

## **Identification of company's requirements by using MFD (Maintenance Function Deployment) "Case Study"!**

Nowadays almost all organizations/companies try to improve their productivity, and competitiveness through modern tools and techniques to avoid the interaction among working areas, which in return leads to minimize the problems and obtain maximum outputs. Actually interaction generates problems, overlapping, gap and frictions between working areas where responsibilities and authorities interact, and consequently frictions between these responsibilities and authorities can be affected.

To make a production process more competitive and more cost effective, different working areas, detailed activities and personnel responsibilities & authorities may need to be better integrated than they are today. (Basim Al-najjar, 2005).

A proper analysis contributes significantly to solve the problem, because it uses throughout all phases from problem definition phase to the control phase. In order to identify, analyze and solve the problem(s) accurately and to achieve the desired condition an appropriate technique must be used that takes into account the most important aspects and factors.

Although, MFD (Maintenance Function Deployment) is a powerful model that enables the analyst to determine the requirements for achieving and maintaining the strategic goals which are decided by manufacturing company. It consists of four phases and two axis "what's & How's" and their answers. The answers are collected by an extensive technical analysis within the plant. Furthermore the phases shifts every step that What's becomes How's and so on. However an extensive analysis should be conducted within the plant and the selected production line(s) from product input to its output. Additionally an identification of personnel's authorities and responsibilities should also be performed to be able to identify if there is any overlap, gap, interaction, problem etc among the involved working areas, on the other hand figuring out how well these working are integrated, constructed and organized.

Moreover, MFD is a flexible model which could be adjusted in accordance with company's branch, strategic goals and requirements. Moreover, it can be applied almost in all industrial companies regardless of their machines, equipment and product or services.

### **Purpose**

The main task of this project is to identify company's requirements within identifying the problems and solving them by the aid of a comprehensive analysis and the application of MFD (Maintenance Function Deployment). As well, to inspect the selected production line and work station(s) in order to identify if there is any interaction, gap, overlap and or problem among the involved working areas such as management, operation, quality control, logistics, maintenance activities, safety regulations and activities. Additionally, to study how well these working areas are integrated and organized. Moreover, to assess how much productivity, competitiveness, working environment and total environment are affected.

## The company

This project has been carried out at XXAB (an industrial company in Sweden). The company offers their customers turning, pressing in automatically and CNC -programmed several operations machines. The company hasn't own products, but it produces according to customer's needs and order. It works with both types of material such as metal sheet and plastic and its customers are both private sectors and industrial companies.

## Empirical Finding

According to the collected data from the analysis there are 6 % product losses (rejected) and 10 hrs / monthly stoppage times due to failures that cause 14, 3% losses in profit margin. It is obvious that the company faces problems within production quality and machine's conditions.

## Phase I

The table below shows that bad machine condition and lost of profit margin are on the same priority level and must be treated parallel. The values/data gathered from the company have been distributed based on the priorities in all four phases and in accordance with the related area.

Losses category (outputs to be achieved, maintained and improved)	Target value (Max. losses)	Requirement necessary for achieving, maintaining and improving the outputs (How's)	Production machine condition	Machine tool condition	Working environment	Condition of the quality system	Competence of the operating & maintenance staff	Condition of the production logistics system	Importance of What's (Total)	Priority list of the actions required for improvement
Bad quality			0,5%	1,0%	1,0%	1,0%	2,0%	0,5%	6,0%	Second priority (plans for deeply analysis and actions are required)
Lost of profit margin (due to failures)			2,5%	2,5%	2,5%	2,5%	3,8%	0,5%	14,3%	First Priority (plans for deeply analysis and actions may also be required)
Bad machine condition			2,5%	2,5%	2,5%	0,0%	5,0%	1,8%	14,3%	First Priority (plans for deeply analysis and actions may also be required)
Importance of How's (Total)			5,5%	6,0%	6,0%	3,5%	10,8%	2,7%	<b>34,5%</b>	

## Phase II

The table below exhibits that the most weight lie on competence of the operating & maintenance staff, the second priority is machine tool condition and working environment. Also, these two problems are in the same priority level and they must be treated parallel.

