EQUIPMENT RELIABILITY CONTRIBUTION TO PRODUCT QUALITY

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IN PARTNERSHIP WITH:
THE MAINTENANCE COMMUNITY BY UPKEEP

The potential financial gains from improving product quality can far exceed company's maintenance budget. Production losses such as rejects, waste, and substandard quality directly impact the bottom line or profitability of a company.

The quality of a product can be impacted by various influences: human factors (operator errors), raw materials (substandard material), shipping and storage, sampling and measurement of quality, and facility/production equipment reliability.

Equipment reliability is the focus here -- both from a maintenance perspective and from a quality perspective -- relative to how it impacts business profitability. This article will identify possible remedies for companies with reliability and quality problems.

First, we must define what quality areas we are specifically talking about. One type of quality is that of a company's products. The quality, as well as the function, of a company's products defines the price it can ask and thus determines the edge a company may have on its competitors. The other type of quality is that of the

> *The maintenance of facility equipment and production systems is more closely connected with the quality of products than most managers realize.*

maintenance itself. How reliable is the company's performance of maintenance? The quality of its maintenance directly impacts the quality of a company's products.

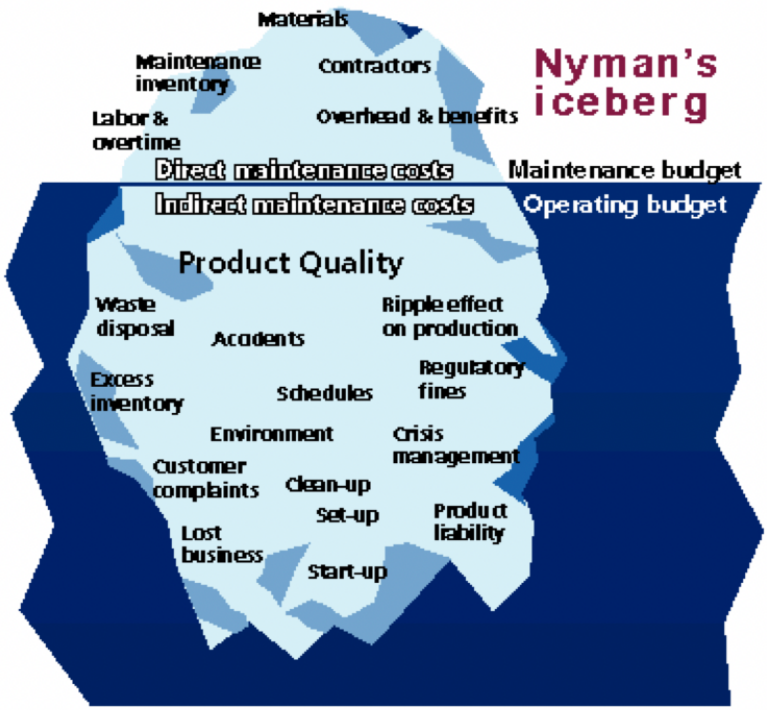
THE IMPACT OF EQUIPMENT RELIABILITY

Equipment reliability directly impacts production capacity for the following reasons:

Equipment outages because of unscheduled downtime. In most cases, unscheduled equipment outages result in the loss of an opportunity to sell a product that could have been produced during that time. This results from lost run time and also from the reduction in quality as a process is brought back up to full product specifications. Such quality losses can add up significantly over a period of just one year.

Equipment stoppages because of unscheduled downtime. Equipment stoppages, either because of direct failure or the failure of facility support systems, sometimes impacts bottom line profitability by creating product waste or scrap. The product cannot be sold, and, in addition, the plant may use Saturdays and pay overtime to make up for the lag in the production schedule. In most companies, waste is measured, but it is not viewed as a direct loss of profits. However, the waste is due to poor quality attributable to equipment stoppages and to the time it takes for the process to return to the required quality level. Additionally, the losses due to excessive waste product, overtime, power consumption, and reduced equipment life are not measured.

