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Master Maintenance: It Is To Ensure The Availability Of Such Equipment And Its Production

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Résumé:- The effectiveness of the maintenance of the industrial systems is an economically challenge in the current strategic industry of cements for a country like Algeria, where quick and effective decision making is needed. Main difficulties and sources of inefficiency lies in the choice of maintenance actions to take in case of machine malfunction, especially when the machine plays a vital role in the process of production. Some decisions may result in heavy economical consequences. So, to avoid unexpected stops of production and the economic effects resulting therefrom, must continuously monitor the equipment and "stalk" all the warning signs of defects before it's too late. However, as this industry offers machines with complex installations or high security requirements, the reduction of operating costs and control of the availability of these facilities are required, must given to maintenance of the systems a stately role. Thus, and despite the age and complexity of the equipment, maintenance service must provide reliable and easily interpretable diagnosis to intervene only in the presence of defective items and therefore avoid the disassembly and reassembly unnecessary, targeting the faulty element, do the selective maintenance and thus minimize human errors and downtime for the repair, an objective of this work. For this purpose, must continuously adapt to technical, technological and organizational progress. Moreover, the need for cement in industrial environment in Algeria (Habitat and construction, East-West Highway, dams etc) imposes new implications for strategies of companies in this field. Therefore, this work is of major importance to the Algerian industry, especially cement or unexpected failures lead to high repair bills, excluding inflation and delay accumulated in different sectors, in particular the habitat and construction.

Key words:- cement, failure, diagnosis, repair, maintenance, disassembly.

I. INTRODUCTION

The effectiveness of the maintenance of the industrial systems is a major economic issue for their commercial exploitation. The main difficulties and sources of inefficiency reside in the choice of the maintenance actions to take especially when the machine plays a vital role in the process of production. So to avoid unexpected stops of production and the considerable economic effects resulting therefore must continuously monitor the equipment and "stalk" all the warning signs of defects before it's too late. Now, maintenance operations can be heavy consequences for several reasons. First of all, these interventions may affect reliability. They often require an interruption of operation of the system. In this case, during any phase of maintenance, the system is not operational. More the maintenance phase is long it is costly due to the unavailability of the system. Therefore the maintenance phase should ideally be reduced of operations to replace, without trial and error, equipment really down [1]. It is the case of the cement industry which has machinery and complex installations or pending case is more economical and systematic interventions are often unnecessary:

- expensive spare parts, labour and loss of production [2, 3],
- delicate because the high safety requirements, the reduction of operating costs and control of the availability of these devices are required [4].

Now, a maintenance action is to replace the equipment that have failed and who are no longer able to perform their function without disruption of the reliability of system [5], while avoiding the inevitable human errors during the stops and service discounts. All these requirements give maintenance service a prominent role while providing reliable and easily interpretable diagnosis despite the complexity and the age of the equipment. So get to minimize downtime and repair time objective this work.

Moreover, the Algeria embarked on major developmental projects in transportation, housing and construction (housing, highway, metro, trams, etc.) requiring new implications for strategies of maintenance meets industrial requirements imposed by the operation. To this end, to ensure the durability of cement, be

credible, competitive and successful in the market, the maintenance services must continually adapt to technical, technological and organizational progress.

II. METHODOLOGY OF WORK

In this work, it appealed the most used tool to approach in conditional maintenance [5], vibration analysis, during the monitoring and diagnostic procedures. The conditional approach based on inspection before a decision of repair, can be approached in two steps: surveillance and diagnosis, Figure 1. The monitoring is based on periodic monitoring of indicators of degradation that overflow thresholds, inform about the presence of a default, global level, need to detect more, spectral analysis. The effectiveness of detection of degradation of machines organs depends on the conditions of measurement (positions of the measuring points, types of sensors, frequency bands, etc) and especially the level of preconceived alarm thresholds. The diagnosis is the tool for the determination of the precise nature of the default, its gravity and the urgency of intervention. Its principle is articulated around the following steps:

- the extraction of information from means of appropriate measures or observations made the rounds by supervisory personnel;
- the development of features and signatures associated with symptoms;
- the detection of a malfunction;
- the implementation of a diagnostic method of failure or degradation from use of knowledge on cause-effect relationships;
- finally, the taken decision (judgment of the installation or reconfiguration).