Losses category Requirements for achieving, maintaining and improving the outputs (What's)	Target value (Max. losses)	The tools that are necessary to preserve the condition of the requirements (How's)	Lack of or inefficient maintenance policy	Lack of or inefficient measuring & analysis system	Lack of or inefficient cost effective & continuous improvement policy	Lack of or inefficient standard & instructions for doing maintenance properly	Importance of What's (Total)	Priority list of the actions required for improvement
Production machine condition			1,0%	1,0%	1,0%	2,5%	5,5%	Third Priority (plans for deeply analysis and actions may also be required)
Machine tool condition			1,0%	2,0%	1,0%	2,0%	6,0%	Second Priority (plans for deeply analysis and actions may also be required)
Working environment			2,0%	0,0%	2,0%	2,0%	6,0%	Second Priority (plans for deeply analysis and actions may also be required)
Condition of the quality system			0,75%	2,0%	0,75%	0,0%	3,5%	
Competence of the operating & maintenance staff Condition of the			4,0% 0,0%	0,0% 0,0%	2,5% 2,0%	4,3% 0,7%	10,8% 2,7%	First priority (plans for deeply analysis and actions are required)
production logistics system								
Importance of How's (Total)			8,8%	5,0%	9,3%	11,5%	<b>34,5%</b>	

### Phase III

According to the analysis within the plant the maintenance system is insufficient due to lack of knowledge and unclear direction. Additionally, the company faces technical problems such as short stoppages and failures. Moreover operator's incompetence within maintenance and its activities causes increment of the ambient temperature inside of the plant which in return could affect the working environment negatively. As well, the first priority in this phase is on inefficient standards and instruction for doing maintenance properly.

Losses category The tools that are necessary to preserve the condition of requirements (What's)	Target value (Max. losses)	The activities that are necessary for effective utilization of the tools in the phase Two (How's)	Lack of or inefficient training program to enhance the operator & maintenance staff competence	Lack of or inefficient techniques for monitoring & adjusting production rate & working environment	Lack of or inefficient measures for monitoring process performance & cost effectiveness	Lack of or inefficient suitable data & knowledge base	Importance of What's (Total)	Priority list of the actions required for improvement
Lack of or inefficient maintenance policy			3,5%	2,0%	2,0%	1,3%	8,8%	Third Priority (plans for deeply analysis and actions may also be required)
Lack of inefficient measuring & analysis system			2,0%	1,0%	1,0%	1,0%	5,0%	
Lack of or inefficient cost effective & continuous improvement policy			3,0%	0,0%	2,3%	4,0%	9,3%	Second Priority (plans for deeply analysis and actions may also be required)
Lack of or inefficient standard & instructions for doing maintenance properly			4,0%	2,0%	1,5%	4,0%	11,5%	First priority (plans for deeply analysis and actions are required)
Importance of How's (Total)			12,5%	5,0%	6,8%	10,3%	<b>34,6%</b>	

## Phase IV

In this phase the first priority lies on “training program to enhance the operator and maintenance staff competence”. Thus, most problems can be solved if the company invest in this area, but that doesn’t mean they will not consider the second priority, because the only difference between them is 2,5%.

