SOME PRACTICAL RESULTS OF RISC BASED MAINTENANCE PROCEDURE INTRODUCTION IN ROMANIAN PAPER INDUSTRY

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Abstract

This paper presents applicative studies related to the implementation of the supervisor system and base risk maintenance in paper industry. Bank data content is presented regarding the unexpected functioning interruptions and reconditioning technologies.

INTRODUCTION

The industrial development of the last decades – globalization, the increasing concurrency, and the high qualitative claim requirements – has made the role maintenance to be a very important issue. It is very well known that the industrial installations are in a continuous way exposed to very complex degradation, wear; erosion processes, which leads after a period to severe break –down of the equipments and the abruption of the entire manufacturing process.

These critical abruptions are less and less accepted by the industry because they could cause accidents, production-looses, and important financial looses, too.

According to the statistics (Mobray, 1992), currently in the hard industry field of the petrol refinement, metallurgy, metallurgy of iron, the paper and pulp industry, the costs of the maintenance of the equipments reach almost 40 % of the total manufacturing costs.

The aims of processes supervising and maintenance:

- to avoid accidents, which can reduce the exploitation safety and produce damages of the personal and to the environment
- to assure a safe use of the installations and equipments

The risk base maintenance decisions is not representing a new concept. We can speak about new concepts in this field only when we refer to the using of the risk base maintenance decisions in the design and equipments maintenance planning field.

The objectives of researches made in the project financed by the Sapientia foundation:

- Elaboration of a concrete methodology for risk base maintenance concept to be applied in Transilvanian's factories
- Connection of supervising activities with logical decisions
- Using "hard and soft" knowledge to the elaboration of risk base maintenance strategy

PRINCIPLES OF THE RISK BASE MAINTENANCE

The concept of risk based inspection and maintenance –**RBIM** – is well known on the international industry from about two decades, but its applying on many fields of industry can still be improved.

The **RBIM** method has been developed for the first time in USA, where some important afferent standards, such as **ASME** - American Society for Mechanical Engineers; **API** - American Petroleum Institute; **EPRI** - Electric Power Institute, have been also developed. According to [Tóth 2002] the definition of the risk is the following:

RISC = Break Down Consequences x Probability Of Failures

The principles of the **RBIM** method are illustrated in figure 1.

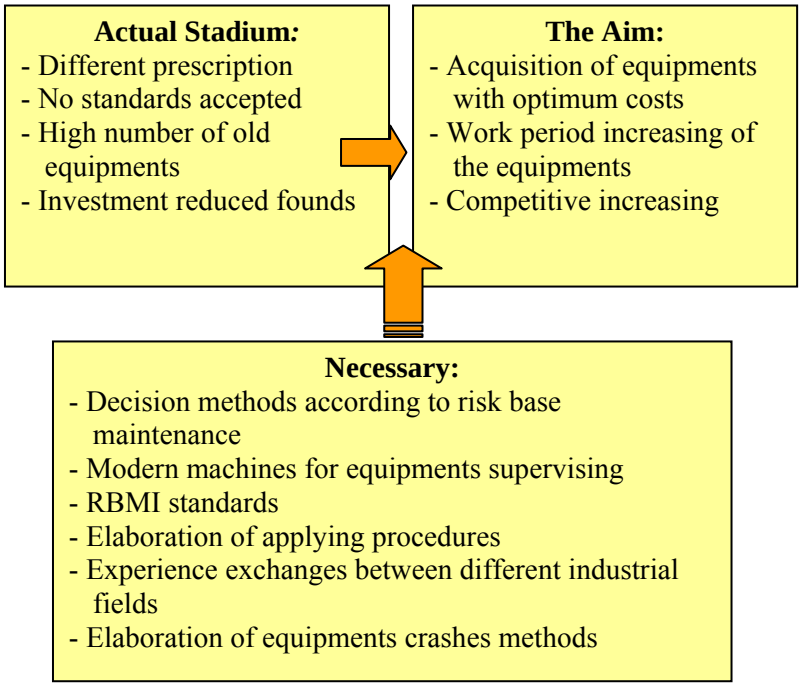


***Fig. 1. RBIM** methodology structure*

The evolution of maintenance strategies is illustrated in figure 2.

