



¹Rodica ISTRATE, ²Manfred SCHMITT, ³Jens APFEL, ⁴Ioan ILCA

EFFICIENCY OF MAINTENANCE IN STEEL MAKING INDUSTRY

¹⁻³. BADISCHE STHAL ENGINEERING GMBH, GERMANY

^{1,4}. MEMBER OF ROMANIAN SCIENCE AND TECHNIQUE ACADEMY, FACULTY OF ENGINEERING HUNEDOARA, ROMANIA

ABSTRACT: Efficient maintenance brings efficient energy consumption and efficient environmental work of the steel making equipments. Maintenance is a real partner for profit.

BSE – Badische Sthal Engineering - “Best practice” tools give to the Steel Making Companies, the possibility to know where their “maintenance efficiency” is located compared to others in the industry.

KEYWORDS: Maintenance; Effectiveness; Efficiency; Best practice; Steel making industry

❖ INTRODUCTION

The steel making industry, steel represent in Romania a very important part of GDP. In this industry branch the crisis appear to be at the final. In August 2010 as compared to August 2009 gross industrial production index increased by 5.7% due to the production increase in electricity, gas, steam and air conditioning supply sector (+8.5%) and in manufacturing (+6.2%). The industrial branches which especially determinate the increases of the manufacturing gross index were: Metallurgy (+27.0%).

Steel production in Romania belongs to the international owners - more than 95 % and the international trend of the steel making industry is also apprehend in Romania.

In steel making industry the volume and the costs of production are very important for a profitable activity. It is important to see the whole picture to make the right decisions and to follow the right strategy. In our conception there are two options:

Focus on direct costs:

- ❖ Limited market
- ❖ Low sales prices
- ❖ Low contribution margin per ton
- ❖ Cost saving (expenditures) is crucial
- ❖ Indirect costs are in this situation not that important because additional output would only increase stock level and bind capital
- ❖ In this case it is possible to increase the risk of delays, while less money is spent for maintenance activities

Focus on indirect costs:

- ❖ Strong market demand
- ❖ Attractive sales prices
- ❖ High contribution margin per ton
- ❖ High availability and operation time required to meet market demand
- ❖ Focus on time, spend more for direct maintenance cost in order to reduce indirect cost
- ❖ Achieved additional contribution margin is higher, than expenditure for maintenance

Maintenance is operational partner for efficiency; especial in Steel making industry, operational should recognize the benefits of working together with maintenance, as a supportive team to reduce unplanned breakdowns, to increase equipment effectiveness, and to reduce overall maintenance costs.

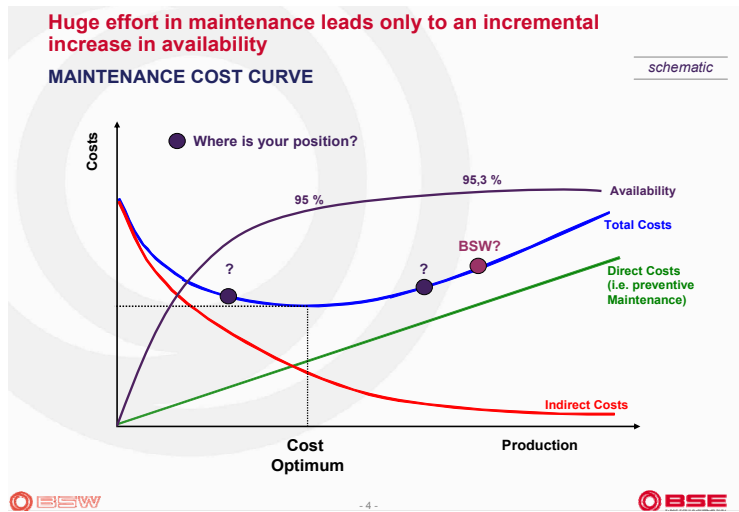
The future capable company has a firm understanding of physical asset management and maintenance process and its important role. It recognizes the contribution of maintenance to total operations' success and profitability. Effective maintenance and physical asset management are closely linked to success and profitability.

The Steel making Companies must analyze and find the most efficient maintenance process.

BSE developed a concept named “Best practice”. Best Practice Study covers very important aspects of successful steel operations and the main indicator is “Total operational efficiency”. Maintenance efficiency is one of the component, analyze by us in this paper. Maintenance is forever.

❖ **MCM – MAINTENANCE COST MANAGEMENT**

BSW - BADISCHE STHALWERKE GMBH, is one of the most productive Mini Mill in the world; few years before the maintenance cost start to increase continuously, like contra-measure BSW communicate this issue to BSE specialists and after proper researches in the plant come MCM concept. Was analyze all the components of Maintenance costs: Material costs, contractors, own maintenance, etc. Was also analyzing the saving possibilities, risk estimation and major issues concerning maintenance at BSW in a full year (2005).



