

Maintenance Strategy and Prevention of Industrial Air Compressor from Failure

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ABSTRACT

Air compressor found in many industrial applications and is a crucial machine in gas transmission in pipelines, petrochemical plants, refineries, etc. After a period of life unexpected failures of internal components due to miscellaneous reasons occur, which affects the operating system performance. For better performance of Air compressor a good maintenance strategy required. This paper presents a case study on air compressor used in heavy Industry and associated problems, diagnosis and effective solutions supported by appropriate maintenance strategies for overhauling and repairing arising out due to frequent failure of parts and improving life of compressor. It is predominantly essential to establish the recommended clearances given for the various parts of the compressor. Based on dimensional measurement of compressor parts selection of repair and replacement becomes easy and it is best for economical point of view.

Keywords : Crucial, Petrochemical plants, Diagnosis, Overhauling, Predominantly, Economical.

I. INTRODUCTION

In most industrial applications, compressed air is considered as the "fourth utility", preceded by the three essential utilities; water, electricity and natural gas. Typically, a simple air compressor is an industrial device that intakes ambient air and increases the pressure with reduction in volume by doing work on the working fluid, namely air or gas.

Industrial air compressors are heavy duty devices used to compress or squeeze components like air, water, gas and oil. Generally large in size, they are capable of producing great levels of pressure to power large-scale, complex systems. Considered an essential component among different industries, they are highly used to run major industrial and manufacturing equipment, including those that incorporate hydraulic or pneumatic operating components.

A good maintenance management system coupled with knowledgeable and capable maintenance and operation staff can prevent health and safety problems and environmental damage; yield longer asset life with lower

breakdowns and downtime; and result in lower operating costs, higher productivity and profitability and a higher quality of life.

II. METHODS AND MATERIAL

1. Objective of Good Maintenance

The objective of maintenance is to maximize the performance of equipment by ensuring that equipment performs regularly and efficiently, by attempting to prevent breakdowns or failures, and by minimizing the losses resulting from breakdowns or failures, and maintain or increase the reliability of the operation of construction plant & equipment. Maintenance is an important factor in quality assurance, which is another basis for the successful competitive edge. Inconsistencies in equipments lead to variability in product characteristics and result in defective parts that fail to meet the established specifications. Beyond just preventing break downs, it is necessary to keep equipment operating within specifications that will produce high level of quality.

