

Bearing Systems in Turntable Motors for CD/DVD applications.

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In the Consumer Electronics, it is a trend that competitors work closely together in the development of new systems. Cost aspects are very important. Only crucial parts for our products are still being produced by Philips. Parts that can be bought for an acceptable price are delivered by suppliers. The turntable motors of CD/DVD players are produced by suppliers. To be sure that the motors perform well enough in our current and future players, improved motors are constantly developed by our suppliers, in close co-operation with Philips specialists.

The turntable motor is the motor that drives the CD/DVD disk in a CD/DVD drive. The requirements on the turntable-motor depend largely on the type of CD/DVD player and the quality of other parts, such as the Optical Pick-up Unit (bandwidth), the stiffness of the module and the resonance frequencies of the module.

As the speed of data-processing is continuously increasing, it shall be clear that the requirements on all the assembly parts, including the turntable motor are increasing rapidly.

For example, the motor of a CD audio player operates at typical speeds of about 600 RPM, whereas the motors in recent DVD-ROM and DVD R/W players operate at speeds above 8000 RPM. And both the track pitch and the spot size for DVD have decreased about a factor 2.5 compared to CD.

For the turntable-motor this has the following consequences:

- The motor bearing load is increasing (proportional to n^2);
- The running accuracy of the motor must increase;
- The allowable tilt error of the disk decreases;
- Disc vibrations become critical;
- The number of revolutions during life increase;

In this presentation some of the tribological aspects of turntable motors shall be discussed. For example, which bearing type can meet the requirements? Should conventional plain bearings, sintered bearing bushes, spiral groove bearings or roller bearings be selected? Which solution is cost effective? What should be the bearing dimensions? Can the bearing be lubricated for life? Should the bearing be pretensed?

The way in which we work together with our suppliers on these issues shall briefly be discussed. Finally, the tools which are available at Philips to predict the motor performance and reliability shall be shown.

- numerical programs
- experimental setup for fast scanning of new motors
- life testing
- reliability studies