

8. MP DESIGN AND EARLY EQUIPMENT MANAGEMENT PROGRAM

MP DESIGN

One of the goals of TPM is to develop maintenance free equipment . One way to do this is to make improvements at the earliest possible stage; in other words, when the equipment is designed. TPM includes activities aimed at preventing breakdowns and defects in newly installed equipment by applying preventive maintenance principles during the design process. In other words, MP design includes discovering weak points in currently used equipment and giving feedback data to the design engineers.

The search for weak points in equipment can be carried out from the following perspectives:

Facilitating Autonomous Maintenance

Some of the most valuable information designers need comes from production workers who must deal every day with the limitations of equipment that was not designed with maintainability or operability in mind. For example:

- + Can cleaning and inspection be easier ?
- + Can lubrication be centralised so that lubricant is supplied at just one or two inlets per equipment unit ?
- + Can the piping layout be improved by changing the location of FRLs or solenoids, for example ?
- + Can the length and layout of wires be improved ?
- + Is debris scattered around ?

Increasing Ease of Operation

- + Can equipment be more resistant to operator errors, such as by changing the positions of switches and the layout of buttons on control panels ?
- + Can changeover procedure be simplified ?
- + Can standards be clarified to facilitate adjustments, or can measurement methods be made easier ?

Improving Quality

- + Have the precision settings and methods been determined (what to measure, how to measure it, limit values, etc.) ?
- + Is Precision easy to measure ?
- + Is diagnostic equipment easy to set up? Does it have visual displays ?

Improving Maintainability

- + Have equipment life data been collected, and is work in progress to extend equipment life ?
- + Can parts replacement be simplified ?
- + Can replacements be done in pre-assembled units ?
- + Are breakdown analysis and repair measures applied to prevention measures in similar equipment ?
- + Are self-diagnostic functions built into the equipment ?
- + Can oil supply and oil changing be simplified ?

Safety

- + Are interlocking methods safe ?
- + Are there safety fences around hazardous equipment ?

The factory floor people and maintenance staff should give feedback on these matters to the design department so it can incorporate maintenance preventive improvements into the equipment. Naturally some improvements cost more than others, and equipment design engineers must weigh the cost of each suggestion against the estimated savings.

EARLY EQUIPMENT MANAGEMENT

When new equipment is installed, problems often show up during test running, commissioning, and start-up, even though design, fabrication, and installation appear to have gone smoothly. During this period, production and maintenance engineering people work hard to eliminate “bugs” in the new equipment. They must often make many improvements before normal operation can begin, to correct problems caused by such problems as 1) poor selection of

materials at the design state, 2) errors occurring during fabrication of the equipment, or 3) installation errors.

The delays caused by such problems are very costly. Even then, the repairs, inspections, and adjustments needed during the start-up period, and the initial lubrication and cleaning needed to prevent deterioration and breakdowns are often so difficult to carry out that supervising engineers become thoroughly discouraged. As a result, inspection, lubrication and cleaning may be neglected, which needlessly prolongs equipment downtime for even minor breakdowns.

Many of these troubles can be avoided when the appropriate processing and operating conditions are built into the equipment through the application of MP design principles. Early equipment management also minimises these errors or omissions and the delays they cause by identifying or predicting them at the stage in which they occur and taking action at that time to prevent them. The key strategy is simple – the same one operator apply in improving their own cleaning and inspection procedures – thoroughly listing all abnormal conditions and systematically addressing each one.

Generally, people notice very few problems at the design stage, but the cost of correcting them later is considerably higher. Virtually 95 percent of LCC (life-cycle cost) is determined at the design stage. Certainly, maintenance and energy costs of operation are determined by the equipment's original design. Efforts to reduce LCC after the design stage will affect only 5 percent of the overall figure.

In many cases, unfortunately, there is poor communication between the equipment design department, the production department, and the maintenance department. This makes it difficult to use the information obtained from routine PM activities to design better equipment. Maintenance engineers do not share data that could be relevant at the design and fabrication stages: and design engineers do not standardize general technical data or use the maintenance data they receive. When maintenance and design engineers cooperate to close the gap between maintenance and design technology, much waste can be avoided.

MP design and early equipment management both attempt to reduce the cost of human error and inadequate planning. MP design reduces the cost of the normal operating life of equipment, and early equipment management reduces the cost of the early failure period. By documenting well their observations and ideas related to equipment, production and maintenance personnel play an important part in reducing these costs.

This chapter has shown just how broad the scope of equipment management should be, and how careful planning is important to prevent costly oversights and omissions. To smooth the ride on the road to “Zero breakdowns” and “Zero defects”, autonomous maintenance and specialised maintenance activities must be closely coordinated with the work of the engineering and design division.