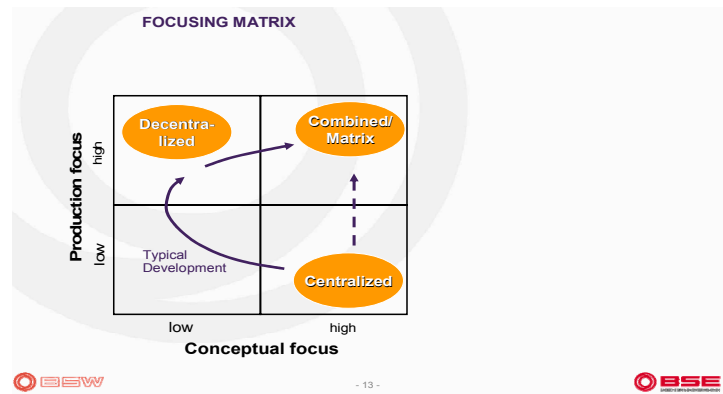
	Site issues	Results
Integration of production team	-Too little integration of production team into maintenance processes -Lower responsibility and less care for equipment by operator -Unconscious handling -Strong wear	High costs for maintenance and spares parts
Capacity balance	-Strong separation between the sectors, although the activities are not that different -The need of employees were counted for each sector -Free capacities between the ranges are not used -Experiences of sectors are not exchanged	More contracting
Shift work	-70 % of the BSW maintenance employees work in the 5-shift-System (112 of 162) -Shift work is primarily risk insurance. -The effectiveness of standard works is smaller. -No comprehensive job planning -Only absolutely necessary work is done, other jobs shifted to dayshift or shutdown day	More contracting

Results three points to starting from:

- ❖ Material costs
- ❖ Contractors
- ❖ Own maintenance

Possible solutions of the maintenance optimisation can be represented by side condition for solution:

- ❖ Adapt the maintenance to the changed conditions
- ❖ Engage the production stronger
- ❖ Improve the work scheduling
- ❖ Create capacities in the own maintenance
- ❖ Make a comprehensive common strategy possible
- ❖ Reduce contracting significantly
- ❖ Offer a high work quality and improvement potential with spare part repairs



An optimum maintenance organization must be adapted to the individual situation of a mini mill

- ❖ Centralized maintenance for building up skills and knowledge
- ❖ Decentralized maintenance for pushing productivity
- ❖ Matrix organization for achieving total efficiency

Action plan:

1. Appropriate maintenance strategy to be establish

In general three different maintenance strategies exist

- ❖ Breakdown strategy (run to failure)
- ❖ Condition based preventive maintenance (exchange after inspection)
- ❖ Time based preventive maintenance (exchange after fixed period of time)

- Depending on the impact on production, an appropriate strategy needs to be applied, together with other important tools: 5 “S” - House quipping and Continuous improvement concept.
- 2. Detailed down day planning and appropriate coordination during execution are factors for efficiency
- 3. A detailed and comprehensive delay reporting is the base for continuous optimization

Process monitoring - delay reporting:

- Reporting covers the
 - recording of production delays (production loss)
 - recording of equipment problems (no production loss)
- Equipment problems must not be identical with production delays.
- Not every equipment problem causes a production delay.
- Therefore it is important to analyze the combination of production records and maintenance records.
- Production and maintenance reports should be computerized and should use a code system based on a common categorization of equipment. This allows quick evaluation.

❖ RESULTS OF MCM

After MCM implementation at BSW, considerable savings could already be realized within three years. Can maintenance efficiency be measured?

The tool name: “Best practice” was developing by BSE.

The BSE Best Practice Study covers every important aspect of steel making and helps to determine the Company position in the industry.

a). Background Best Practice Study

- The Best Practice Study compares steel plants and rolling mills from all over the world in order to find the best performers, e.g. per region or steel quality.

- It is possible to carry out an overall benchmark, and also to study the details and compare consumption figures or cost on a detailed level (e.g. kWh per ton...).
- Our customers can position themselves within this framework in order to benchmark their performance with the industry and also to identify potentials for future improvement.
- Selected Key Performance Indicators (KPI's) are used for the comparison

b). Holistic approach through four different areas:

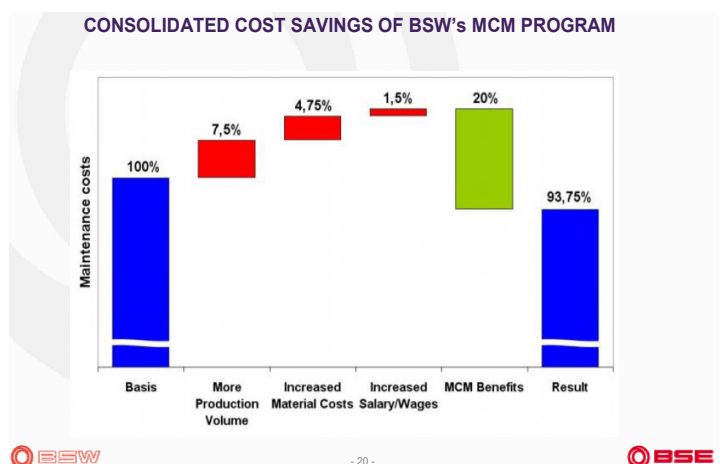
- Productivity Management
- Cost Management
- People Management
- Environmental Management