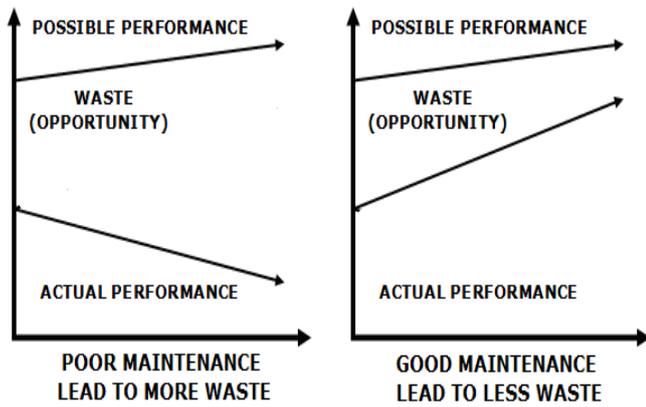


Figure-1

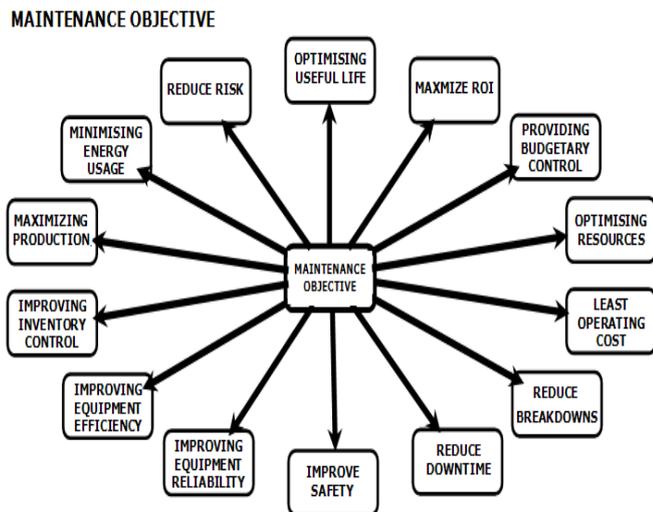


Figure 2. Maintenance Objective

Following are the list of objective:

1. Support operations by keeping plant & equipment in good condition so that maximum production can be met.
2. Maintain the plant & equipment in full efficiency so that it works in minimum energy usage.
3. Maintain plant & equipment in good condition so that there is minimum risk during operation and improvement in safety.
4. To ensure maximum useful life of equipment with lower operation cost.
5. To execute its program while optimize resource utilization with higher productivity.
6. To reduce plant and equipment breakdown hours.
7. To maintain lowest inventory and procurement of spares in time.
8. To improve plant & equipment reliability and productivity.

9. Conduct engineering projects like equipment modifications, construction, installation, and relocation.
10. Prepare for future changes by anticipating needs and organizing flexibly.
11. Achieve continued improvement by evaluating performance, taking corrective actions, and measuring progress.

Maintenance Vs. Organization Objective:

- Meet or exceed customer satisfaction.
- Maximizing profit, Meet set targets.
- Meet set safety standard.
- Minimizing cost of operation,
- Improving ROI.
- Improving quality of product.
- Zero product defect.

2. Preventative Maintenance Checklist for Air Compressor

Scheduled preventive maintenance and inspection are essential for continued optimum performance and long service life of the compressor and its components. An industrial air compressor required a schedule maintenance procedure for their continuous operation without failures to take place. So for this purpose A maintenance engineer provide a details maintenance procedure for every component of an industrial air compressor. These procedure for maintenance of every parts are given as.

Air Filter: Be sure to check it every month. If it becomes dirty, or you get a tune up have it replaced. It's easy to find and reach usually, it's the big round filter container at the top of the engine.

Belts and Hoses: Take a quick look periodically at belts and hoses. If any belts look frayed or worn, replace them. If your Hoses are bulging, brittle or rotten, they need to go. Bottom line. If a hose looks bad, or feels too soft or too hard, it should be replaced by a Quality Tune up professional.

Grease the bearings of the motor: Put new lubrication grease in the motor bearings, using the special lubricator.

Daily Maintenance:

- Check oil level of both compressor and engine if so equipped. Add quality air compressor lubricant as required.
- Drain moisture from tank by opening tank drain valve located in bottom of tank. Do not open drain valve if tank pressure exceeds 25 PSIG.
- Stop, Look & Listen for any unusual noise, failure to compress, overheating, vibrations or belt slippage and correct before damage of a serious nature develops.
- Turn off compressor at the end of each day's operation. Turn off power supply.

Checks to be Carries out Every 90 Days:

1. Check the inlet and bypass valve calibration.
2. Visually inspect the inlet air filter element. Clean (if filters can be cleaned) or replace as necessary.
3. Visually inspect the oil mist arrestor and refill the U pipe, if necessary. Clean the housing and replace the element if saturated.
4. Drain and clean the instrument air filter by replacing the cartridge, if necessary.
5. Inspect air filter internal parts, verifying the absence of cracks and ensuring correct seal.

Pressure Relief Valve: The pressure relief valve is an automatic pop valve. Each valve is properly adjusted for the maximum pressure permitted by tank specifications and working pressure of the unit on which it is installed. If it should pop, it will be necessary to drain all the air out of the tank in order to reseal properly. Do not readjust.

Tank Drain Valve: Drain valve is located at bottom of tank. Open drain valve daily to drain condensation.

