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Optimisation of Condition Monitoring Techniques Applied to a Three Stage 40 bar Reciprocating Compressor in a FMCG Industry

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Introduction: Reciprocating compressors play an important role in maintaining an efficient productivity in the FMCG industry. Any unpredicted breakdowns and faults would lead to high maintenance and operational costs. In the mean time, many different techniques have been developed for condition monitoring. However, the performance of techniques is highly application dependent and hence it requires a systematic study of them to determine those suitable for a large compressor .

Aim: This research will investigate into the development of a robust and cost effective system for the condition monitoring of a large reciprocating compressor in a FMCG industry. Different types CM techniques will be reviewed to identify the suitability for a 40bar three stage compressor. The measurement system, signal analysis and data management will be then developed based upon this compressor. In the meantime the techniques will also be evaluated head by head based on a smaller compressor in the lab.

Belliss & Morcom

Three Stage 40bar Reciprocating Compressor

Type : WH29H3N

Capacity at 40 barg m³/hr FAD cfm : 1800/1058

Delivery pressure bar(g) psi (g) : 40/580

Speed r.p.m : 735

Shaft power KW/HP : 286/384

Motor power KW/HP : 325/435

In engineering there is a huge range of possibilities of machine going from excellence to ridiculous. If the parts has not been changed in time, the possibilities of a catastrophe is very high. There will be a big downtime and the overall cost will be extremely unacceptable. The Monitoring of the Three Stage 40 bar Reciprocating Compressor will give the exact moment for the replacement of a part when found, the Planning department can arrange for a convenient time to replace the damage part. Condition Monitoring is the key to preventing failure from happening and the key to a good predictive maintenance and assists the preventive maintenance as well.

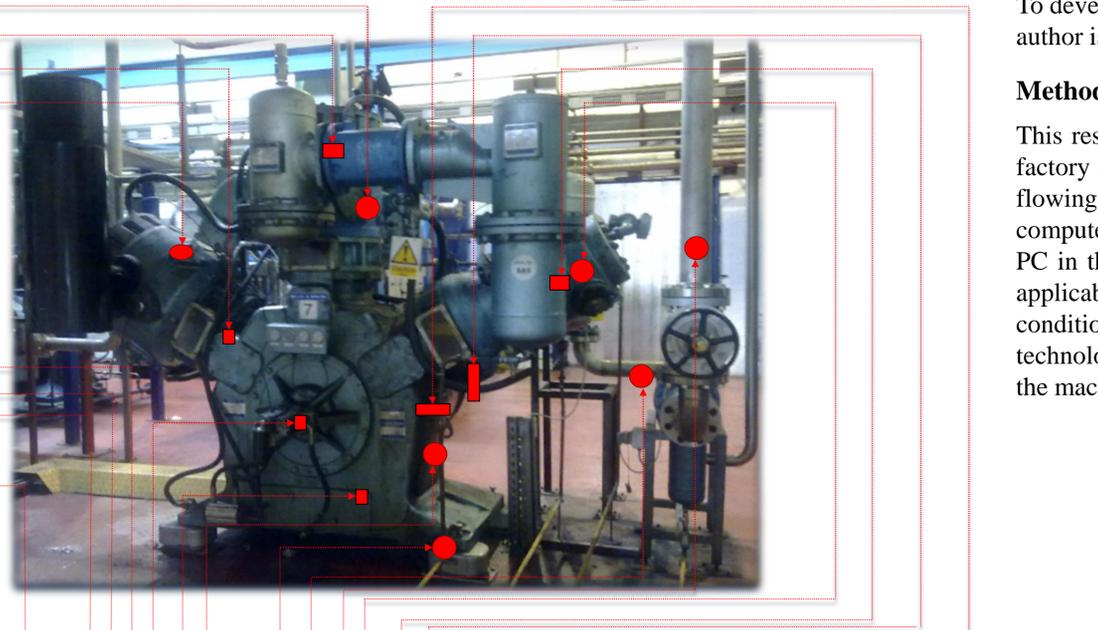
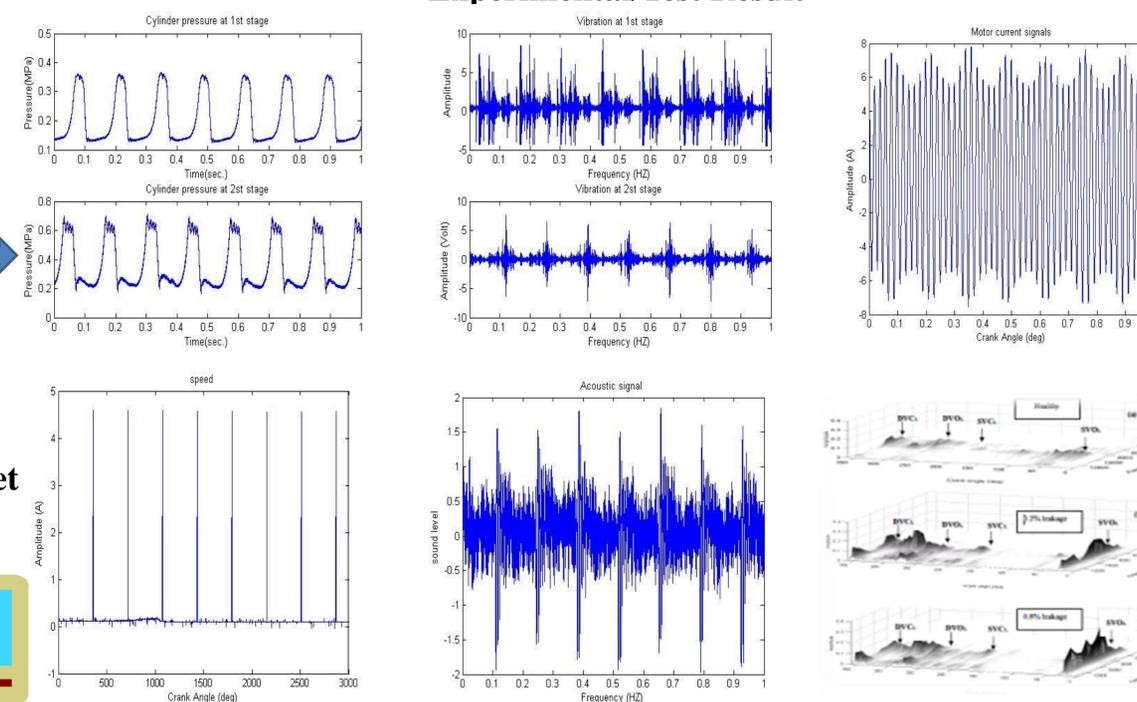
Objectives

