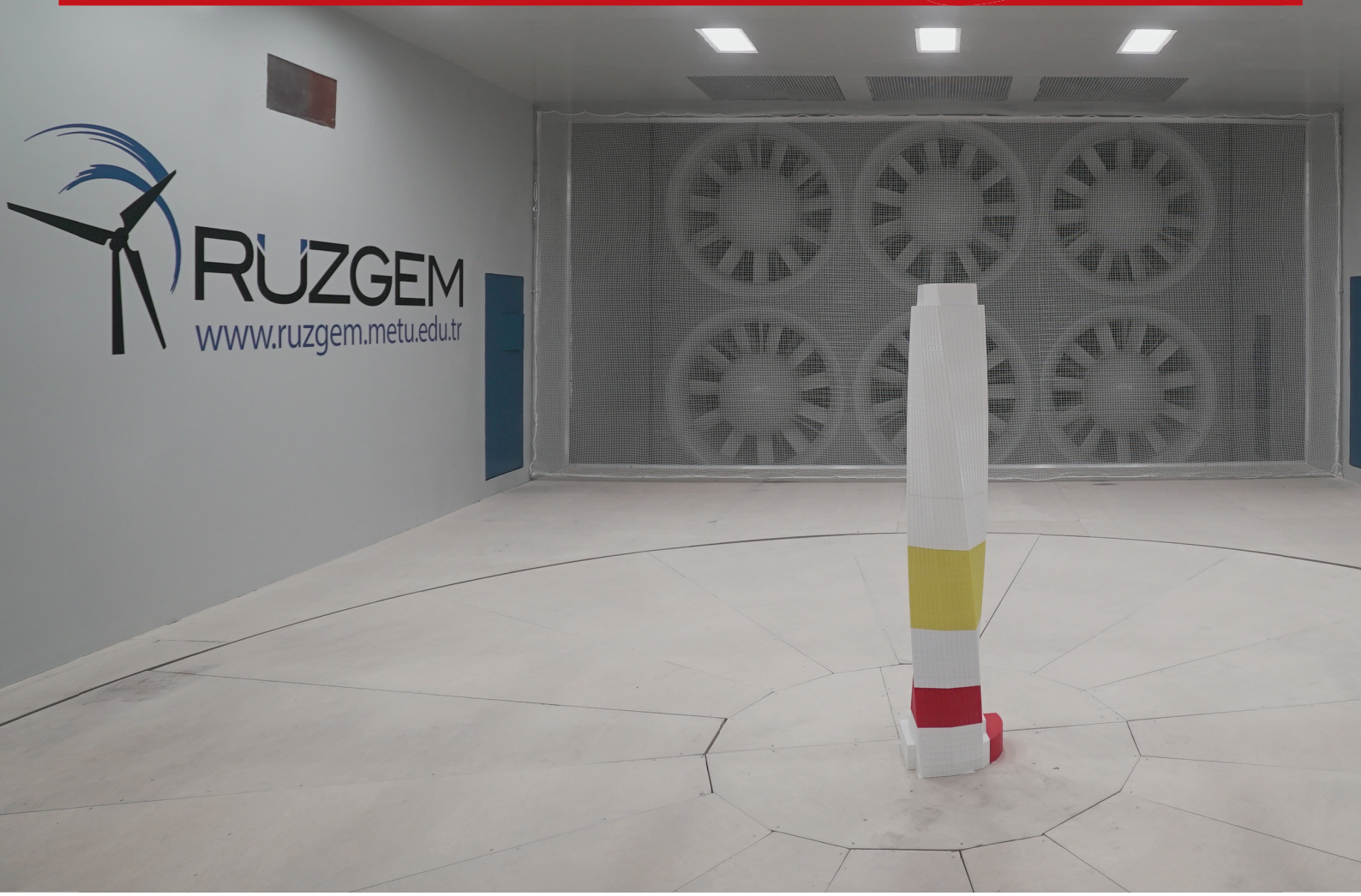
ENGINEERING TOMORROW

Case story | Rüzgem

Danfoss VACON drives play key role in **flagship Turkish wind tunnel project**

Turkey's newest large-scale wind tunnel at METU Center for Wind Energy (ODTÜ RÜZGEM), which has mostly been built using local design and production contribution, is being hailed as a leading project in the region that will contribute to local ideas and enterprises, while also allowing the country to respond to wind tunnel requests from abroad.