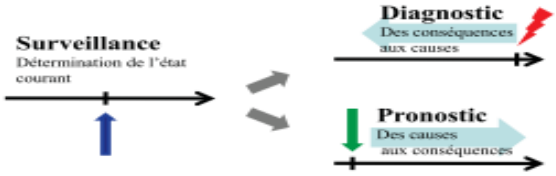

Figure 1: Principle of a diagnosis **[6]**

III. APPLICATION

This work involves the supervision of equipment control fan R1S07 in the area believed the Elmalabiod cement, figure 3, consisting essentially of an engine, a gearbox and a fan.

Figure 3: control fan equipment

3.1. Used equipment

- manifold Analyzer: MOVI PACK
- accelerometer: ASH 201
- vibration analysis software: ONE PROD (XPR 300)

3.2. Technical characteristics of control equipment

- **Engine**

Table 1: Technical characteristics of the engine

MOTEUR	PUISS	NBR TOUR FREQ	PALIER AV ATT Freq de défaut à 1 hz				PALIER AR OP Freq de défaut à 1 hz			
SIEMENS 1LS7-634-4HA-90-Z	840	1482 tr/mn	NU228 + 6228				NU226			
		24.7 hz	BE 8.15 4.19	BI 10.85 5.81	ER 6.89 5.98	DC 0.43 0.42	BE 7.37	BI 9.63	ER 7.37	DC 0.43

- **Réducteur**

Table 2: Technical characteristics of the reducer

DESIGNATION		ORGANE	NBR DENTS Z	VITESSE ROTATION tr / mn	FREQ DEFAUT HZ	FREQ ENGR HZ	ROULEMENT Freq de défaut à 1 hz	
REDUC BCSA UJS75P	1 train	Pignon 1	26	1482	24.7	642.2	SKF 32226	BE 8.71 BI 11.28 ER 7.37 DC 0.43
		Roue 1	59	653.08	10.88		SKF 33030	BE 13.59 BI 16.4 ER 10.11 DC 0.45

Ventilateur

Table 3: Technical characteristics of the fan

VENT	NBR pales	VITESSE	FREQ turbine	FREQ pales	ROUL ATT (vent)	ROUL OPP (acc)
FLS HT3500/ 3450 BBA	08	653.08	10.88	81.63	SKF 22348	SKF 22340

3.3. Search for defects

Following a noise found and reported by the workers on the production line of cement. A monitoring system adopted by the maintenance service. The measuring points have been configured with special attention. The operation of the machine is bound to every moment to his damage, a particular interest in levels as these are the path to passage for the vibration. We have configured eight-point measures to assess the behaviour of equipment, figure 4.

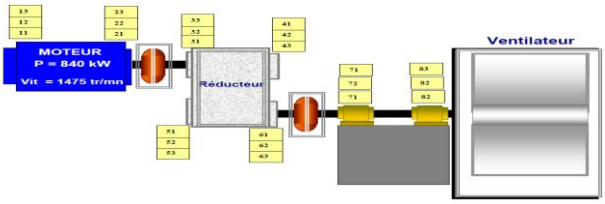

Figure 4 : diagram and the points of measure adopted

Motor fundamental frequency: 24.7 Hz
Frequency of gear meshing CASB 15.3: 642.2 Hz
Frequency fan: 10.88 Hz

3.3.1. Engine

The measures identified in the overall analysis are represented in figure 5a.

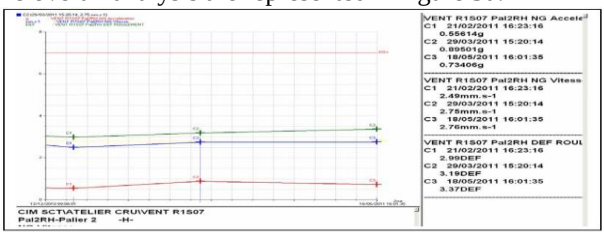

Figure 5a: Trendline NG acceleration, speed and engine DEF**.**

Finding:

- overall vibration levels found in acceleration are acceptable.
- the overall vibration levels in speed are acceptable.
- lack of acceptable bearing factor.

In conclusion the overall vibration behaviour of the engine is stable at an acceptable threshold; however we turn to spectral analysis, figure 5b, for more information on the State of health of the engine and determine the source of noise.

