

Effective maintenance engineering and management in welding industry

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ABSTRACT – The purpose of this paper is to investigate the maintenance needed for machine in welding industry and giving suggestion to overcome the breakdown time and prevent for any major losses. Therefore, the paper contains maintenance organization, strategy, system approach, planning, scheduling and the computerized maintenance management system suitable for welding industry. Basically, the first thing need to be consider is the organization to simulate the company and organize the maintenance well. Then, task is brought to next step which is choosing the right strategy to implement into the company and with the strategy, comes the system approach to maintenance which will be needed the organize/secure planning and scheduling. Computer system is when everything kept in place and secure and in that particular application one's company can be more organized toward a better maintenance.

1. INTRODUCTION

Welding today is applied to a wide variety of materials and products, using such advanced technologies as lasers and plasma arcs. The future of welding holds even greater promise as methods are devised for joining dissimilar and non-metallic materials, and for creating products of innovative shapes and designs. Chosen industry for this study is Welding Industries (M) Sdn. Bhd. which is located at Pusing, Perak. Welding Industries (M) Sdn. Bhd. has become the only local company in Malaysia that manufactures welding machines for use by industries.

Effective maintenance engineering and management is an orderly and systematic approach of administrative, financial, and technical framework for assessing, planning, organizing, monitoring and evaluating maintenance and operation activities and their costs on a continual basis. A good maintenance management system coupled with knowledgeable and capable maintenance and operation staff can prevent health and safety problems and environmental damage; yield longer asset life with lower breakdowns and downtime; and result in lower operating costs, higher productivity and profitability and a higher quality of life.

In Figure 1.1, the Facility Manager (FM) function has been gaining increasing recognition for the important role it can play to create cost savings and efficiency of the workplace. The primary task of FM is to manage support services to meet the needs of the organization, its core operations and employees. It deals with the maintenance management of the physical assets and

incorporates controlling services necessary for successful business [1].

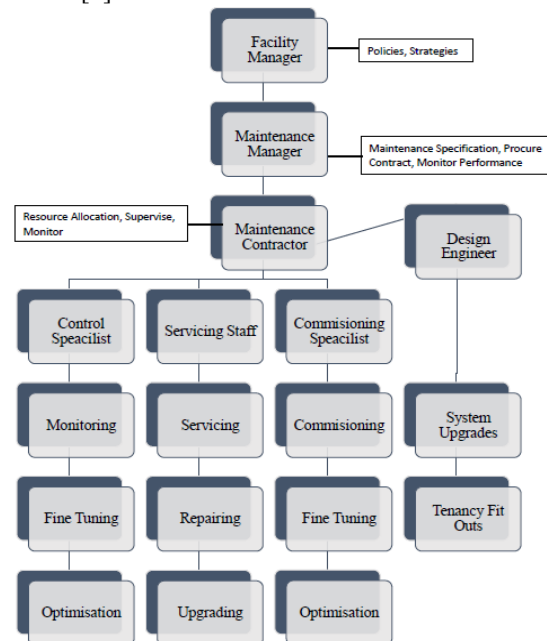


Figure 1.1 A maintenance management structure proposed for Welding Industry

A maintenance system can be viewed as a simple input/output system. The inputs to the system are manpower, failed equipment, material and spare parts, tools, information, policies and procedures, and spares. The output is equipment that is up, reliable and well configured to achieve the planned operation of the plant. The system has a set of activities that make it functional. The activities include planning, scheduling, execution and control. The control is achieved in reference to the objectives of the maintenance system. The objectives are usually aligned with the organization objectives and include equipment availability, costs and quality. The feedback and control is an important function in this system that can be used to improve the system performance.

2. MAINTENANCE STRATEGY USED IN WELDING INDUSTRY

A good preventive maintenance program anticipates and prevents equipment failures such as doing periodic inspections, parts replacement and equipment cleaning. Automated equipment, such as a robotic welding cell, for example, requires a targeted, routine

preventive maintenance program to ensure proper operation and provide maximum in-service lifespan. An effective program involves a routine systematic inspection, adjustment, lubrication, and replacement of components, as well as software upgrades and performance testing and analysis.

