Case History	Unstable Vibration of Steam Turbine Generator	Rotating machinery (turbine & generator)
Self-excited Vibration		

Object Machine

Thermal power steam turbine (Fig.1)

Observed Phenomena

During low load operation after reaching the rated rotational speed, unstable vibration occurred at the No.1 and No.2 bearings of the high and intermediate pressure turbines. (Fig.2)

Cause Presumed

As a result of frequency analysis and running test during changes of lubrication oil temperature, oil whip was assessed to be the cause.

Analysis and Data Processing

(1) A result of frequency analysis showed that the major component is 1,450 rpm, which is about 1/2 of the rated rotational speed.
(2) Increasing the lubrication oil temperature reduces the unstable vibration. (Fig.3)
(3) Comparison of bearing temperatures during operation clearly indicates that the bearing metal temperature at the vibration occurring positions is lower.
(4) A result of check of alignment when assembling indicates that the HIP-LP coupling alignment (HIP decreasing) was set at a large amount compared to the actual machine.

Judging from the above analysis results, it was estimated that the unstable vibration was caused by oil whip that occurred due to a decrease in No.2 bearing surface pressure.

Countermeasures and Results

After conducting a shim up to increase the No.2 bearing surface pressure, no vibration has occurred. The increase in the No.2 bearing surface pressure was checked by the increase in the bearing metal temperature.

Lesson Learned

It is important to set an appropriate amount of alignment at the time of assembling a turbine. It is also vital to pay attention to an amount of changes when setting the alignment.

References

Nothing in particular.

Keyword

Turbine, generator, self-excited vibration, oil whip, alignment

★ Improper alignment setting is often related to unstable vibration of multi-span rotors, which requires attention. Beware also of alignment in the horizontal direction.

