

Vibration problems at a control oil pipeline in a power plant

Since the commissioning of a power plant, increased vibrations were observed at the control oil pipelines of a valve of the steam turbine as well as on the steel frame of the turbine. The manufacturer was able to reduce the pipeline vibrations by 30 % to a maximum vibration velocity of $v = 144$ mm/s by modifying the pipeline and by installing different vibration dampers. Nevertheless, strong vibrations on the pipelines on the floor of the turbine were noticed. According to the manufacturer, they resulted from a residual imbalance of the turbine shaft. Of course, the operator of the plant was not satisfied with this situation. Therefore, he asked KCE to carry out a metrological analysis during a planned standstill of the plant.

Magic formula to solve the problem was – as realised in many other projects before – to measure the pipeline, actuator and bearing vibrations of the steam turbine simultaneously together with the pressure pulsation in the control oil system.

During the shutdown of the plant the vibration situation changed only marginally with the slow reduction of load. However, when afterwards the rotational speed of the turbine being free of load fell down, the vibration level at the control valves even increased. By means of an impact test with a modal hammer during standstill of the turbine the cause for this phenomenon could be quickly revealed. A slightly damped natural frequency of the whole actuator just below the operating speed of the turbine was responsible for the increased vibrations. It led to a vibration excitation of the connected control oil pipelines and via the stiffened support structure also to vibrations in the floor area. For the reduction of the vibrations the shift of the mechanical natural frequency by stiffening of the suspension of the actuator was recommended. The implementation of this measure was carried out by the manufacturer, who stiffened the flange on the housing of the control valve.

Since the realisation of this measure the operator of the plant is absolutely satisfied as the vibrations on the frame of the turbine disappeared completely.



Contact:

Dr.-Ing. Johann Lenz
Telephone: +49 5971 9710-47
j.lenz@koetter-consulting.com