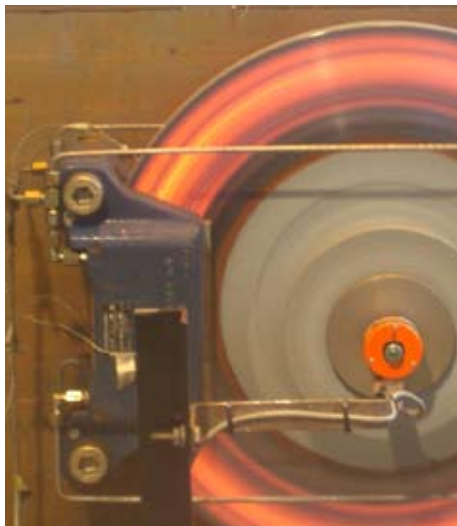




VLT® High Power Drives mounted on brake tester

Svendborg Brakes A/S is one of the leading manufacturers of industrial brake systems. In addition to a large range of hydraulic applied failsafe and active disc brakes, they also market hydraulic power units with various functions, controlled braking systems SOBO® and couplings. The company offers local support via a global network of local offices and distributors around the world.



One of the world's biggest brake testers

In principle it is easy to calculate the forces to be controlled to brake a train from, say, 200 km/h to a standstill or to brake down a wind turbine that has suddenly gone out of control.

However, how do you test whether the calculations are correct or whether the sub-suppliers' components meet specifications?

You could take a risk and test all this in practice. Or, a safer route, would be to perform a small-scale test to verify the figures.

For Svendborg Brakes A/S small scale tests were not good enough, because malfunction of their products could be fatal. Therefore they decided to set up a test rig on their site in Svendborg.

Originally, the brake tester was made for testing wet brakes using oil in their brake system. However, today the brake tester is used for a multitude of purposes such as test of cranes, conveyor belts and other mining equipment.

What does it take to simulate a 5.5 MW wind turbine?

The brake tester set up in Svendborg has a huge 8-tons flywheel with a diameter of 3.2 m. The flywheel is mounted on a 2-tons shaft with a bearing diameter of 350 mm. It is also fitted with two brake discs. One of the discs is used during the automatic brake test and the other one is used as an emergency brake which can stop the whole plant if necessary.

The brake disc of the emergency brake weighs 650 kg. The shaft is mounted in two bearing brackets with oil-filled bronze friction bearings, where the oil is heated to 40°C. There is continual monitoring of temperature and vibrations of each bearing. The weight of each bearing bracket is about 500 kg.

The transmission from the shaft to a 90 kW motor is done by eight V-belts with a gear ratio of 1:3.35. At over-synchronous motor operation it is thus possible to obtain a flywheel peripheral speed of 375 km/h.

The emergency brake consists of two brakes with a total braking torque of 96,000 Nm. The rotating parts have a total moment of inertia of 13,323 kgm². When the flywheel reaches maximum speed, an energy unit of 28.5 MJ must be braked.

It takes about 8 seconds for the emergency brakes to do that.

The plant also allows testing of small brakes.

Why Danfoss?

So far drives from other suppliers had been incapable of starting the motor. Svendborg Brakes A/S contacted the Danfoss sales company in Aarhus, and it turned out that they had mounted a 90 kW drive with a 110% starting torque.

At first sight the Danfoss salesman could conclude that the drive was not big enough for the job. He then asked Danfoss Drives experts from the headquarters to do some calculations and very quickly they found out that a VLT® 5202 frequency converter was the right one to use for a 132 kW motor.

However, it was not possible to deliver that unit within the requested delivery time of 2 or 3 days, so instead Danfoss delivered the bigger VLT® 5252 frequency converter matching a 160 kW motor. Later it turned out that the bigger drive was an advantage, as it allowed over-synchronous operation. Apart from ensuring quick delivery, Danfoss Denmark also guaranteed that Svendborg Brakes could return the drive if it did not live up to their expectations.

Quick delivery, quick commissioning

The time plan was agreed upon over the phone. The order was placed on a Tuesday and Svendborg Brakes had the drive same day. Various installation adaptations were then made - and Monday morning at 10:00 three Danfoss Drives specialists



arrived on site to take care of the commissioning. After some measuring, entry of data and automatic motor adaptation, the team was ready to press START. All that only took twenty minutes and the shaft started to rotate.

Now the final fine adjustment of the plant could begin. Ødegaard & Danneskiold-Samsøe A/S was asked to balance the flywheel before increasing speed to above 60 RPM. For balancing the flywheel they used 15 kg blocks not 5 g and 10 g blocks which are used for balancing car wheels.

Optimizing plant to 8 MW

During the following months the Danfoss Drives experts visited the plant a couple of times to optimize the drive because when a flywheel of that size runs at high speed, more energy is required due to - among other things - airflow resistance. To reach 8 MW it was necessary to encapsulate the flywheel and then extract all the air from the encapsulation to make it possible to obtain peripheral speeds of about 450 km/h.

The Danfoss Drives team also resolved other glitches in the system and today the customer is running fine.