The RÜZGEM Large Scale Wind Tunnel is situated in Ankara, Turkey, at the Middle East Technical University (METU). The wind tunnel is a closed-loop multi-purpose wind tunnel with a 3m x 7m x 20m boundary layer test section, a 2.5m x 2.5m x 10m aeronautical test section and a 3m diameter open-jet test section, all of which will be able to meet the test needs of the aviation, wind energy, civil/construction and automotive industries.

Fans are the primary component of wind tunnels, providing a concentrated stream of air in either a vertical or horizontal flow, and their design is critically important. Danfoss VACON® low harmonic drive solutions were chosen for use in the 2.4MW wind tunnel fans, to effectively ensure low voltage harmonic distortion in the power supply.

Danfoss, together with its partner, Des Teknoloji, produced VACON panels in the local Des Teknoloji facility in Turkey to create a bespoke solution for the fans, and further carried out all required technical support. The aerodynamic design and structural analysis of the fans were done at RÜZGEM and the fans were produced and integrated to the wind tunnel by Teknima.

What's **in it for you**

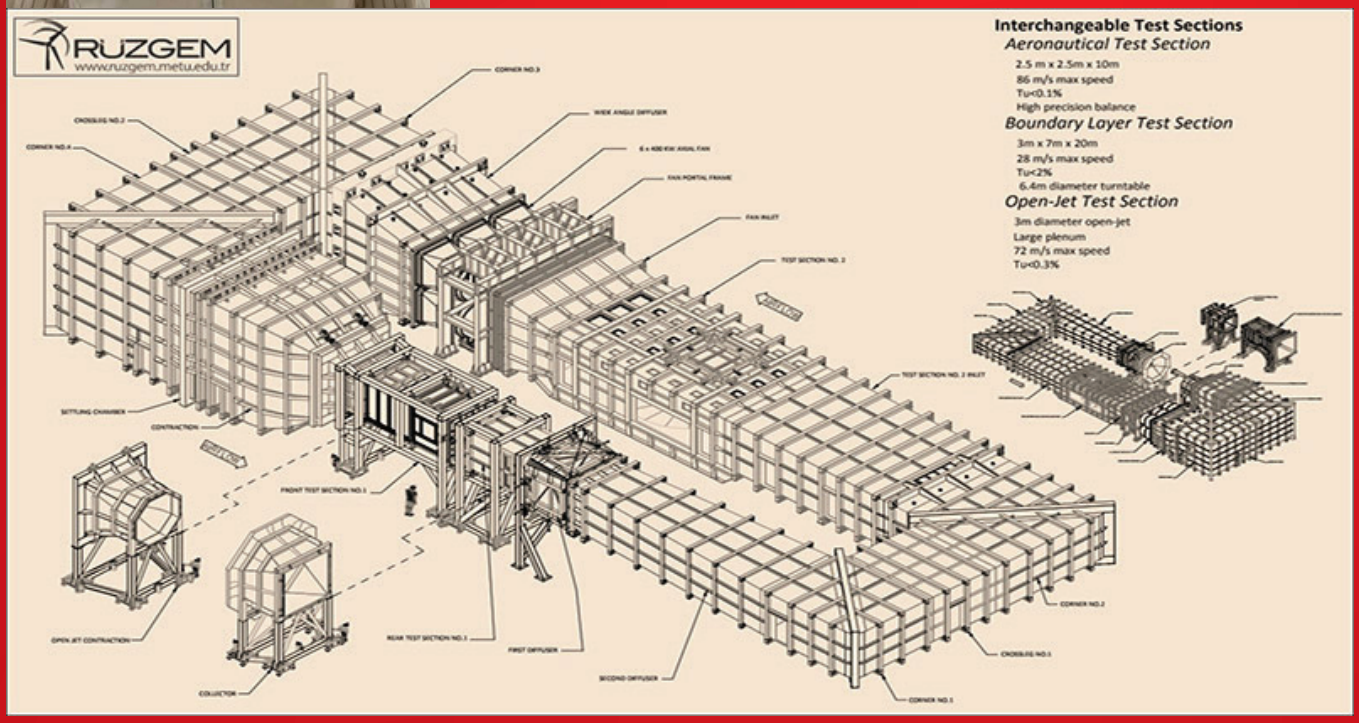
Air cooled drive modules within the VACON® NXP Common DC Bus product range