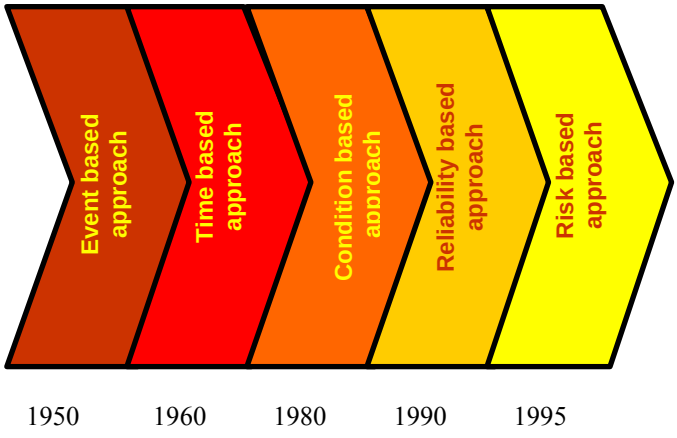


***Fig. 2.** Evolution of maintenance strategies (Tóth 2005)*

In Romania, the Manufacturing Engineering Department from Technical University of Cluj-Napoca (TUC-N) **organized the international workshop on RBIM** on 19th May 2005. Over 20 specialists coming from different industrial fields attended. One of the most

important subjects in the workshop was trying to elaborate a status about maintenance and trying to implement the RBIM standard in the industrial area.

APPLICATIVE AND EXPERIMENTAL STUDYS

The supervising in exploitation and RBIM application in the paper and pulpindustry from Romania

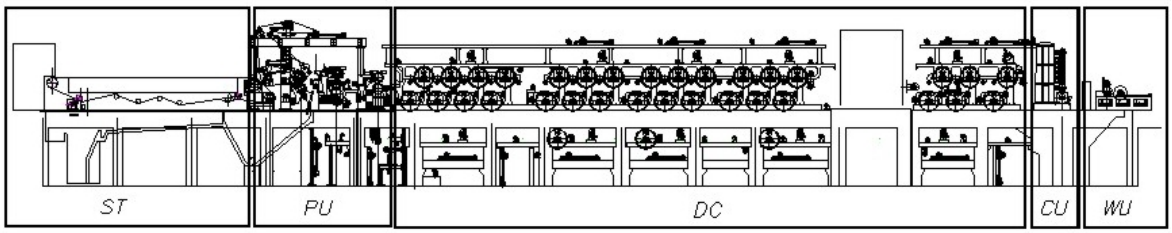
Our research has focused around the company Somes S.A., member of the group SCR, which is the biggest company from Romania in this field.
The production of this company is over 20.000 tons of paper and over 25.000 tons of cellulose.

In the frame of the research, the following aspects were analyzed:

- The constructive particularities of the utilized aggregates,
- The characteristic wears and defections and the functioning interruptions caused by these,
- The reconditioning technologies and as well the improvement solutions proposals.

Description of the paper manufacturing aggregate

The utilized aggregate is composed by the following main parts (fig.3.):



- ST - the table of the sieve
- PU - press unit
- DC - drying cylinders
- CU – calender unit
- WU – wrapping unit

Fig. 3. *The basic scheme of the paper aggregate*

The raw material (the cellulose fiber + water +bonding agent + colouring agent+ filling materials) is launched on the sieve and in the unit **ST** where there are forming the paper sheet and a big part of the water is being removed. Sequel in the press unit **PU** the paper sheet is pressed in order to remove the remained water. For this purpose the paper sheet is passing through the drying cylinders heated with steam. In the calender unit **CU** the paper is pressed in continuation in order to obtain gloss and then the paper finalized in this way is rolled up in wrapping unit **WU**. The general view of the aggregate is presented in the figure 4.