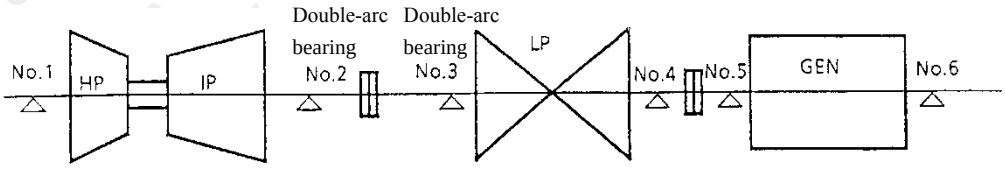

Fig.1: Steam turbine generator

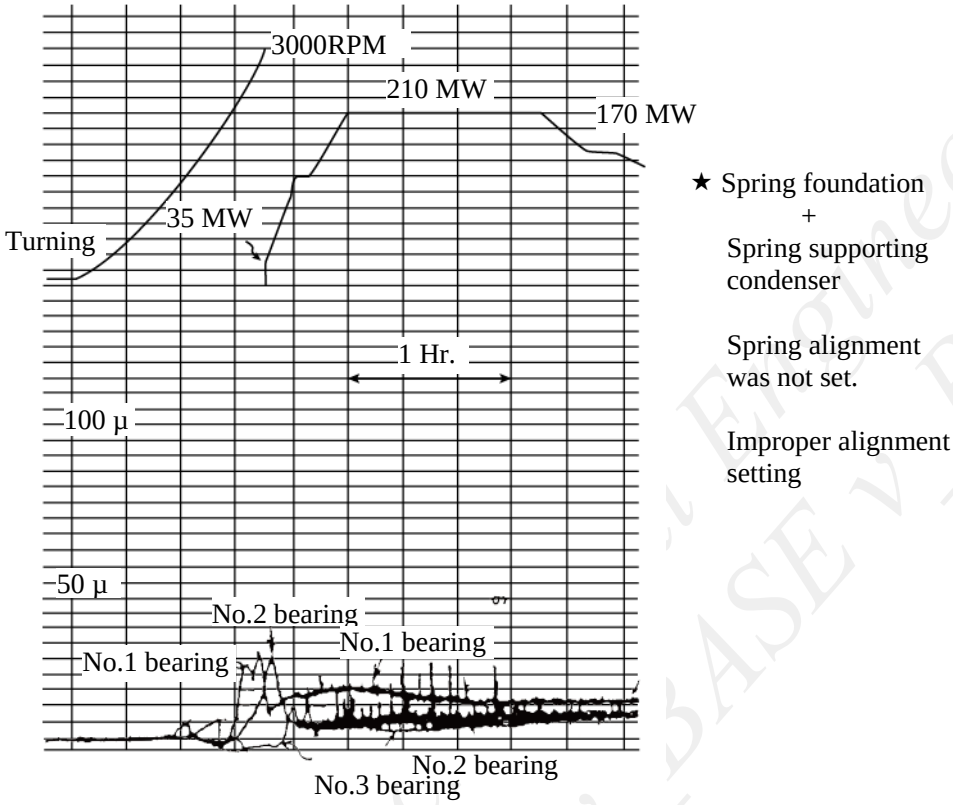

Fig.2: Bearing vibration phenomenon

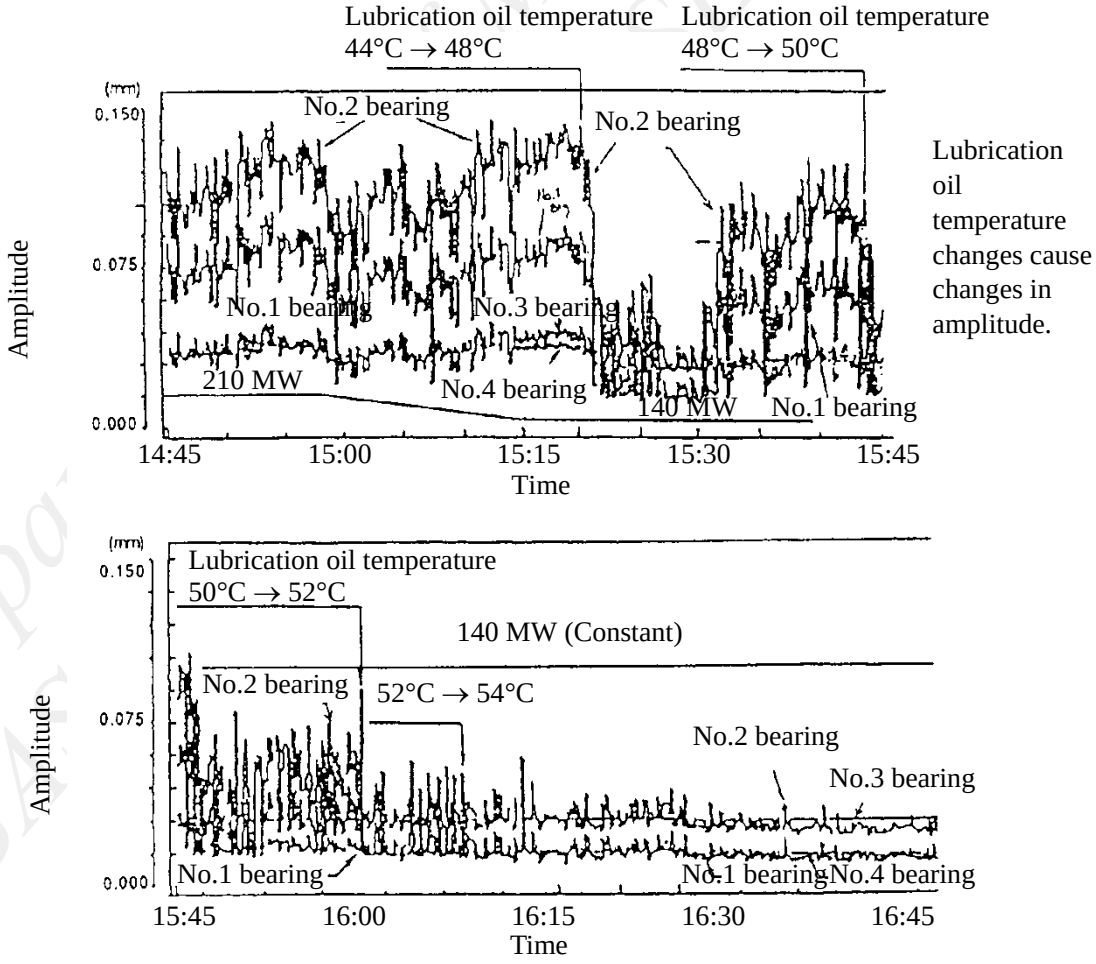

Fig.3: Bearing lubrication oil temperature and shaft vibration