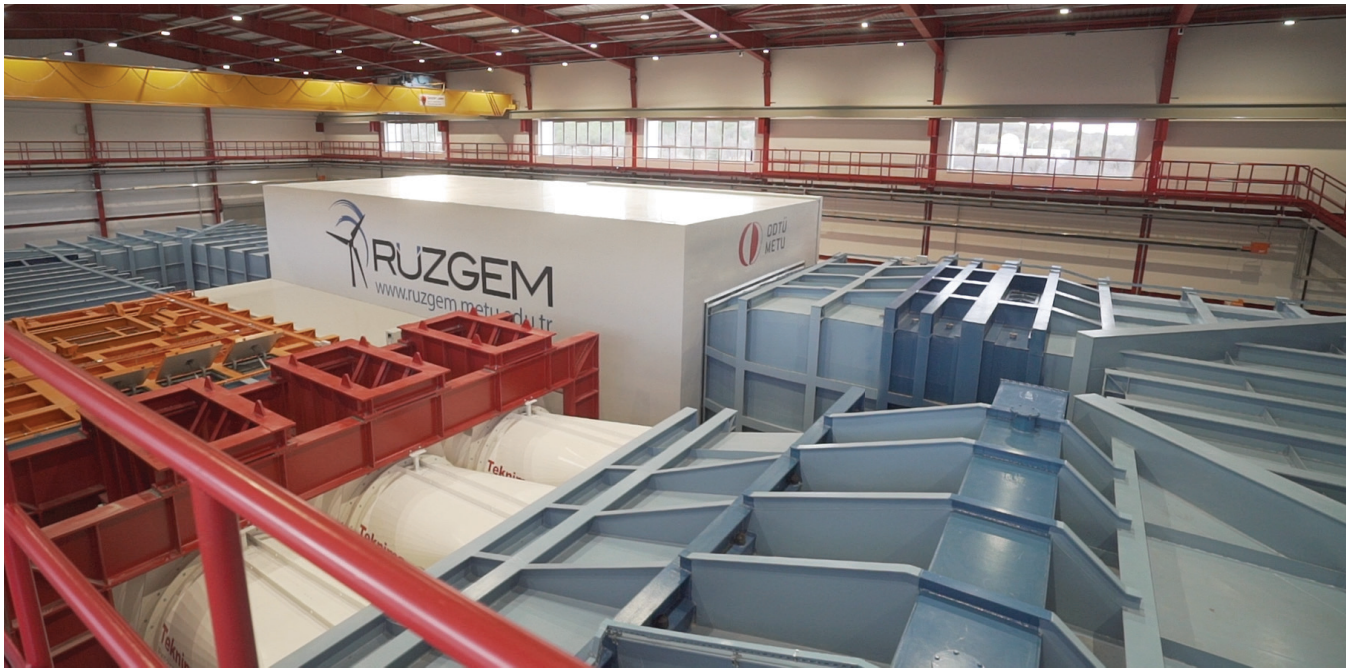
VACON® NXP Common DC Bus

Key features	Benefits
Full power (0.55 to 2.2 MW) and voltage (380 to 690 V) range for both induction and permanent magnet motors.	Same software tool, same control option boards allowing the maximum utilization of VACON® NXP features over a wide power range.
Five built-in expansion slots for additional I/O, fieldbus and functional safety boards.	No additional modules required. Option boards are compact and easy to install at any time.
Low harmonic regenerative front end. Cost effective non-regenerative front end.	Optimized drive system configurations enabling minimized overall investment cost. Excessive braking energy can be fed back to network saving energy costs.
Compact drive modules and easy integration to cabinets.	Optimized module design reduces need for additional engineering and saves in cabinet space reducing overall costs.

"Turkey's newest large-scale wind tunnel required the integration of variable frequency drives (VFDs) within the fans - the most crucial component of the wind tunnel. Low harmonic products were also required, as was a short delivery period and a successful start-up by the relevant qualified drives engineers."

- Professor Dr. Oğuz Uzol, Head of METU RÜZGEM Project





"Voltage harmonic distortion, which generally results from nonlinear loads in the power system, can pose a significant threat to power quality in the supply network, which in turn can cause malfunctions in equipment connected to the supply. Danfoss solutions allow you to connect large loads to your supply without fear of creating an unacceptable distortion level. In this application, it is critical to ensure low harmonic distortion for these special condition fans. "

"Danfoss faced stiff competition from other competitors, as this was a prestigious project that a number of different companies wanted to be involved in. It was necessary for us to adapt to the specifications to use our own solutions. The client had a high technical knowledge and needed some reassurance of the effectiveness of our proposed solution over time."

- İlkay Kuvel , Danfoss Drives Turkey Sales Manager

The complete **range**

VACON® Common DC Bus product portfolio meets all the requirements with a flexible architecture, comprising a selection of active front-ends, non-regenerative front ends, inverters and brake choppers in the entire power range and voltages from 380 V to 690 V.

