SKF Microlog Balancing Module

Summary and basic theory

Summary

This application note describes the benefits of balancing a machine, how the SKF Microlog modules help to detect and rectify unbalance, the causes of unbalance and some basic theory to help users understand the principles of the balancing procedure.

Reasons for correcting unbalance

When an unbalanced shaft is put into operation, the unbalance then causes:

- Excessive loads on the bearings
- Reduced bearing life
- High vibration levels
- High noise levels
- Reduced machine life
- Reduced product quality
- Operator fatigue or injury
- **Increased costs**

Other SKF modules related to Balancing module

The **Conformance Check module** gives an unskilled person a simple pass or fail indication as to whether a machine is within its balance limits.

The **Analyzer module** provides spectrum and phase information to allow a semi-skilled person to confirm that unbalance is the root cause of high vibration. (Time can be wasted in attempting to balance a machine that isn't suffering from unbalance.)

The **Bump Test module** is used to verify that a machine is not operating at a resonant speed. Unbalance cannot be corrected easily when a machine is running at resonance. The module can also be used to carry out a simple run down test with the same objective.

The **Balancing module** takes the operator through a very simple sequence of tests to locate and correct the position of unbalance on a shaft.

Figure 1. SKF Microlog with modules related to the Balancing module.

Causes of unbalance

Many rotors will have an asymmetrical distribution of their mass, for example, as a consequence of variation in:

- Product build
- Variation in thickness or density of material across an impeller or spindle
- Uneven wear during operation
- Uneven corrosion during operation

Single plane balancing

Single plane balancing is carried out where there is the possibility to attach one correction weight. Therefore, vibration is only measured in one position.

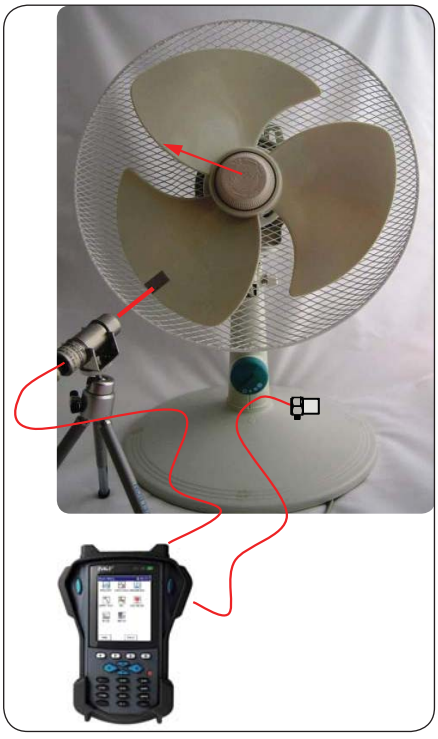

Figure 2. Single plane balancing example.

Dual plane balancing

Dual plane balancing is carried out where there is the possibility to attach two correction weights. This requires the measurement of vibration in two positions.

Figure 3. Dual plane balancing example 1.

Figure 4. Dual plane balancing example 2.

Basic theory 1 of 3

Each blade of a spinning rotor will exert a centrifugal force on the center line of the shaft. Provided that each blade exerts exactly the same force at equal spacing, then the center of gravity will coincide with the axis of the shaft.

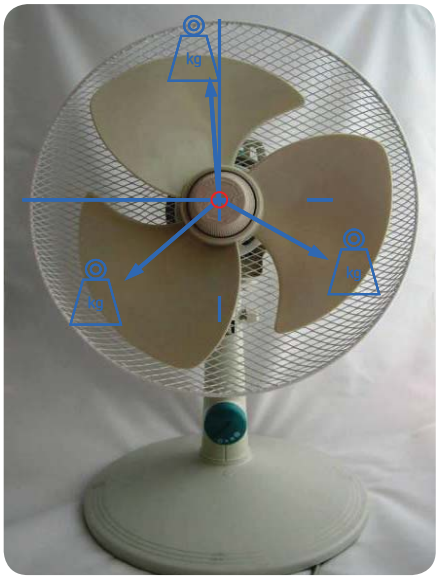

Figure 5. Exerting centrifugal force on the center line of the shaft.

