MAINTENANCE ORGANIZATION OF MACHINE TOOLS

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ABSTRACT

Maintenance of machine tools like every other maintenance operation requires a systematic approach. It must be properly planned, organized and executed. In order to get the right type of man employed, whether he be manager or floor man of the maintenance team must be carefully selected. This paper enunciates the maintenance organization based on the company's requirements. It mentioned the downtime cost and information about all the elements of machine tools stoppage. It also identified two factors standing against successful maintenance activities. These are high cost and poor human approach. Solutions to these problems were provided. Rational and cheap procurement of maintenance materials, reduction of downtime/cumulative maintenance time minimizes cost. On the human angle, the qualities of man in the maintenance team will make or mar maintenance activities.

Key words: quality, quality control, maintenance organization cost, downtime cost

INTRODUCTION

Quality control measures are designed to track characteristics of quality and to take action to maintain quality within limits.

In manufacturing, the actions call for may be equipment maintenance. The maintenance function then acts as a supporting role to keep equipment operating efficiently to maintain quality standards as well as to maintain quantitative and cost standards of products.

Maintenance of machine tools or any other equipment is a costly activity. It is one of the sizeable indirect costs that enters into manufacturing and for this reason requires attention by management. Thus, in terms of quality and quantity, the maintenance function aids increased productivity. In any economy, increasing industrial productivity is the only way to improve the standard of living. To achieve this in Nigeria efficient management and organization of industrial processes to cope with advanced engineering techniques and equipment is required.

The real value of any industrial organization and its processes are measured by its ability to prepare for and realize the work program. Machining processes are daily becoming more demanding on the plant in order to cope with the higher output rates required. In addition the continuing increases in competitiveness between producers, demand that reliability of plant and equipment must be ensured. To accomplish this feat, an aggressive maintenance program covering all plant must be the main responsibility of every maintenance organization.

FUNCTIONS OF THE MAINTENANCE ORGANIZATION

In the past, in view of its costly nature, maintenance work has been regarded as a necessary evil and only tolerated because it could be a clog in the wheel of production activities. Today, however, the production organization personnel, with their increased knowledge, appreciate the value of good maintenance as being an essential service without which production quality and output would suffer.

The following definition normally accepted as being the responsibility of the maintenance organization:

"To ensure that production plant equipment and supply services are available for productive use during the scheduled hours and performing to agreed standards. This should be achieved at a minimum operating cost."

Further discussions today on maintenance organization will be based on the definition above. First, this means that the plant must be available during scheduled hours normally they will be fixed for in advance. But when important orders are to be met, excess hours may be worked during planned maintenance periods. This decision must then be made and agreed upon as to reliability of the plant for this period.

Normally, it is much quicker and less expensive to repair or replace a deteriorating component than to repair or replace a failed component and any other resultant damage.

Second, the definition refers to standards. This specifically is the component quality, with machining this applies to dimensional accuracy and component surface finish. It is the engineering design department who sets these standards.
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The maintenance engineer must be fully aware of the required quality for he has to interpret these in the instructions given to obtain them. Thus, any apparently unreasonable high standard set must be questioned to limit the maintenance work.

The third part of the definition states that the maintenance function must be achieved at a minimum cost. This perhaps is the most difficult part of the definition to be satisfied and is better termed “optimum cost”.

The real cost of maintenance organization is in two distinct categories:
1. Direct cost: This includes labour, spare parts, maintenance equipment and supply of services.
2. Indirect cost: This includes the non-scheduled hours necessary for the production force to make up output cost due to plant failure, the additional services required by production and the presence of the maintenance crew during these periods. Also included in the indirect cost is the value of work which is not acceptable due to poor quality.

The cost of the maintenance function cannot be determined over a short period of time for it is variable due to the number of variables that apply in normal production processes. These variables include hardness of components, breakdown rates of cutting tools and the prime human factor in production.

The definition implies that the responsibility of the maintenance function is complementary to the production effort and this should be fully appreciated. The production organization has its own essential skill and knowledge; the managers and supervisor has been trained to perform these skills.

GENERALIZATION OF MAINTENANCE ORGANIZATION

The maintenance organization must be set-up to satisfy the factory requirements. These requirements are in two broad areas:
(a) The “domestic” maintenance of production buildings, lighting and ventilation systems, roadways and fences and other such general areas that are not directly related to production.
(b) The maintenance of production plant and equipment, essential services such as power, gas and water supply and all material handling and transport equipment.

The ration of (a) and (b) may vary considerably between different factories and thus the maintenance organization will vary considerably. On the one hand a large fabrication company specializing in batch production could have extensive buildings and little plant, on the other, a company may concentrate its efforts on precision machining through automatic flow lines.

