

since the scope did not include the generator. Power Diagnostics® Services were significant in preventing a forced outage.

The turbine-generator set has one high pressure and two low pressure turbines and a water cooled generator. The turbine and generator side at the low pressure turbine, the turbine and exciter side at the generator, the exciter bearing and the shaft pump were examined by vibration test points (see figure 8).

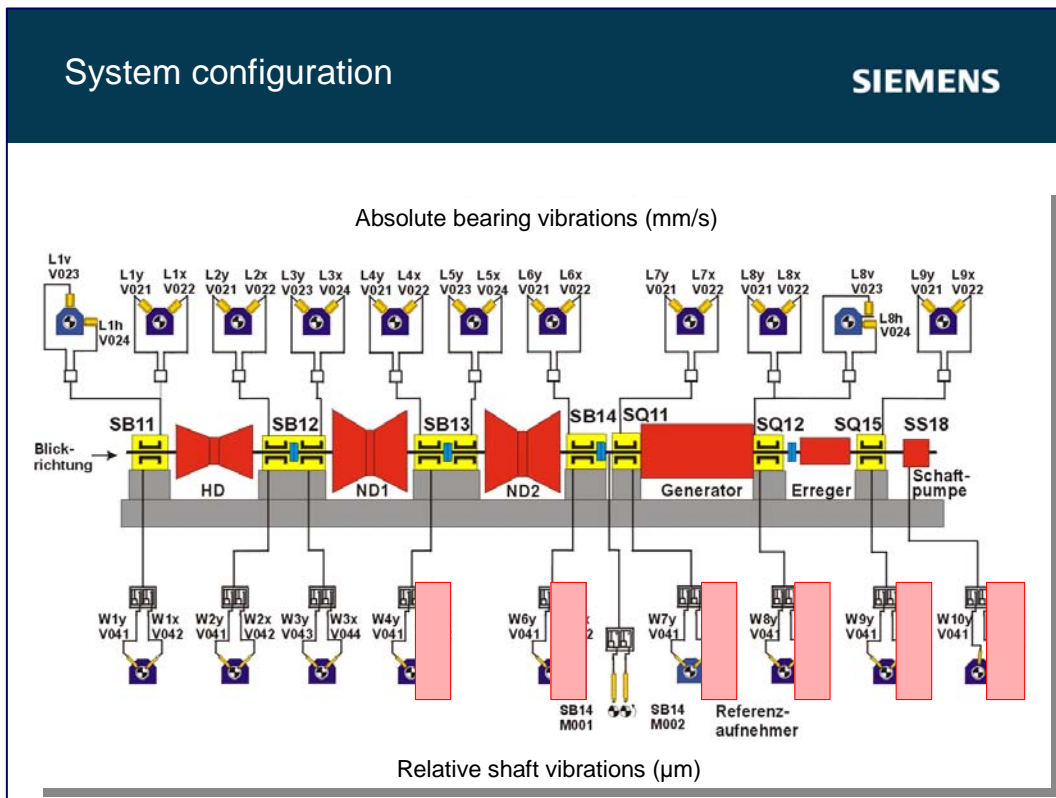


Figure 8: System configuration and vibration test points

Examination of the vibration behavior between 10th February – 10th March showed changes in the vibration behavior as from 21. February (see figure 9). The measurement values were still under the limit values so the operator was not really alarmed. Concerning vibration issues changes are always indications, even if limit values were not exceeded therefore the situation was seen as a task force issue.

In order to get a detailed view of the vibrations the summarized values of the amplitudes as well as the vibration vectors were examined. The vibration vectors showed high changes of the vibration level - about three times higher. The high variations of the vibration level indicate a generator vibration problem (see figure 10).