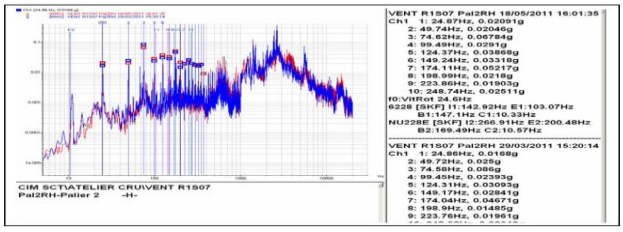

Figure 5b: spectral analysis of the engine

Finding: - stable Amplitudes at the frequency of rotation of the motor 0.02 g to 24.87Hz.
- Balance of the 3rd harmonic of frequency of rotation of the motor including the threshold remains tolerable.
- Impact on the frequency of rotation of the motor.

3.3.2. Gear B.C.S.A

The measurements taken at the entrance and exit of the reduction in the overall analysis are respectively represented in figures 6 and 7.

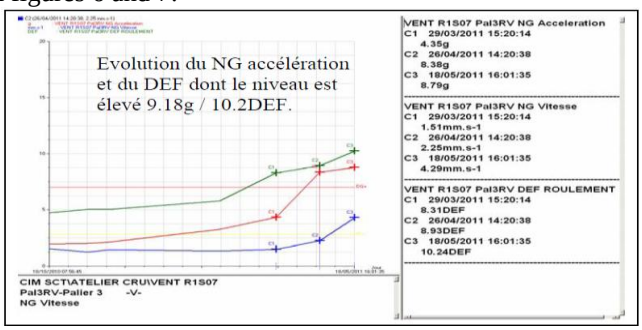

Figure 6: Trendline NG acceleration, speed and reducing DEF.

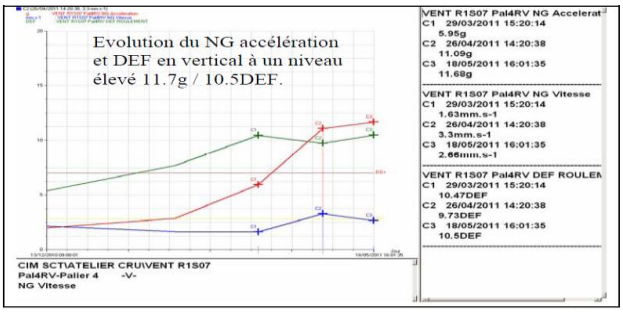

Figure 7 : Trendline NG acceleration, speed and reducing DEF

Finding:
- the overall vibration levels in speed and acceleration are high and bearing failure is also high.
- Evolution of NG acceleration and the DEF which high 9.18 g \/ 10.2DEF;
- Evolution of NG acceleration and DEF vertically at a level high 7.3 g \/ 10.5DEF.

For more details about this behaviour we turn to spectral analysis, figures 8et 9.

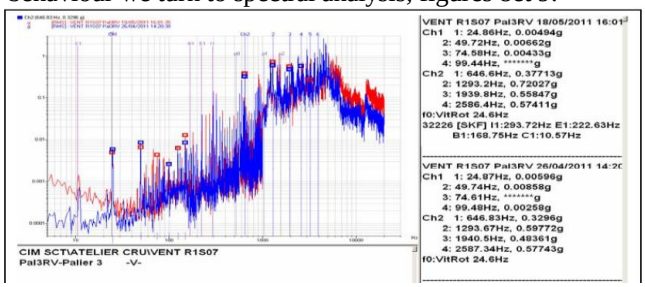

Figure 8: spectrum may 2011

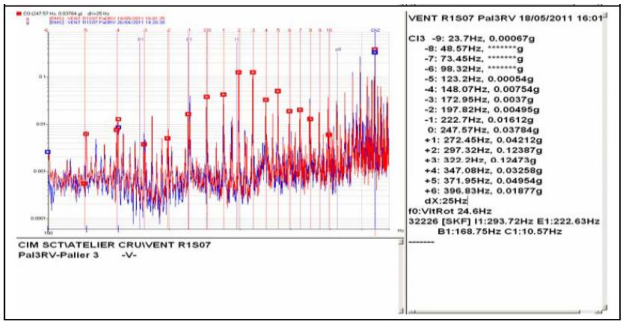

Figure 9: spectrum zoom.

For more precision on the State of health of the bearing, we do use the envelope analysis (bearing Fault Detection), figure 10.