Basic theory 2 of 3

If the distribution of mass on a rotor is uneven, then the center of gravity will not lie over the center line of the shaft. As the shaft spins, the eccentric center of gravity will try to force the machine off its center line, resulting in high vibration.

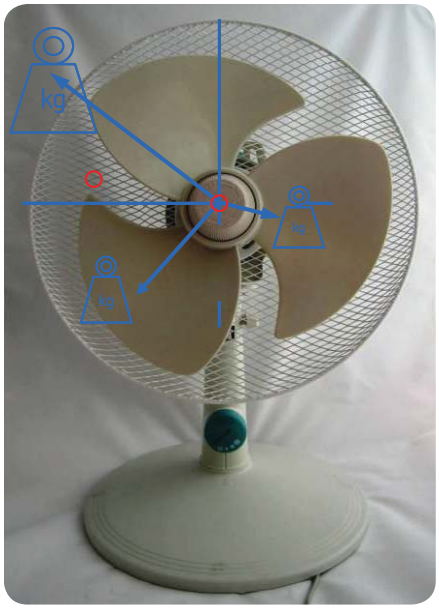

Figure 6. Uneven distribution of mass.

Basic theory 3 of 3

In reality, it is not possible to see the position of the rotating center of gravity.

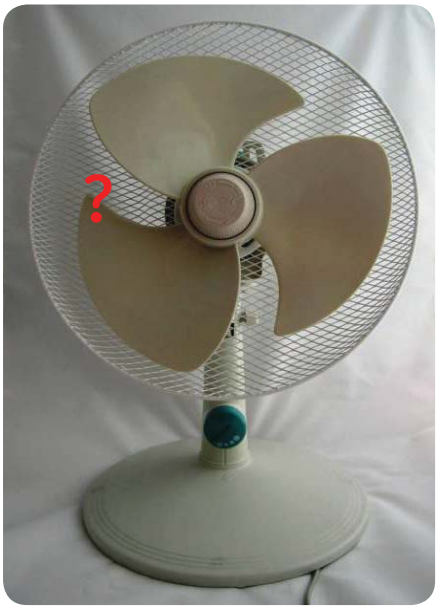

Figure 7. Rotating center of gravity cannot be seen.

By using the Balancing module, we can take vibration and phase readings to establish the magnitude and position of the unbalance force. The software will then tell the operator where to attach the correct amount of compensation weight.

Alternatively, the software will tell the operator where and how much material to remove. Both alternatives return the center of gravity to the center line of the shaft and reduce the vibration and loss of revenue.

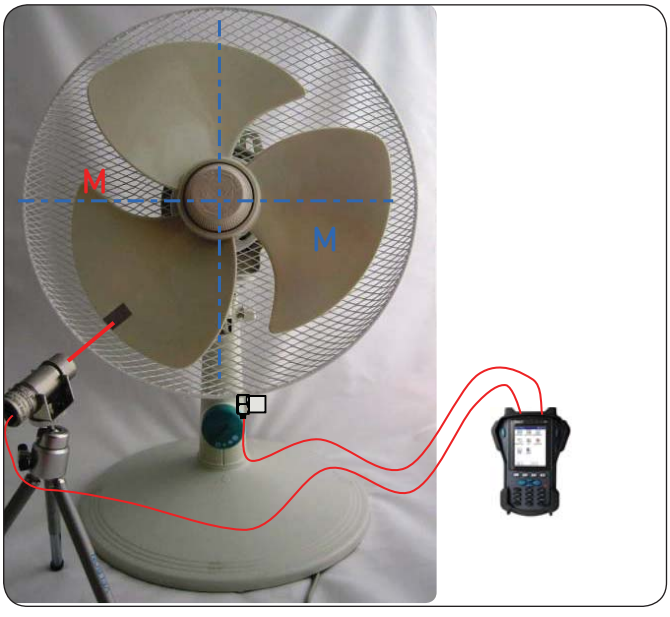

Figure 8. Using the Balancing module.

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