

Cost-efficient reduction of vibration.

Vibrations in the neighbourhood of a compressor station successfully reduced.

During the operation of a reciprocating compressor station, significant vibration effects occurred in an office building in the neighbourhood. These were so strong, that employees at CAD workstations on the first floor sat in front of vibrating tables and undisturbed work was impossible.

Previously, there had already been various investigations with elaborate proposed solutions whose implementation costs were between 250,000 and 500,000 Euro each. Against this background the operator wished for a cost-effective, practical solution.

To the starting situation: The station consists of two identical, 2-stage, double acting reciprocating compressors. The compressors are driven by electric motors with each 1,400 kW drive power. Both compressors are mounted on a common foundation plate.

The total flow rate is controlled by a bypass. For this purpose, each compressor has a control valve, which returns the surplus quantity of the first stage back to the suction side. Both control valves are connected in parallel and are controlled electro-pneumatically.

A metrological investigation of the vibrations showed that the vibration situation in the neighbourhood was characterised by strong oscillations with a cycle duration of about 12 minutes.

In addition, a change in load of the compressors had an influence on the vibrations.

Through an increase in load, the slip of the drive motors changed and with this the cycle duration of the beat phenomena in the neighbourhood. At a fixed phase shift between both compressors, there was a minimum of vibrations in the neighbourhood.

Based on these results, the following measures were conceived and implemented at short notice:

- Installation of a top dead centre (TDC) sensor on the flywheels of the compressors
- Logging of the output signal from the PLS-system as phase shift of both compressors
- At an increase of the phase shift above a defined upper reaction threshold additional closing of the bypass valve of compressor A with 4% and additional opening of the bypass valve of compressor B with 4%
- As a reaction to this the trend of the phase shift changes through the different load of the compressors
- On reaching a defined lower reaction threshold, adjustment of the control valves in the opposite direction

The measurement after implementation confirmed the success of the measure, because the detected vibration velocities were well below the required values – with unrestricted availability and performance as well as costs well below 50,000 Euro.



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