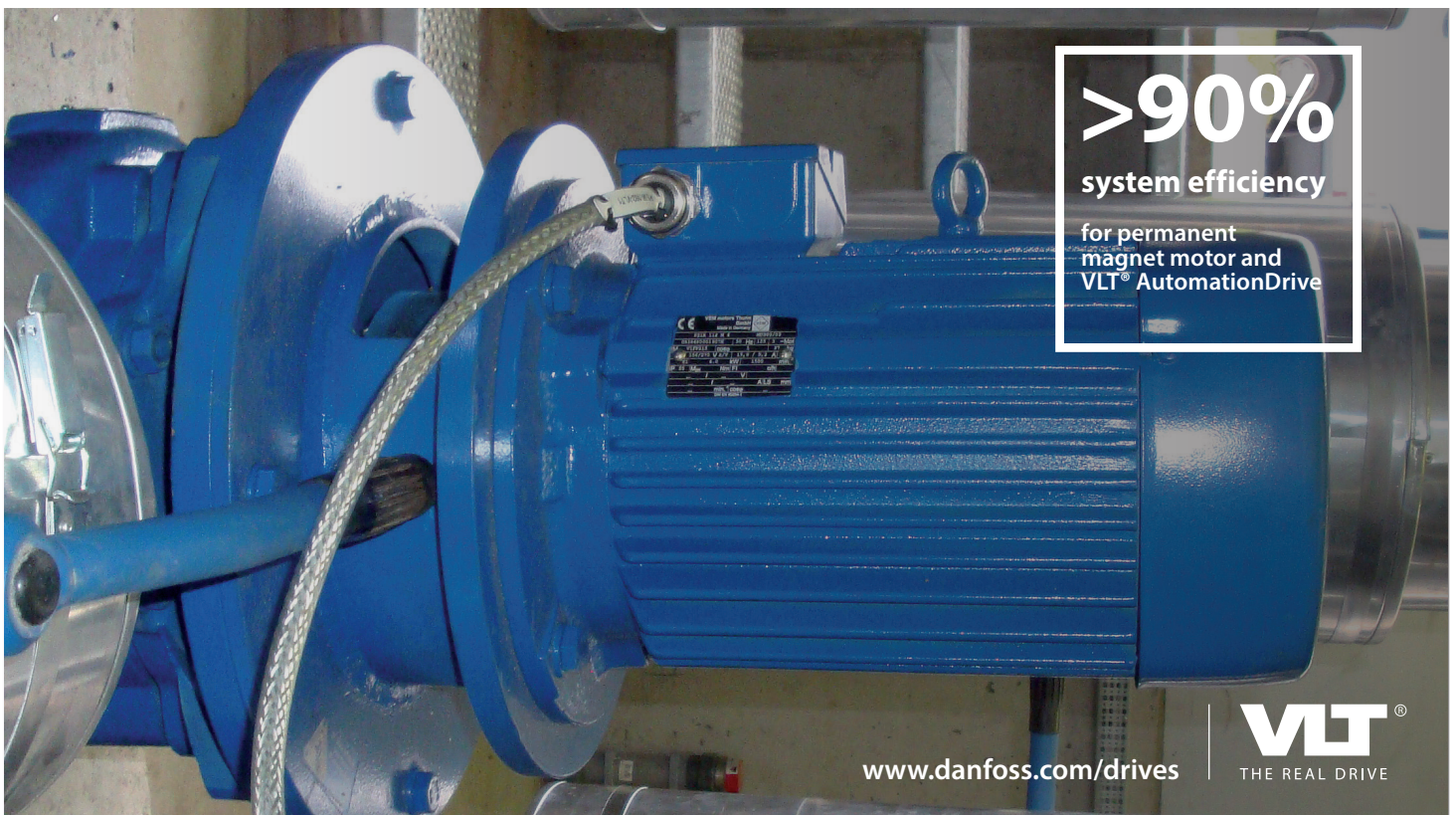
A district heating plant in Horsens, Denmark has opted to use a highly efficient pump solution with a permanent magnet motor and a VLT® frequency converter from Danfoss. The equipment has been installed in a small pumping station that supplies 220 single-family homes and small-scale industry with district heating. A single pump can cover the high level of capacity variation between warm summer days and cold winter months.