In order to extend the life of welding equipment, Total Productive Maintenance (TPM) can be implemented to improve the productivity and reduce the operating costs [2]. TPM enables a company to:-

- (i) Increase output/productivity without increasing the size of its welding fleet.
- (ii) Meet deadlines easier and avoid outsourcing welding.
- (iii) Conserve capital or free it for other uses.
- (iv) Increase profit margins (which in turn can enable pricing flexibility if necessary).
- (v) Improve cross-functional teamwork and communication.
- (vi) Empower associates to not just solve welding equipment problems, but also to eliminate the source of the problem.

3. IMPLEMENTATION OF SYSTEM APPROACH TO MAINTENANCE IN WELDING INDUSTRY

Operators are exposed to fume and gases when welding and exposures vary depending upon the process and specific working conditions. Fabricators are under continual pressure to reduce worker exposure to potentially harmful substances in the workplace, including welding fume.

There are many ways to reduce exposure to welding fume. Each solution addresses part of the welding system. Approaches to controlling welding fume actually fall into two broad categories:-

(i) Reducing fume generation

Limiting the generation of welding fume begins at the design stage. All other things being equal, a properly sized weld will result in the lowest amount of welding fume for a given process and set of procedures. Over welding, on the other hand, unnecessarily increases welding fume. As the amount of weld metal increases, the amount of fume also increases. The welding engineer should be aware of the role that weld size plays in the creation of fume.

(ii) Limiting operator exposure to fume

The most direct approach to limiting personnel exposure is simply to limit the amount of time an operator spends welding. This can often be accomplished via job sharing, automated welding systems, fume extraction technology, wall mounted low vacuum/high volume system and portable high vacuum/low volume extraction unit.

The limits for fume exposure set by OSHA and others are measured in milligrams of particulate per cubic meter of air (mg/m³).

OSHA proposed an 8-hour Time-weighted average of 5 mg/m³ for these fumes; this limit is established in the final rule. This limit applies to the total fume concentration generated during the welding of iron, mild steel, or aluminum; the fumes generated by the welding

of stainless steel, cadmium, or lead-coated steel, or other metals such as copper, nickel, or chrome [3].

4. EFFECTIVE MAINTENANCE PLANNING AND SCHEDULING SYSTEM

An effective maintenance scheduling system will decrease a considerable amount of non-productive time and provide a schedule of work orders with job descriptions, material requirements, necessary documentation, asset location, etc., enables the maintenance technicians to spend more time accomplishing the work. At the same time, certain repairs and/or modifications may require the equipment to be inactive, so it is extremely important that there is coordination with operations to plan and schedule the jobs in order to minimize downtime. Advanced planning and scheduling will also help avoid unnecessary overtime costs, and scheduling equipment and personnel will lead to an increase in production and a decrease in downtime. Maintenance scheduling is level of maintenance that requires planning, allocation of significant amount of time, and high degree of coordination between different departments, and is typically initiated through a work order. Scheduling deals with the specific time and phasing of planned jobs together with the orders to perform the work, monitoring the work, controlling it, and reporting on job progress.

5. CMMS SOFTWARE IN WELDING INDUSTRY

A Computerized Maintenance Management System (CMMS) is a software program designed specifically to help maintenance teams carry out their jobs more efficiently. The software is designed to assign maintenance tasks to the staff within a company in a more organized manner. Software such as WELDSPEC, Welding Coordinator and Welding Estimator can be used in welding industry to:-

- (i) Track and manage welding procedures;
- (ii) Trace fabrication information; and
- (iii) Project cost estimation.

6. CONCLUSION

This paper covered knowledge regarding maintenance of facilities and machine/equipment activities in good working condition and develops good maintenance management knowledge in the welding industry.

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