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Article

A Study of Geared Variable-Speed Coupling for Low-Speed Driven Machines

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A B S T R A C T

Geared variable speed turbo coupling as boiler feed pump drive. Having a mechanism of working of the geared variable speed turbo coupling(R-K coupling) and Variable-speed turbo couplings(S-coupling). This paper presents the detail study over the fluid coupling having a variable speed with gear inputs for low-speed driven machines. Considered a flow coupling R16 K-1 with the specifications and particular input the design calculations and analysis were be taken to decide the performance of the fluid coupling with low-speed driven machines. This paper concludes the design, functioning, performance with experimental results of the variable speed coupling.

Keywords: Fluid Coupling, Variable Speed, Experimental Results

Introduction

Coupling is a device used to connect two shafts together at their ends for the purpose of transmitting power. The primary purpose of couplings is to join two pieces of rotating equipment while permitting some degree of misalignment or end movement or both .The control requirements of low-speed driven machines such as coal mills, I.D. fans or crude oil pumps, vary greatly.Depending on the application and for optimum adaptation to the existing space conditions, the gear stage is designed as a helical gear or bevel gear.

Design and Function

For low-speed driven machines,the turbo coupling is fitted with a reduction gear on the output. Coupling and gear stage are situated in a common housing,the lower part of which serves as an oil reservoir. By adding a Voith hydrodynamic brake (optional),with an appropriate breaking torque characteristic,heavy masses of the driven machine can be rapidly decelerated Figure 1.

Oil Supply

Both working and lube oil are supplied from the integrated oil tank. The oil system can also be used to supply both the motor and the driven machine with oil.

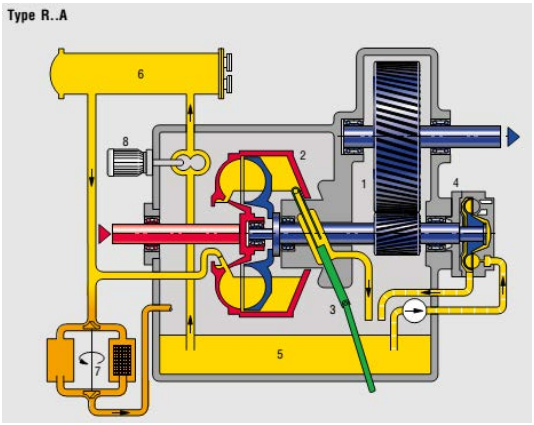


Figure 1.Low-speed driven machines

Geared Varible-Speed Coupling Type R.A.

- Gear stage
- Hydrodynamic variable-speed coupling
- Scoop tube (adjustable)
- Hydrodynamic brake (optional)

- Oil supply
- Working oil cooler
- Duplex filter
- Oil pump

Type R.A.

The variable-speed coupling is fitted with a helical reduction gear on the output side. Typical driven machines are coal mills, crushers,low-speed pumps and fans.

Experiment

Geared variable speed turbo coupling: R16 K-1

Power requirement of driven machine: $P_{a=}$ 3186kW

Motor speed : n_e=1483rpm

Gear ratio : $U_1=z_e/z_{1=}$187/52

Primary speed : n_1=5333 rpm

Full load slip : s=2,1 %

Output speed turbo coupling: : n_a=5220rpm

Regulating range: : 4:1 downwards

Oil tank filling: : approx. 700 Ltr

Filling pump (centrifugal pump) and jointly driven as gear-tooth Lube oil pump (gear pump) system drive via the pump shaft

Auxiliary lube oil pump: 240 electric motor driven pump

Auxiliary lube oil pump motor: QU 132 S4 AAT

Technical data: 5.5kW;415V;50 Hz; 1500 rpm; IP 54;B5

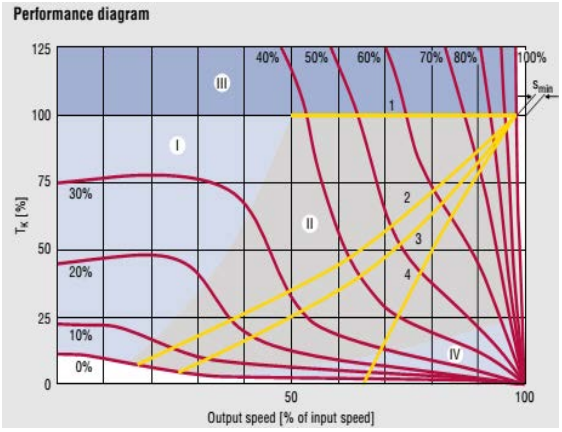
Lube oil for external units: 120litres/min Pressure 5.5bar

Scoop tube actuator: Marton air SPWG 2222B special; with manual adjustment

Signal: 4-20mA

The main functions of Geared variable speed turbo coupling, or R-coupling can be classified into four mechanisms:

Requirements under normal loading and operating



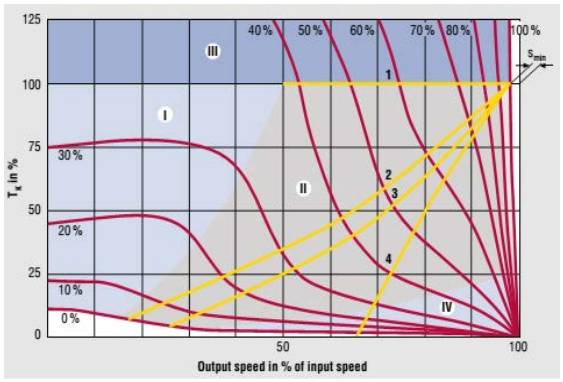


Figure 2. a) and b) Performance diagram for different output speeds

conditions: Viscosity:- From 28.8 to 35.2 mm^2/s at 40°c Starting viscosity under conditions applying at the location of use not above 250 mm^2/ s for gear pumps with adequate drive power up to 400mm^2/ s.

Result Graph

With the percentange of torque developed by coupling the different output speed have been recorded along with the input speed Figure 2.

Conclusion

It is essential for the designer to have a good working knowledge of the mechanical features of shell and tube heat exchangers (STHE) and how they influence thermal design.

Fluid couplings were the one which are more efficient for the low speed machines, the result graphs were indicating the conceptual increase of the flow of fluid at varieng input speed with percentage of perticular torque exerted by means of coupling.

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