The results have been especially positive as they represent a clear improvement in system efficiency. "The biggest advantage is that we can regulate the capacity of the new pump over a range of approximately 2 m³/h in the summer, to about 30 m³ in the winter, with a high degree of efficiency for the entire flow range. We can therefore avoid having to change between different pumps depending on the season", explains heating technician John Nørgaard.

VLT® frequency converters are the perfect fit for regulating permanent magnet motors. The pump, from the Trium factory in Hasselager, Denmark, is equipped

with a VEM 4kW permanent magnet motor, type P21R, which is regulated by a VLT® AutomationDrive. The permanent magnet motors have no rotor loss, unlike ordinary asynchronous motors, and they are well suited to use with wider control ranges.

The affiliation of VEM motor and VLT® frequency converter results in a combined efficiency of over 90% over the entire control range. By comparison, a traditional solution with an asynchronous motor provides an efficiency of around 80% at full capacity.



A solution for the future

The new pump solution also yields significant savings in electricity consumption. As district heating plants are required to develop energy-efficient solutions to achieve a reduction in their CO₂ emissions, this solution has been particularly welcomed by the Horsens Heating Plant.

According to John Nørgaard, the Horsens plant is so satisfied with the solution that the company expects to adopt the permanent magnet motor solution in future when other, larger motors need replacing. The fact that permanent magnet motors have the same dimensions and are directly compatible with standard motors makes their deployment particularly attractive.



Heating technician John Nørgaard and the frequency transformer installation with VLT® AutomationDrive FC 302 4 kW IP 55.



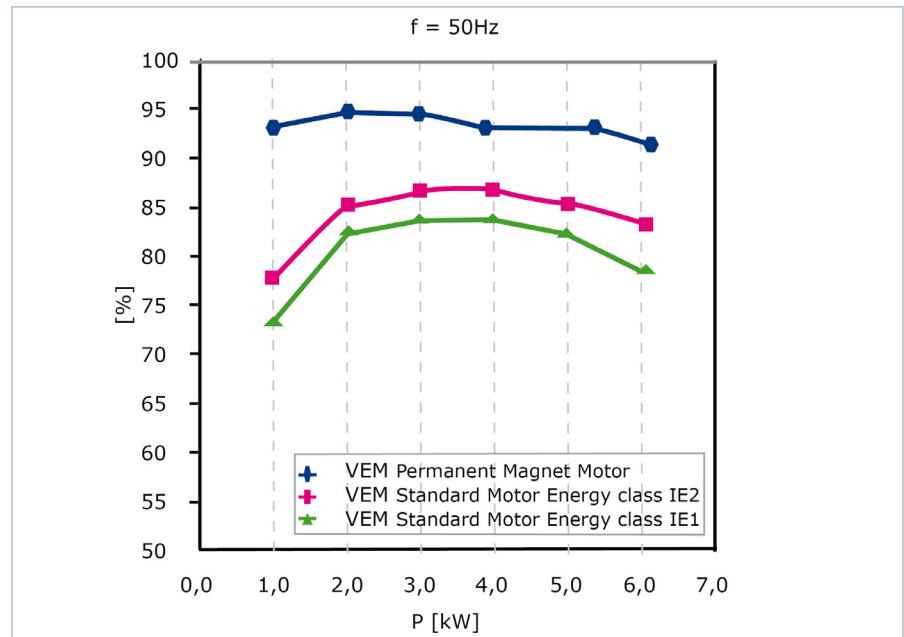
The Trium pump is equipped with a VEM permanent magnet motor and VLT® frequency converter, which help to achieve a high level of system efficiency.

The Horsens Heating Plant sees the following advantages in the new pump solutions:

- An energy efficient pumping solution that uses the same pumps during summer and winter months
- Space-saving and low-noise output solution
- Wide control range with a high efficiency rating
- Electricity savings that benefit the bottom line and provide a reduction in CO₂ emissions

Facts about permanent magnet motors:

- Compatible with normal, asynchronous motors
- No magnetization loss in the motor's rotor
- Significantly enhanced efficiency rating - particularly during partial load operation
- Much higher efficiency than energy class IE2
- Permanent magnet motors must be controlled by frequency converters. Direct on line operation is not possible.
- The additional costs of permanent magnet motors are typically recovered through savings over the course of one year.



Efficiency rating for VEM permanent magnet motor type PE 1R, as compared with VEM standard motors, energy classes IE1 and IE2:

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