In the first example the company may sub-contract the major portion of its maintenance work while in the second major portion of its maintenance load will be carried out by company’s own staff.

Generally speaking, it is more economical to have all domestic maintenance carried out by contractors and majority of machine tool maintenance carried out by company’s employees. However, some industries are finding it more economical to employ contracted machine tools maintenance personnel, provided they possess the necessary skills and can remain in the plant for a reasonable period of time.

MACHINE TOOL STOPPAGES, GENERATION OF DATA FOR PLANNING MAINTENANCE WORK LOAD

The following is necessary data required for stoppages (each machine is given an identification number)

<table>
<thead>
<tr>
<th>s/no</th>
<th>Item</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time of plant failure</td>
<td>Production function</td>
</tr>
<tr>
<td>2</td>
<td>Time of service call</td>
<td>Maintenance function</td>
</tr>
<tr>
<td>3</td>
<td>Time of commencement of maintenance</td>
<td>Maintenance function</td>
</tr>
<tr>
<td>5</td>
<td>Time for completion of maintenance action</td>
<td>Maintenance function production function</td>
</tr>
<tr>
<td>6</td>
<td>Repair necessary</td>
<td>Production function</td>
</tr>
<tr>
<td>7</td>
<td>Cause of failure</td>
<td>Production function</td>
</tr>
</tbody>
</table>

Action is usually taken after carefully analyzing accumulated maintenance data. A method of recording the necessary data is listed below:
Information contained above fully explains all elements of machine tools stoppages.
To permit an overall picture of maintenance breakdown action to be assessed the production of a large wall chart is suggested. This chart will state the identification number, and description of each machine.
It should also contain the following:
(a) Area of failure (mechanical electrical etc)
(b) Number of stoppages over designated periods
(c) Time for maintenance action to be completed
(d) Cumulative time for maintenance
In addition to records directly attributed to each machine tool, it will be necessary to record daily the total time spent by the maintenance crew in making repairs; this is to permit details of the section work loads to be assessed for maintenance planning purposes.
At this stage, armed with the details of the general condition of the plant, the maintenance engineer can proceed to formulating ways and means of reducing downtime. This exercise can be successfully conducted through the application of a planned, scheduled preventive or routine maintenance policy and, or by method study.

DOWN TIME
The time that an item of equipment is out of service, for example as a result of equipment failure. The time that an item of equipment is available but not utilized is generally not included in the calculation of downtime. In other words, downtime is the time that the asset is not in a condition to perform its required function. The downtime of an item includes active maintenance time and delays due to awaiting spares, labor, facilities, movement, etc. Unless otherwise stated, downtime due to failure is considered to commence at the instant the item is deemed to have failed and to persist until the equipment is again available.

TRUE DOWNTIME COSTS (TDC)
True Downtime Cost (TDC) is a method of recording and analyzing all the costs associated with equipment downtime in a production, processing or manufacturing facility. It provides a way to assign time and/or monetary value to stoppages in a complete, thorough and true way that reflects the direct, indirect and opportunity costs lost because of plant and equipment outages.
TDC includes downtime factors commonly overlooked, or previously considered “non-tangible”, to arrive at a more accurate value for the real cost of downtime. Downtime costs include more than the simply the direct costs usually quoted to managers. The true downtime cost includes a vast array of wasted business support costs and lost business opportunity costs because resources were needed to rectify a downtime incident that probably did not need to happen.

HUMAN FACTORS IN MAINTENANCE ORGANIZATION
In the organization of maintenance the importance of the maintenance man in his value to his company has continually increased. This implies that the type of man employed whether he be manager or floor mate of the maintenance team must be carefully selected. The main qualities that this man possess are: An enquiring mind, a dedicated attitude, a high sense of responsibility and a good spirit of co-operation in the team. Without these qualities, the reliability of the organization of the maintenance team could be in doubt. It is therefore necessary for the production organization to have a sense of regard for its maintenance service. Lack of this co-operation however, will greatly affect the smooth and efficient operation of plant.
Furthermore, it must be appreciated that the traits and qualities of the maintenance men must be understood by his superior to encourage him to give his best. If he is over-supervised, he will draw into his skin and do as instructed.
On the other hand, if under supervised, he could believe that the supervisor does not know his job or if he does, then the supervisor is off loading too much on the man. Of utmost value to any maintenance organization is a supervisor who understands the tradesman traits and can administer soundly.

CONCLUSION
So far, essential requirements of a functional maintenance organization have been discussed though not exhaustively. Inherent problems and tasks are not likely to diminish in number and importance with increased industrial activity.
However, this paper has succeeded in creating the awareness that systematic maintenance, no matter how simple when aggressively pursued can reduce downtime and consequently maintenance costs.
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