Do not open drain valve if tank pressure exceeds 25 PSIG. The automatic tank drain equipped compressor requires draining manually once a week.

Tools: Always be sure that the trigger on the tool is not pulled when turning on the air compressor.

Voltage: Ensure that the machine is plugged into a properly grounded outlet. If your machine is plugged

into an outlet without the properly grounded electrical circuits, there may be damage to the electrical panel of the compressor as well as the possibility of a fire.

Maintenance schedule of an Industrial Air Compressor:

Action	Part or Item	Time					
		1 W	1 M	3 M	6 M	1 Y	2 Y
Inspect	Coolant Level	x					
Inspect	Discharge Temperature(Air)	x					
Inspect	Separator element differential	x					
Inspect	Air Filter (at full load)	x					
Check	Temperature sensor			x			
Inspect	Coolant filter Delta	x					
Inspect	Hoses			x			
Replace	Coolant Filter				x		
Clean	Separator scavenge screen and orifice					x	
Clean	Cooler cores				x		
Replace	Air filter			x			
Replace	Separator element			x			
Replace	V-belt and gas spring						x
Replace	Ultra coolant						x
Inspect	Starter contactors					x	
Service	Drive motor lubrication		x				

Figure-3 maintenance schedule of air compressor component (Sources-BHEL Bhopal)

III. RESULTS AND DISCUSSION

Maintenance Activity for Electrical Component of an Air Compressor:

- Check main panels.
- Check panel cooling Fan.
- Clean main pump inverter.
- Check all circuite breaker, magnetic conductor and relays.
- Check current setting of all circuite breaker and motor overload.
- Visual checking of all power and control cables.
- Check all motors terminals.
- Check and clean fluff & dirt at all motors fan covers.
- Check all pressure switches.
- Check calibration of main vessel and all addition tank.
- Check all signal isolators.
- Check setting of tangle sensors.

- Check all pneumatic solenoids.
- Check all indicating lamp.
- Check all ON/OFF switches.

IV. CONCLUSION

Common Air Compressor Problems:

1. Compressor will not operate.
2. Excessive noise in operation.
3. Knock same cycle as R.P.M
4. Knock occurs while compressor is loading.
5. Excessive oil consumption.
6. Oil in discharge air.
7. Compressor vibrates
8. Air blowing out of inlet.
9. Insufficient pressure at point of use.
10. Excessive belt wear.

Probable cause to these Problem:

1. No electrical power, low oil level.
2. Loose pulley, flywheel, belt, belt guard, cooler, clamps or accessories.
3. Loose flywheel.
4. Loose connecting rod nut.
5. Oil leaks, wrong oil viscosity.
6. Worn piston rings.
7. Mountings bolts loose, Pulley and flywheel misaligned.
8. Broken first stage inlet valve.
9. Leaks, slipping belts.
10. Pulley out of alignment, belt too tight or too loose.

Solution to above Problem:

1. Replace pressure switch to one that has a lower cut in PSI.
2. Tighten all loose ends, check for possible damage to bearings.
3. Replace bearing, replace rod.
4. Check piston assembly.
5. Clean Air filter, replace gaskets, clean filter assembly.
6. Check viscosity, drain down to full mark on sight gauge.
7. Realign, Tight belts, replace crank shaft.
8. Change valve plate assembly.
9. Adjust tension in belt, realign motor pulley with compressor flywheel.
10. Provide proper ventilation, change unloader valve.

In this Paper, a general framework for maintenance and improving performance of an Industrial air compressor and reduce the chances of failure as low as possible. A distinctive feature of the proposed approach is that the air compressor will operate with less breakdowns. The suggested approach considers operating constraints for compressors, several types of maintenance policies as well as managerial aspects regarding maintenance decisions. Various component of air compressor examined scheduled basis and improving their efficiency, also reduces cost of maintenance. The case studies solved have demonstrated that the simultaneous optimization of maintenance and operational tasks of compressors.

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