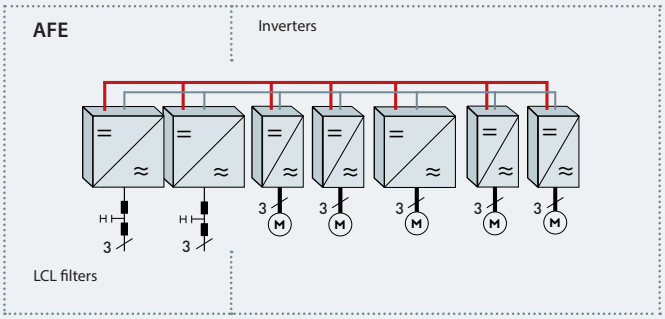
Flexible configuration, customized solutions
Common DC bus components can be used in a multitude of combinations. In a typical DC bus configuration, the drives that are generating can transfer the energy directly to the drives in motoring mode. Common DC bus drive systems have different kinds of front-end units to meet the requirements of the electricity network and the process where the drives are used.

With the right configuration, the drive system can achieve optimal performance and significant energy savings can be made when braking energy is utilized to its full potential.

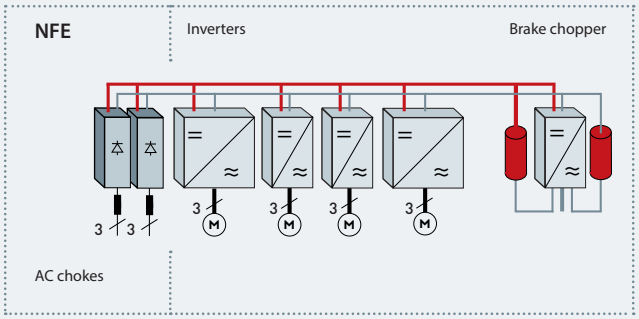
Front-end units
The front-end units convert a mains AC voltage and current into a DC voltage and current. The power is transferred from the mains to a common DC bus and, in certain cases, vice versa.

Active front-end (AFE)
The AFE unit is a bidirectional (regenerative) power converter for the front-end of a common DC bus drive line-up. An external LCL filter is used at the input. This unit is suitable in applications where low mains harmonics are required. AFE is able to boost DC link voltage (default +10%) higher than nominal DC link voltage (1,35x UN). AFE needs an external pre-charging circuit. However, AFE does not need any external grid side measurements to operate. AFE units can operate in parallel to provide increased power and/or redundancy without any drive to drive communication between the units. AFE units can also be connected to the same fieldbus with inverters, and controlled and monitored via fieldbus.

A regenerative common DC bus system



A non-regenerative common DC bus system



A common DC bus system consists of one or more front-end modules and inverter modules connected together by a DC bus.

Solution:
customisation of VACON panels **produced locally**

The Danfoss VACON panels produced created a flexible, low-harmonic solution according to the client's specific requirements, using six VACON 400 kW regenerative frequency converters including active front end modules (AFE), inverter units (INU) and filters (LCL and du/dt).

"We presented our VACON drives with INU, AFE and filter modules to meet the required power quality standards (IEEE519 STD) and specifications. The customer was convinced that our VACON modules and solutions perfectly matched with their needs, also offering further advantages in terms of data collection from the VACON Fieldbus (Profinet) system, which directly integrated into the closed system industrial PC in order to secure the system perfectly." - says İlkay Kuvel ,

Results:

"With the assistance and support of our partner, DES Teknoloji, Danfoss was able to offer competitive pricing for the drives and local panel building advantages. Together with our partner, we could absorb the cost of commissioning and start-up. We further proved the strength and reliability of our service with our team in Turkey." - İlkay Kuvel, Danfoss Drives Turkey Sales Manager

Additionally, several site visits from the Danfoss team in Turkey helped to increase the client's trust in both the product and service support. We are very pleased to play our part in this exciting project that is such an important part of Turkey's drive to showcase its international expertise in this arena on the international stage.

- İbrahim Koç, Des Teknoloji Project Director

DES Teknoloji provides electronic automation applications and has been a dealer of Danfoss Drives products for more than five years. The company has been involved in completed turnkey projects in many fields, providing services in various areas including machine automation, HVAC, water and wastewater applications, marine applications, and the iron and steel industries. DES Teknoloji additionally provides after-sales technical, application and maintenance support.

Teknima is involved in the design and solution, manufacture and maintenance of

fans and control panels, which are designed and manufactured with high quality components and materials to offer maximum performance and ergonomic design to decrease noise levels. The company was established in 2007 and has been focused on clean air technologies since 2012.