Losses category The activities that are necessary for effective utilization of the tools in phase two (What's)	Target value (Max. losses)	The factors required to support integrating maintenance with plant business (How's)	Lack of or inefficient strategic plan for integrating maintenance with the plant business	Lack of or inefficient risk capital for integrating maintenance with the plant business	Lack of or inefficient knowledge & experience in the production machines & process	Lack of or inefficient managerial & organizational tools	Lack of or unsuitable criteria for selecting tools, methods & policies e.g. for the most informative CM system, & most cost effective maintenance policy	Importance of What's (Total)	Priority list of the actions required for improvement
Lack of or inefficient training program to enhance the operator & maintenance staff competence			2,5%	3,5%	2,0%	2,0%	2,5%	12,5%	First priority (plans for deeply analysis and actions are required)
Lack of or inefficient techniques for monitoring & adjusting production rate & working environment			1,0%	0,0%	1,0%	2,0%	1,0%	5,0%	
Lack of or inefficient measures for monitoring process performance & cost effectiveness			1,3%	2,0%	1,0%	1,0%	1,5%	6,8%	Third Priority (plans for deeply analysis and actions may also be required)
Lack of or inefficient suitable data & knowledge base			2,0%	0,0%	4,3%	2,0%	2,0%	10,3%	Second Priority (plans for deeply analysis and actions may also be required)
Importance of How's (Total)			6,8%	5,5%	8,3%	7,0%	7,0%	<b>34,6%</b>	

## Authority & Responsibility

The table below identifies the responsibilities and authorities for the operators who work at the selected production line. Moreover it highlights the current situation among the related working areas. Furthermore it's obvious that there are an internal interaction, gap, and overlapping among working areas. Additionally, the operators perform different tasks during operating time and sometimes they do more by helping each other when it needs. That is noted down in the comment column.

Quality activities	Responsibility	Authority	Comments
Production stations	The operators are responsible for quality control, however they help each other within checking the quality of the first produced unit.	The operators supervise the new employee & make control measurement and are engaged in other activities.	There is an overlapping because the quality control is made by two or more operators. Further the operator performs several kinds of jobs at the same time.
Packing station	Packaging the products and labelling deliveries to the right customers	Other operators supervise and help when it needs & make control to assure that the job is done right.	
Maintenance activities	Responsibility	Authority	
Operators	Operators do usually maintaining, cleaning the machines and equipment, and report faults and problems.	Operators are responsible for performing maintenance tasks and help each other when problem occurs.	The maintenance strategy and maintenance best practices need to be improved. There are not professional maintenance staffs in place, neither a suitable maintenance strategy.
Production activities	Responsibility	Authority	
Supervisor	Operators are responsible for machine's operating, reducing process disturbances, reducing stoppages and faults, and using the right production program for every dimension	The operator has also the authority to stop the machine when a problem occurs.	The operators perform several tasks during operation time. Furthermore there are an interaction among operation, maintenance, and quality. Moreover there is a gap regarding maintenance area.
Cutting tool man	The operators are responsible to use the right tool for every dimension, and to assure that the tool is mounted correctly.		
In the packing station	Packaging the right product dimensions and making quality control before putting it in the related pallet.	The operators have are authorized to reject defected products.	

### **Conclusions (and Recommendations)**

An appropriate maintenance strategy and maintenance best practices that daily could be performed at plant of operators have a significant role on machines and equipment conditions because these activities prolongs assets lives length. There are still some of industrial companies that neglect maintenance and regard it only as costs, due to the lack of knowledge about how much it contributes in long term. According to the analysis there isn't professional maintenance crew in the place, neither an appropriate maintenance strategy. In order to avoid technical and organizational problems and to reduce other costs the company has to adopt cost effective- maintenance. Thus XXAB has to reinforce its maintenance system, by establishing a suitable maintenance strategy, clear direction, maintenance best practices, hiring professional and skilled maintenance staff and implementing new tools and systems.

Additionally, based on analysis and the gathered data the operators experience more stress, due to multi task performance during the operating time which in return can lead to maximize the amount of defects and faults. Thereby, the company has to reconstruct, reintegrate and reorganize the plant in a better way to minimize the amount of stress, faults and defects. That leads to enhance company's profitability and improve its competitiveness. Furthermore, the working environment is an essential factor that cannot be neglected because it could impact the operators, machines, equipment, assets and the entire production process, therefore it recommends that the company has to consider its location space and takes into consideration to move to a bigger location especially when the company is on an expansion phase and has a brilliant market.

OBS: A part of data/information and few sections of the project are taken away because it's confidential.

Best regards

Hamid Al-najjar