ABB Sets World Record for NASA Wind Tunnel

With the successful delivery of a 101 MW variable speed drive for a 135,000 horsepower synchronous motor in a NASA wind tunnel, ABB has set a new world record for size and power

The unusually large drive is needed for simulated flight testing of large supersonic aircrafts. ABB retrofitted a wind tunnel, operated for this purpose by the National Aeronautics and Space Administration (NASA), with a 101 MW variable speed drive system — the world's largest.

The wind tunnel is located at NASA's National Transonic Facility (NTF) in Hampton, Virginia. The ABB equipment supplies and controls a giant fan that generates wind velocities in excess of Mach 1.

The high power is necessary to simulate the operating conditions of large transport aircrafts flying at transonic speeds (960…1440 km/h). A unique feature of the wind tunnel is its ability to simulate other flight parameters such as Reynold numbers associated with these aircrafts, typically between values 50 million and 100 million, which manufacturers need to optimize design and shorten production development cycles. Considering that only a few wind tunnels are able to achieve Reynolds numbers above 10 million, NASA's NTF is the only tunnel that can simulate Reynolds numbers in excess of 100 million. The variable speed drive system improves the reliability, efficiency and productivity of the NASA facility and therefore enables NASA to offer higher efficiency and productivity to its customers as well.

101 MW — the largest variable speed drive in the world

The MV Drives & Power Electronics division of ABB, located in Turgi, Switzerland, manufactures a complete range of energy-efficient electric drive components and standard as well as engineered drives for every potential application. The range of variable speed drive systems extends from about 1 MW to 100 MW and more. With a rating of 101 MW, the one commissioned by ABB for NASA in 1997 is the biggest ever built in the world.

Modern variable speed AC drives raise your profitability

It is surprising how many industrial processes can be improved by variable speed drives. The larger the process and the higher the performance demands, the greater the benefits to be gained from a variable speed drive system. With a drive of a few megawatts, the energy savings alone can recuperate the investment in a relatively short time.

Smoother process control

Better control of the process is another advantage of a variable speed drive. The ABB drive system guarantees accurate control of speed and torque and excellent dynamic performance. Wherever precise coordination is a must, the control system ensures that the motor speed is at its optimum.

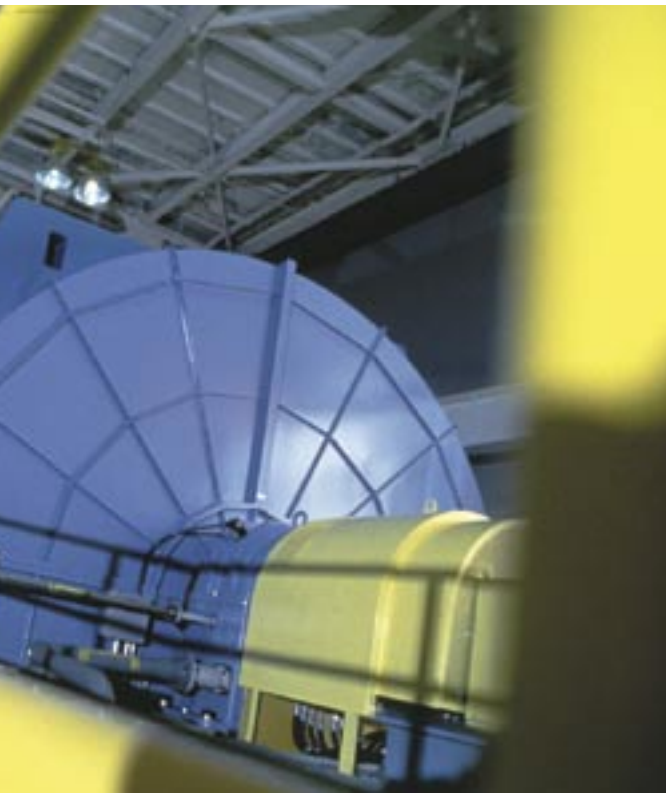
Variable speed drives are thus the starting point of effective automation.

Other benefits of speed control

Apart from smoother control of the process and energy savings, electronic speed control also means that there is less mechanical stress on the machines, bearings and shafts and therefore less maintenance.

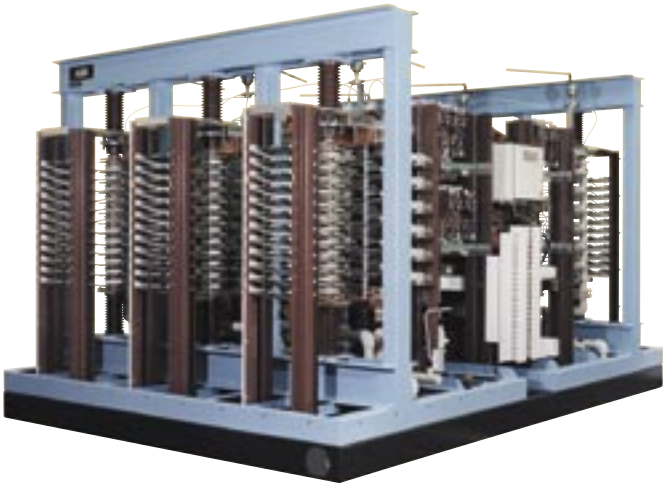
The low starting current also reduces the thermal stress on the machine and avoids the adverse influence of starting surges on the power system.

All these factors add up to high plant reliability and availability. A further important and very topical point is the obvious environmental friendliness of electric drives.



Equipment layout

At the NASA NTF, the ABB converter is in the same building as the synchronous motor, which is mounted about 9 meters away. Nearly twice as large as any other variable speed drive in the world, the converter occupies a space 9 meters long, 9 meters wide and 9.75 meters high. Excluding its coolers and other accessories, the motor occupies a space 3.65 meters long, 6.1 meters wide and 7 meters high.



Both the converter and the motor were assembled on site. The converter was shipped from ABB in Turgi, Switzerland, in four pre-assembled units as shown above. The 365-ton motor manufactured by ABB at their works in Birr, Switzerland, was shipped in 3 major pieces (rotor, lower and upper half of stator), with the coolers and accessories shipped and installed separately. Final motor connections were done by ABB in Richmond, Virginia.

Those were the largest electrical components, but powering them also required the installation of a new transformer, related switchgear and modifications of the existing electrical substation. The transformer was supplied by ABB in Drammen, Norway. The switchgear is also supplied by ABB, making it an „all ABB“ drive system.

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