OVERSPEED TEST STATION

Project leader: Dipl.-Ing. Armin Rockhausen | Project duration: 01/07-06/09

ABSTRACT

The overspeed test stations for rotating machine elements on the market are driven by an asynchronous motor. The required speed is reached by means of a gear box. Special oil bearings and the masses that have to be accelerated - such as gearwheels and drive axles - require engine output. For that reason a relatively powerful engine with a power of several kilowatts is necessary. With the new drive model, driven and mounted by magnetic forces, a solution should be realised without a gearing and with a small power train only.

Based on the dynamic and strength-relevant necessities different geometries of the motor structure were realised in the design phase.

The first design included an ordinary solid shaft. In this case, however, 11 natural frequencies would have to be passed. Thus, this design could not be realised. The next design consisted of a hollow shaft with two radial bearings, that at the same time function as motor with one axial bearing each at both ends. By means of combining motor and axial bearing the length of the drive shaft could be reduced significantly. This had a positive impact on the rotordynamic behaviour. Moreover, in contrast to the solid shaft, the hollow shaft is much more rigid with reference to the weight. Thus, only 4 natural frequencies (maximum) had to be passed .

At the end of the project, a series of test pieces with hollow shaft was tested. However, only one test piece could be successfully spun up to 250.000 rpm. As a key issue the durability of the magnets in the carbon fibre bandages has still to be improved according to the extreme loads. For this reason, a follow-on project has been applied for. This project is to resolve the outstanding problems.

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