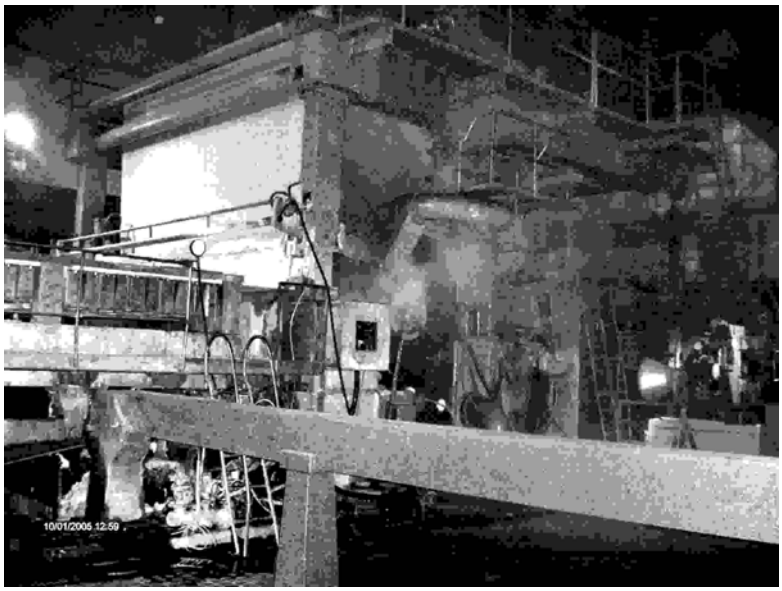


Fig. 4. *General view of the paper aggregate*

The supervising of the inadvertent interruptions of the equipments

Beginning with the year 2000 there has been pointed out the inadvertent interruptions in of the equipment caused by different factors
(table 1).

THE INADVERTENT INTERRUPTIONS (UNEXPECTED)
OF THE PAPER MACHINE IN HOURS Table 1

Year	Technological	Electrical	Mechanical	Total stops
2000	175	87	96	358
2001	164	94	94	352
2002	142	115	88	345
2003	152	26	65	243
2004	74	14	20	108

Using the dates from table 1, it was drawn the diagram of the different types of unexpected functioning interruptions (fig. 5).

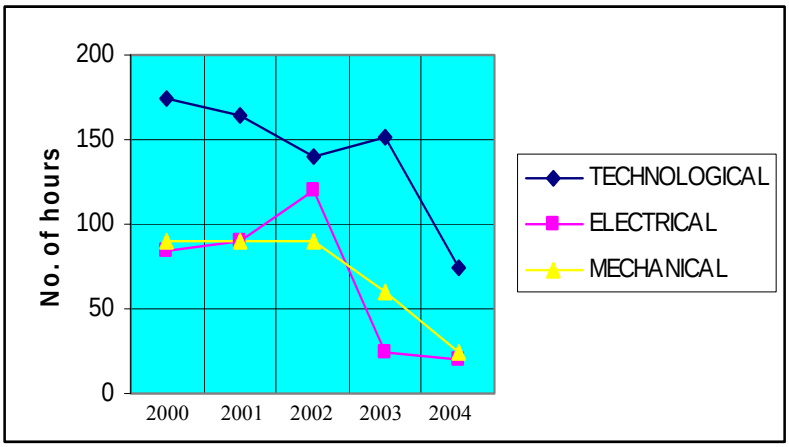


Fig. 5. *The diagram of the unexpected functioning interruptions, caused by different factors*

Using the dates from table 2, it was drawn the diagram of the different types of unexpected functioning interruptions (fig. 6) and the diagram of the total function interruptions (fig. 7).

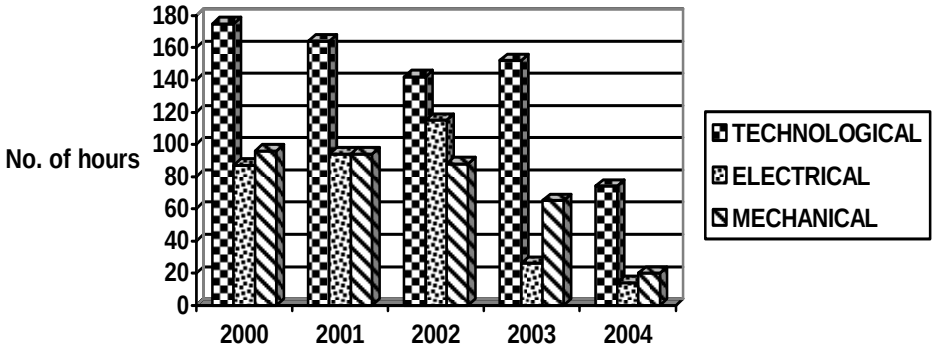


Fig. 6. *The diagram of the unexpected functioning interruptions, caused by different factors*