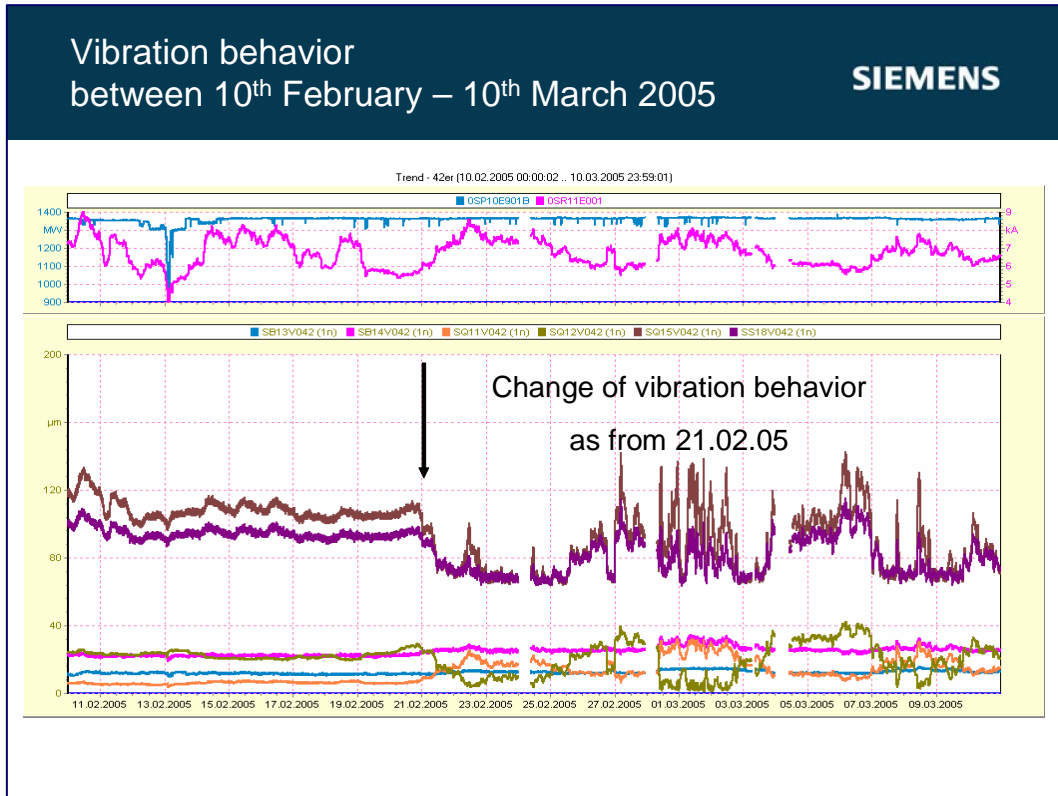


Figure 9: Vibration behavior between 10th February and 10th March

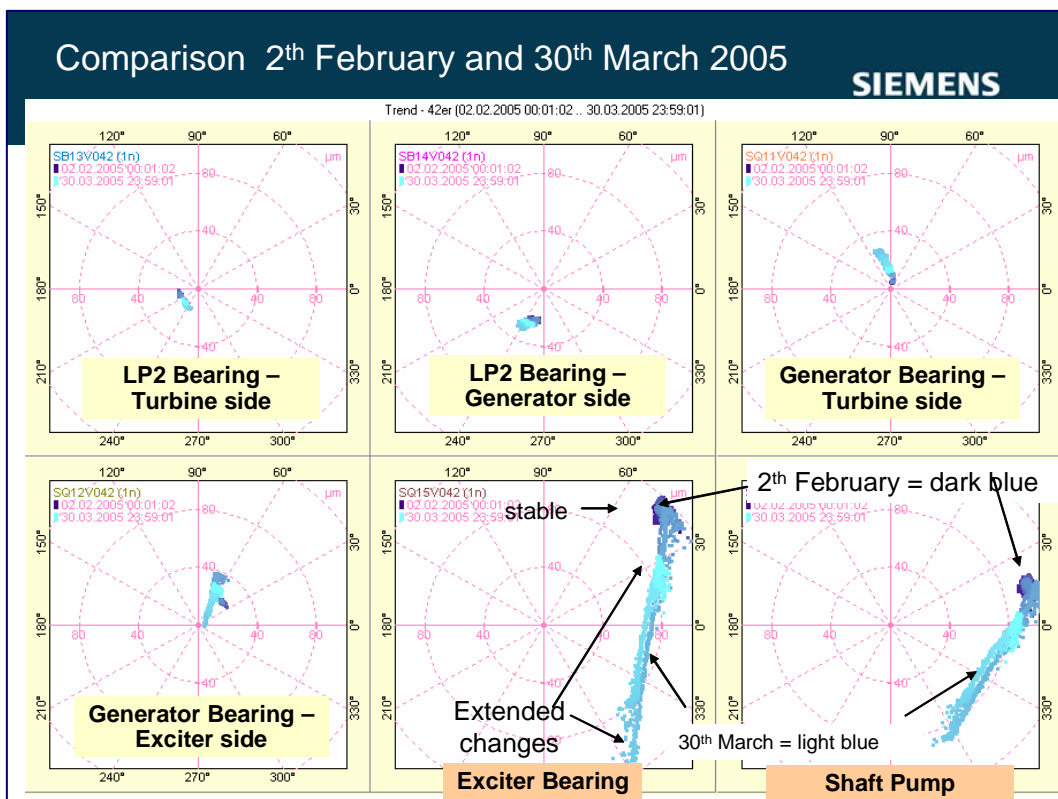


Figure 10: Comparison 2nd February and 30th March

Experts gather from the significant changes of the vibration levels based on the know-how from development & design and the experience an exciter current depending issue. On this account a correlation vibration behavior versus excitation current was realized. Following distinctive features could be determined

- ❑ No linear correlation between exciter current and vibration level
- ❑ Increased vibrations at higher and lower excitation current
- ❑ Lowest vibration level at 6,8 kA excitation current

(see figure 11)

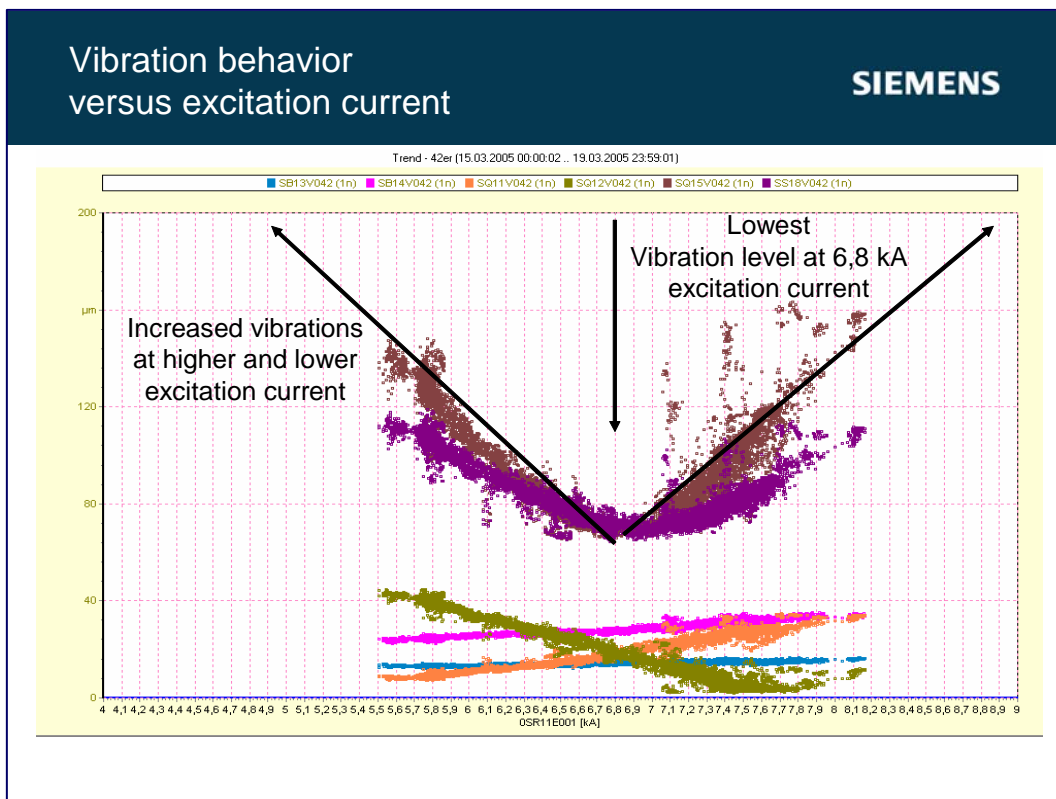


Figure 11: Vibration behavior versus excitation current

Based on this results following statements were made:

- ❑ The typical vibration behavior with regard to the exciter current influence has been changed since 21. February
- ❑ There has to be an additional influencing parameter which has a high dependency on the exciter current and causes the vibration

One possible reason for this behavior could be the influence of the primary cooling water temperature on the vibration behavior. An additional test was realized to analyze the behavior of the vibration by changing cooling water temperature under constant excitation current.

The result of the test showed that the machine had an identical behavior (see figure 12).