c). Identification of Best Performers per grade or region

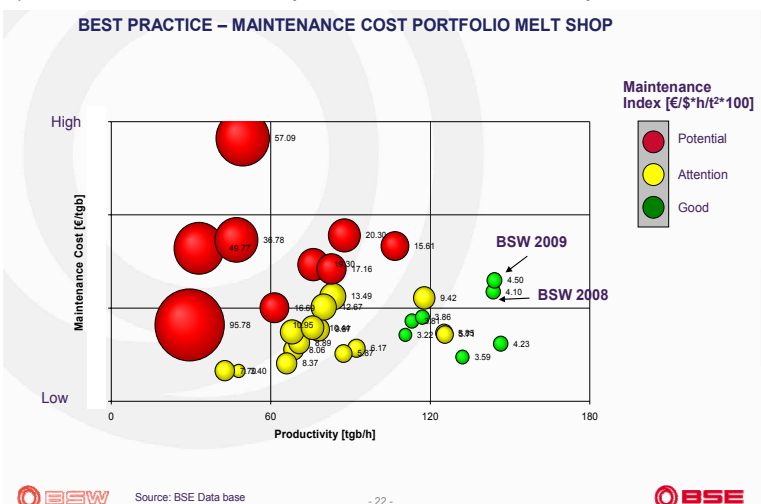
d). Determination of position within industry and identification of potentials for further improvement

In our case, to measure and compare the maintenance efficiency and effectiveness, we try to find a correlation between the maintenance efforts by means of money and the productivity in tones per hour. The size of the bubbles represents the maintenance index itself. Green bubbles are good, red bubbles are bad.

Efficient maintenance is represented by low costs and high output. But high output also allows higher absolute maintenance costs. This graph should give the customer an indication where his own maintenance efficiency is located compared to others in the industry.



- 20 -



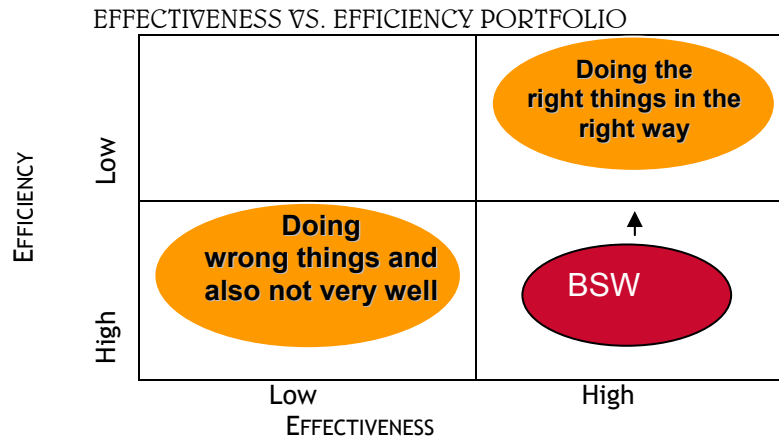
BSW Source: BSE Data base

- 22 -



❖ CONCLUSION

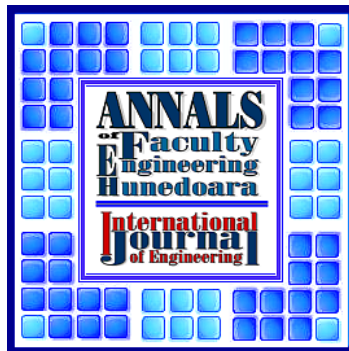
Effectiveness comes before efficiency, but the goal is “doing the right things in the right way”



If you want to know where your position in the industry is, you can apply to Best practice, free of charge - “bestpractice@bse-kehl.de”

❖ REFERENCES

- [1.] REINER HAGEMAN - Efficiency in maintenance - 4” International Mini-Mill symposium “We SEE the future” April 25 to April 28, 2010 in Schluchsee / Germany.
- [2.] *** The future Capable Company – Maintenance Life Cycle Engineering Inc. 2002.
- [3.] BSE – Best practice in the steel industry, framework for Mini Mills - 2010
- [4.] www.bse-kehl.de



ANNALS OF FACULTY ENGINEERING HUNEDOARA
 – INTERNATIONAL JOURNAL OF ENGINEERING
 copyright © University Politehnica Timisoara,
 Faculty of Engineering Hunedoara,
 5, Revolutiei, 331128, Hunedoara,
 ROMANIA
<http://annals.fih.upt.ro>