

Service Insights

Couplings Technologies | Oil & Gas | Replacement | EMEA

Application	Compressor - Injection
Product	BHS Diaphragm Coupling, Type MKB 224IIS
Country	Angola
Operator	European oil & gas major

Voith diaphragm coupling solves vibrational problems

The operator of an FPSO ship off the west coast of Africa is confronted with vibrations of two compressor trains during commissioning. He therefore approaches the train OEM, who in turn approaches Voith, as the conclusion can be drawn that the turbulence heat of the multi-disc coupling of non-Voith production is the cause. The Voith service team provides the solution to the problem with a BHS diaphragm coupling.

Viewpoint of customer: During commissioning of two compressor trains (each with 1x low-pressure, 1x high-pressure compressor) for gas injection into an oil field on an FPSO ship (Floating, Production, Storage, Offloading) in May 2008, high vibrations occur on the output side of the pinion shaft as well as on the input shaft of the low-pressure compressor from 97% of the nominal speed. Both shaft ends are connected by a flexible multi-disc coupling. The temperatures at the coupling casing and adapter are sometimes much too high at over 130°C / 266°F and the vibrations increase with the temperature increase. The compressors are driven by a gas turbine with variable speed, behind which a turbo gearbox from non-Voith production is connected.

Several balancing rounds of the strings on site were necessary on the part of the drive train OEM in order to operate both compressor units for the first time and to enable the feeding of gas. Neither this party nor the plant operator want to risk repeated balancing in the field if the coupling or rotor has to be removed or reinstalled for future maintenance work. The approach is to redesign the coupling and oil system.



Low pressure compressor, coupling with casing and transmission of the string

Oder: The plant manufacturer's positive experience with BHS diaphragm couplings from Voith in other projects was reflected in the fact that an exchange of the previous flexible coupling between turbo gearbox and low-pressure compressor (LPC) was intended to solve the vibration problem.

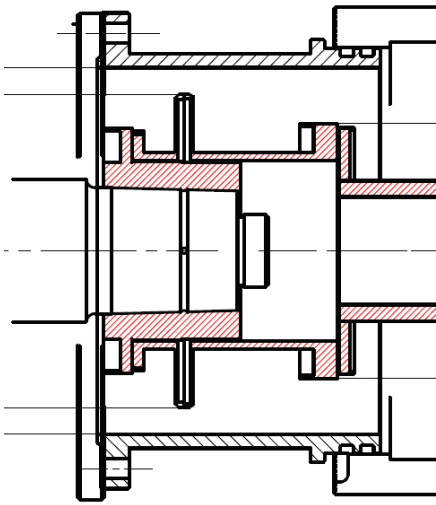


Initial design with problems

Insights:

In order to determine whether the observed phase shift corresponds to a resonance, a lateral analysis of the high-speed shaft system consisting of pinion, coupling and LPC is performed. The analysis of the plant manufacturer shows that

- there is a resonance field in the operating range, but the vibrations remain low with a well-balanced coupling
- any imbalance in the coupling automatically leads to high vibration in the bearing of the pinion shaft and the LPC, which is difficult to compensate
- the multi-disc coupling is very sensitive to unbalance
- the multi-disc coupling generates a high temperature in the casing at high speed, which causes such an imbalance.



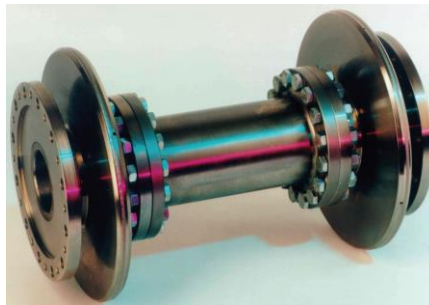
Cross section of the BHS membrane coupling - little contact surface for air turbulence and sufficient space for coupling casing

Technical Details: The Voith diaphragm coupling as current solution

- has a lower overhang moment due to 45% reduced weight of 13.8 kg / 30.4 lbs compared to 24.5 kg / 50.0 lbs for the initially used multi-disc coupling and thus shifts the critical speed from 15200 rpm to 22500 rpm

- reduces the turbulence heat by its smooth design of the flexible diaphragms as well as its 30% reduced outside diameter of the screw connections from max. approx. 130°C / 266°F to max. approx. 80°C / 176°F and thus avoids or switches off the clutch imbalance
- reduces vibrations by up to 50% to a minimum of 6 micrometers without a single balancing run

In addition to replacing the coupling, the drive train OEM has installed an active extraction system on the oil system.



Solution: BHS membrane coupling from Voith with excellent properties

How we make the difference...

Since October 2009, the previously problematic shafts have also been running with the BHS diaphragm coupling with good vibration values without a balancing run being necessary during commissioning. Also in the future, no balancing will be necessary after maintenance work on the compressor trains during recommissioning.

With a BHS diaphragm coupling, this and other customers have a product at their disposal that can also be retrofitted into existing systems. This coupling

- is wear-free and highly reliable
- has low axial loads and lower restoring forces
- does not excite vibrations itself
- has the best rotor dynamic properties due to its low weight

More about the Voith product at:

www.voith.com/BHS-Turbogears

More about Voith Service at:

www.voith.com/turbo-industry-service

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