Prevention Methods of Self-excited Vibration due to Dry Friction of Vertical Rotor

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Long Abstract

ABSTRACT

Recently, because of performance upgrade s of rotating machinery, the clearance between rotating parts (Rotor) and stationary parts (Stator) has become very small. Therefore, vibration problems by the contact of rotor and stator often occur. In addition, with some types of rotating machinery, the sliding bearing without liquid lubrication is also used. In such condition, the rotor and the stator always come in contact at bearing sliding surface. So, if the contact condition of rotor and stator is severe (such as friction constant of sliding surface is high etc.), various vibration problem s may occur.

Typical vibration problem by friction is self-excited vibration due to dry friction (often called “Friction Whip”). Usually, this type of vibration is prevented by low friction coefficient of sliding surfaces. However, if we can accept high friction coefficient of bearing sliding surfaces, we may use more high performance bearing materials (wear resistance, strength, chemical, durability, material cost, etc.).

In this paper, it is investigated that the characteristics and the prevention methods of self-excited vibration due to dry friction between rotor and stator by experimentally approach.

Figure 1 shows the test rig of vertical type simplified rotating machinery. The vibration behavior of “Friction Whip” on this test rig was investigated (Fig.2 shows an example of the vibration behavior). Next, the effects of various parameter of the system were investigated , and then, the prevention device of such vibration was devised in this study. This device is able to cancel out instability effect of friction force on the rotor. As a result, the “Friction Whip” of the test rig was controlled effectively by this device.

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See other references on full paper.

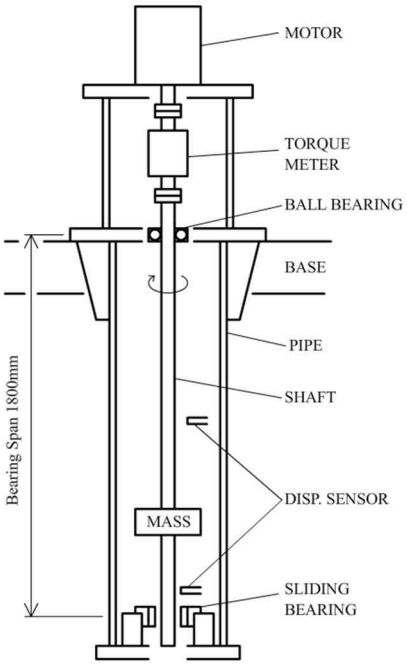

Fig.1 Test Rig

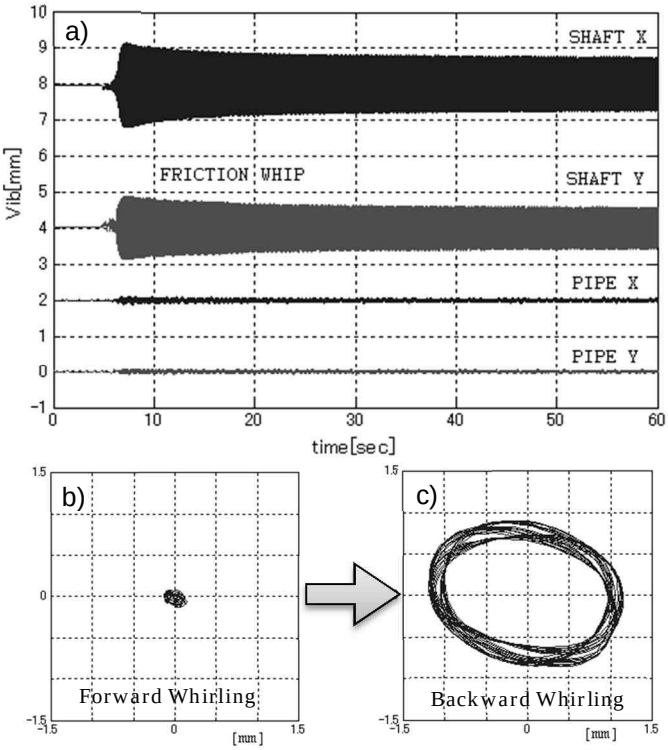

Fig.2 An Example of Friction Whip

a) Time wave of shaft and pipe
b) Shaft orbit (without Friction whip)
c) Shaft orbit (with Friction Whip)