- To gain the general knowledge of condition monitoring systems in the market and research community through intensive research and literature review.
- To study about the function of the data acquisition.
- To familiarize with Matlab software, write some programs, simulate under different operating condition.
- To study the behavior of three phase electric motor.
- To design and build a comprehensive reciprocating compressor test facility in the lab where faults would be seeded in order to gain experimental data on the subsequent system behaviour which could help in evaluating the methods that will be developed for the factory.
- To introduce specific, quantified faults into the compressor and to determine the effects on compressor performance.
- To capture the raw binary data file that contained the recorded data and remotely monitored it over the internet.
- To develop a system including data measurement, processing and management for the condition monitoring of a 40bar compressor in the company where the author is working.

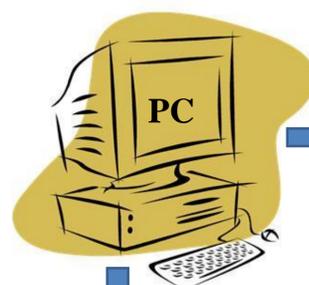
Methodology & Conclusion

This research will be fulfilled by a number of numerical simulation and experimental evaluation based on a lab model. It will then be transposed on a real factory environment. Data from accelerometers, microphones, pressure sensors, ultrasonic sensor, wear debris sensor, angular speed encoder and the current flowing in the motor will be amplified and filtered wherever required. The signals will be connected to a data acquisition system which will be linked to a computer using some advance software. The raw data will be captured then sent over the internet where it will be possible to remotely be monitored from any PC in the factory or the University. To enable a fast analysis and manipulation of the raw binary data files that contained the recorded data, a generically applicable user-friendly software program will be written in Matlab where the data could be analysed and decision could be taken. This is a novel approach of condition monitoring of a three stages reciprocating compressor application in a FMCG factory and that will be remotely monitored over the internet. This technology will save the company from making inappropriate expenses, improve the productivity, reduce downtime and help in focusing the improvement of the machine reliability.

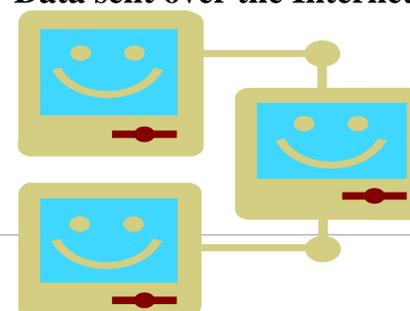
Experimental/Test Result



Data Acquisition System



Data sent over the Internet



Remote PC & Engineers taking decisions