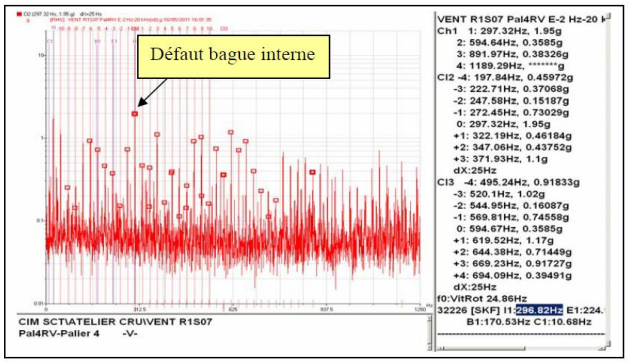

Figure 10: Analysis of envelope

Finding:

- Evolution of the amplitude of the second harmonic of frequency of meshing at the entrance to the reducer of 0.57 g to 0.63 g.
- Side bands (modulation) around the frequency of meshing spaced by the frequency of rotation of the shaft of PV 10.93Hz output.
- Comb of skate on 296.88Hz frequency which corresponds to the frequency of default internal bearing ring bearing shaft GV (see analysis of envelope) 4.

3.3.3. Bearings fan

The global level analysis gave results following, figure11.

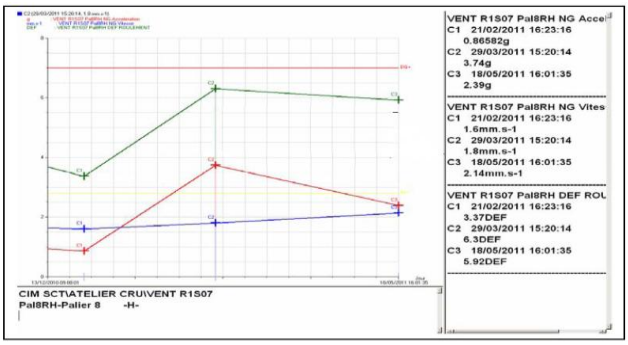

Figure 10 : Trendline NG acceleration, speed and bearing 8 DEF.

Conclusion:

- Low development of the NG speed of 1.8 to 2.14 mm/s which the threshold remains acceptable.
- Overall vibration levels found in acceleration on the bearings of the fan are tolerable.
- The overall vibration levels in speed on the fan bearings are acceptable.
- Factor tolerable bearing failure.

For more precision on the behaviour of the fan, we turn to the spectral analysis, figure 12.

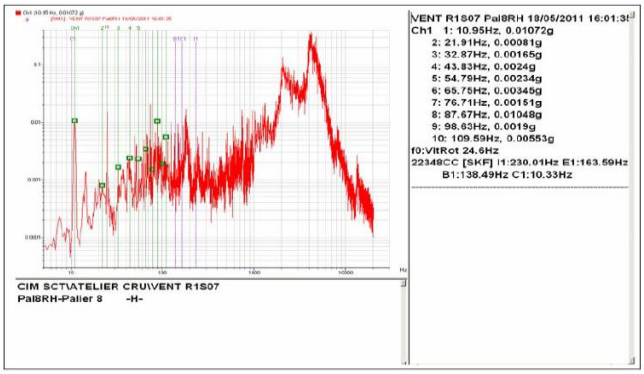

Figure 12 : Analyse Spectrale

Finding:-unbalance fan acceptable 0.01 g to 10.95 Hz.

The envelope spectrum reveals lack of inner ring of 1.95 g (danger threshold) with presence of Sidebands on the frequency of rotation of the SGS that requires a change in working capital as soon as possible.

IV. CONCLUSION

Technical and industrial production tool control is based on the routine maintenance of equipment and systems, and their exceptional maintenance which is in relation to end of their technical life. In its most general sense, the maintenance is not limited to the corrective actions carried out on equipment, such as the repair or replacement, but it aims to ensure that machines are able to perform the duties expected of them, in conditions of security and profitability permanently. These actions include key equipment controls to carry a diagnosis on the State of the latter. Thus, should the industry ensure that the operators of facilities and strategic machines (economically and safely) implement maintenance policies tailored to issues of safety and security, in the interests of quality and competitiveness. Now, in practice, facility age and market competitiveness becomes a major concern of the industrialists. Thus, it is essential that the maintenance remains adapted to the role it should play in the prevention of incidents and unplanned stoppages: detect and correct defects before they compromise the health of the equipment, or the production and security in the enterprise. The vibration analysis allows to establish files to know the evolution of the State of the machine and provide safe intervention dates, intervene just before the failure occurs and the replacement wisely. This allows to improve the operation of the machines and bring them to a level often exceeding the specifications of origins of the equipment. Thus, the phase of maintenance should ideally be reduced to operations to replace the equipment actually failed without trial and error, and make selective maintenance: "the vibration signal is the identity of the machine".

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