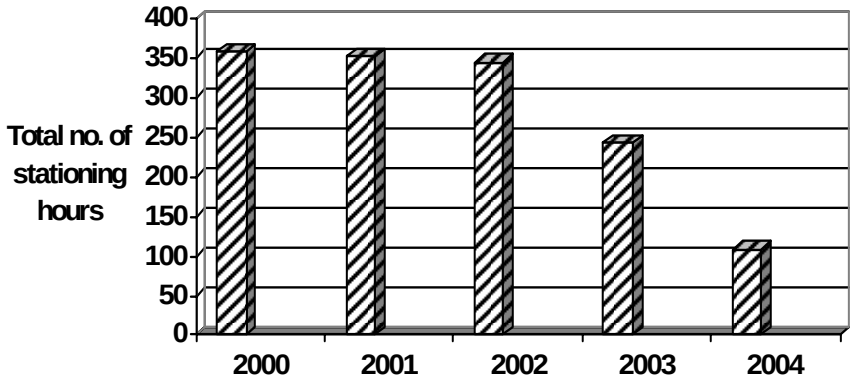


Fig. 7. *The diagram of the total functioning interruption*

From the figure 6 it results that over 50% of the annual total functioning interruption were caused by mechanical and electrical defects. From the figure 7 results a positive evolution only in year 2004 toward the decrease of the functioning interruption hours, obtained by a series of technical-management measures, among which RBIM can be reminded.

The methodology of supervising the equipment's state

One of the efficient supervising methods of the functioning state of the equipments is the measurement of the vibrations. In this purpose, it was used the Microlog CMVA60 and Martin-Condition Detector devices, with which it was measured the period of the vibrations in the directions: H – horizontal, V – vertical and A – axial. In figure 6 is presented the evolution diagram of the horizontal vibrations period at one of the aggregate's pump.

As it can be observed from the figure, in the first six months, these amplitudes were in the normal limits. In august 2004 these started to increase suddenly. Then by reconditioning measures these were brought back to the normal limits.

Some characteristic wear forms are shown in the figure 8.

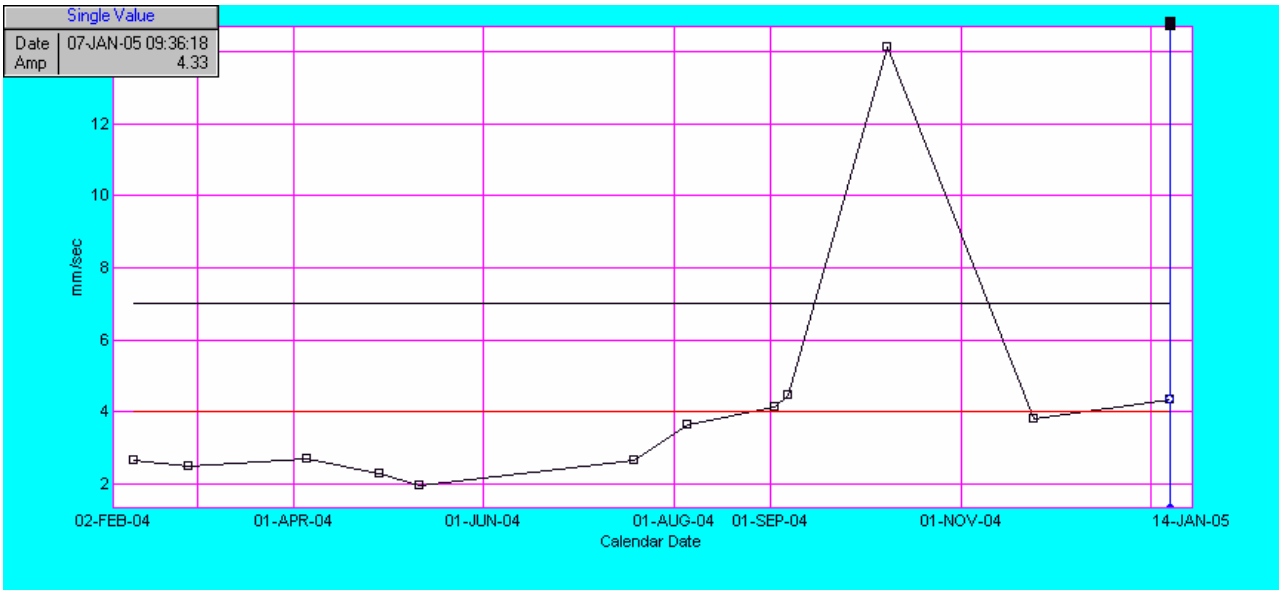


Fig. 8. *The diagram of the evolution of the horizontal vibrations at the pump 211*

CONCLUSIONS

In order to realize an efficient exploitation of the equipments from the paper industry are the followings:

- ► the continuous and careful supervising of the behavior of each equipment,
- ► the elaboration of a maintenance program based on risk,
- ► the elaboration of some adequate reconditioning technologies

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