

VIBRATION CONTROLLED DETERMINATION OF THE CLUTCH ANGLE FOR SINGLE-SHAFT COUPLINGS

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ABSTRACT

The combination of gas and steam turbines within a single shaft for the production of electrical energy provides high efficiency as well as flexibility with respect to different primary resources and overall operating properties. To benefit these advantages the steam turbine is separated from the generator and gas turbine shaft by a self-shifting and -synchronising (SSS)-clutch. The coupling of the steam turbine results in bearing vibrations dependent on random angles between the two shafts after the joining process. For some coupling angles these vibrations may exceed prescriptive limits causing the security equipment to shut down the whole unit, while other angles meet the operational demands.

This paper introduces a combined concept for the identification and adjustment of coupling angles with low amplitudes of vibration at the bearings. The method is based on the theory of rotor dynamics and needs only few measurements of the bearing vibrations next to the SSS-clutch and the rotation angle between the two shafts. The bearing vibrations are displayed as orbits of the shafts central point. Using the complex calculus, these elliptical orbits can be separated into a circular part revolving in the rotating direction and another circular part revolving in the opposite direction. Depending on the phase shift between the unidirectional parts of both shafts angles with low bearing vibrations can be identified.

The identification concept of advantageous angles is applied to measurements of operating units. The determined coupling angles are in good accordance with the measurements as shown in the paper.

Keywords: Cogeneration, control, rotor dynamics, bearing vibrations, SSS clutch