

Analysis And Design For Screw Compressor

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Abstract- Compressed air is one of the major energy consuming utility in any industrial operations and is often referred to as the “fourth utility”. This project report contains the detailed discussion on the oil free screw compressors. Compressed air is the necessity of most of the industries around the globe. The compressed air is produced by different methods. One of the production of compressed air using oil free screw compressors is one of the efficient methods in term of pressure & power consumptions.

This report deals with the construction, working and various aspects that are necessary for efficient production of compressed air for industrial use.

Keywords- Rotor, Screw compressor, CFM, Tooth profile, Clearances, Solid Works, CFD

I. INTRODUCTION

Air compressor is a machine designed to store air under pressure and release the pressurized air in a controlled fashion as per the requirement. It uses positive displacement mechanism and it is also used to replace piston compressor. Thus this rotatory screw compressor is a type of gas compressor. The gas compression process takes place due to continuous sweeping motion of rotary screw so there is very less possibility of surging of flow. Screw compressor gives output in CFM (cubic feet per minute). The main advantage of this compressor is, it supply continuous compressed air with very less fluctuation. It is applied for low pressure applications up to 8 bar. We can also use screw compressor in multiple stages.

Inbuilt component parts of screw compressor:

Air filter: - It removes the dust particles from the incoming atmospheric air.

Throttle valve: - It regulates the flow of air into the compressor elements during loading and unloading time which is actuated by unloaded cylinder.

Bleed off cooler: - During loaded operation air inlet throttle valve is open and unloading valve is closed. When the working pressure reaches the preset maximum, the pressure of

HP element is then released to inlet casing upstream of throttle valve. Bleed off cooler is used to cool this air.

LP element: - LP element houses two screw type rotors, mounted on ball and roller bearings. The male rotor driven by the step up gear and the female rotor are synchronized through timing gear, which maintain a slight clearance between the rotors. It is used to compress air to certain extent.

Intercooler: - During the compression process in LP element, the temperature of air increases which is passed into the intercooler for cooling by water.

Intercooler safety valve: - It protects intercooler by regulating the pressure inside the intercooler.

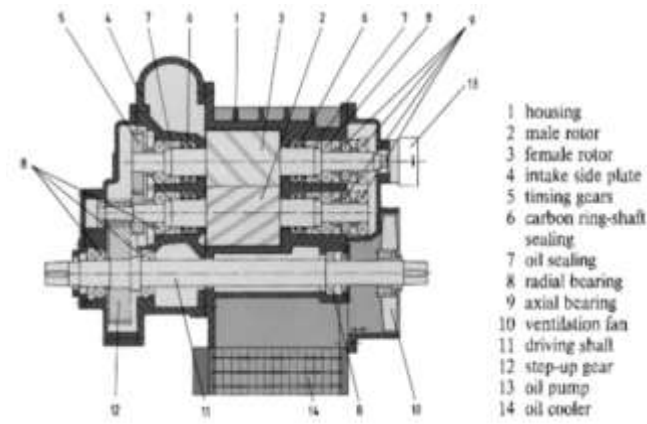
HP element: - It is used to compress air to required pressure.

Check valve: - It prevent blow back of compressed air from net when the compressor is unloaded or stopped.

After cooler: - During the compression process in HP element, the temperature of air increases which is passed into the after cooler for cooling by the water.

II. PROPOSED SYSTEM\CONSTRUCTION

The components of screw compressor are fitted inside housing as shown in fig. The rotor which is in direct contact with driving shaft is called as male rotor where the rotor connected to other end of male rotor is called as female rotor. Intake side plate is used to control the air inlet to adjust same pressure. Oil and water cooling methods are used to cool the gears or outlet air respectively. Water is used to cool both air or oil.



Methodology\Working of an oil free screw air compressor

The above discussed are the various parts that form the spine of the oil free screw air compressor. Let us now clearly know the working of the air compressor.

- Atmospheric air is drawn into the hump hose through the air filter.
- During the loading period the air is drawn into the LP element through the throttle valve.
- Here the air is compressed to certain pressure in the small clearance between the flute and lobe of screws.
- Then the compressed air is passed into the intercooler to reduce the temperature of compressed air.
- From here the second stage of compression occurs as the air flows into the HP element where the set level of pressure is obtained.
- The amount of compression depends on the speed of the flute and lobe.
- Then it passes through the check valve from where the compressed air passes through the after cooler.
- Temperature of compressed air is greatly reduced in after cooler from where the air goes to the air receiver.
- The moisture in the compressed air gets condensed to certain extent in the air receiver.
- The condensate is driven out through the drain valve which is provided at the bottom of air receiver.
- From receiver the air passes into the air drier where it is cooled to remove the remaining moisture and then reheated to room temperature so that the condensation does not form on the outside of pipe system.
- Then the air is passed in to the ultra filter where the compressed air is filtered from micro impurities.
- Then this compressed air is used wherever required in the industry.

III. CONCLUSION

Screw compressor has been used successfully for many years in institutional and industrial applications. Lowering the cost of screw compressor and improving their performance will clearly provide more opportunities for compressors and their technology. Screw compressor gives low fluctuation in air output.

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