Don Nyman of Nyman and Associates, great mentor of mine in the past, related maintenance costs to an iceberg. The losses due to quality considerations fall below the water line and are not normally identified or measured in relation to equipment reliability or maintenance. For example, one company that makes cardboard boxes, while not sold out, does produce waste related to quality issues. Even though the company does not use overtime, their revenue losses reach $4.2 million a year. If



one were to measure the losses with Saturday labor and facility operation to make up for production losses, the number could grow by $1.8 million per year. These figures do not include losses due to lost customers because of late shipments. The loss of customers due to late shipments is difficult to measure, but it is a loss that can seldom be recovered.

RELIABILITY AND MAINTENANCE

The quality of the maintenance performed impacts product quality. It takes reliable equipment to produce products to quality specifications. Variations in maintenance processes cause variations in equipment reliability and performance. Taking measurements of "best maintenance practices" can reveal what causes variations in equipment reliability. (See Table 1.)

If a company truly wants to implement a quality management process, then it must ensure that it identifies the variations in equipment reliability. Attempts have been

Table 1: Equipment variations and solutions

Best practices measurement	Causes of variation	Solutions
70% of equipment failures are self-induced	* Lack of skilled work force	* Skills assessment and training
	* Operator errors	* TPM/operator procedures
	* Reactive culture	* Change measurement
	* PMs not performed properly	* PMs must be managed as an experiment
30% of all labor hours should be on PM	* PMs not being performed to a standard	* Have detailed procedures
	* PMs not a high priority	* Measure PM compliance
90% of all work orders come from preventive maintenance	* PM inspections are turning into repair activities	* Train personnel in proper PM execution
	* 90% of all maintenance work is not planned and scheduled	* Implement a true planned/ scheduled maintenance program
Emergency work is less than 2% of total maintenance labor hours	* No PM schedule compliance	* PM schedules must be completed within 10% of time allotted (e.g., 30-day frequency/PM compliance to within 3 days)
Courtesy of John Day, former engineering/maintenance manager at Alcoa Mt Holly, recognized by many organizations for over 20 years as the best in maintenance.		

made in Table 1 to identify areas of variation together with possible solutions, however best way to identify and improve quality through improved equipment reliability is to:

1. Identify whether an equipment reliability problem exists and whether it impacts

quality. Measure (in dollars of lost revenue) waste caused by equipment reliability issues.

2. Perform a maintenance assessment to identify where the variations are in the maintenance process. For example, are they in procedures relating to preventive maintenance (PM), planned maintenance schedules, the storeroom, emergency work, crew structure, or some other maintenance-related function?
3. Develop an action plan and timeline with benchmarks and performance metrics to reduce variations in the maintenance process to an acceptable quality level.
4. As you measure, improve the maintenance process as required.

Companies that want to compete more effectively in today's market must be progressive and accept and implement change. Eliminating variations in the process and thus improving product quality can provide increased market share, add revenue (and profit) to the bottom line of a company, increase employee morale, and reduce costs associated with a maintenance program, which is in a reactive state. A total planned maintenance program can pay for itself through the elimination of product quality variations.

Total planned quality maintenance (TPQM) is not just a buzzword. It is a philosophy that must flow from top management down in order to produce the effects that most favorably impact the bottom line. TPQM is a program of maintenance that can improve employee morale and effectiveness. It involves all aspects of maintenance

Metric	Typical	World Class
Maintenance cost/replacement asset value		
Maintenance cost must include labor (including overtime), materials, contract maintenance, and capital replacements, and maintenance (replacing worn-out assets because they were never properly maintained)	3.5–9%	2.0–3.0%
Maintenance materials cost/replacement asset value		
Maintenance materials cost must include material in storeroom stock plus material in other locations (maintenance shop, plant floor, etc.)	1.0–3.5%	0.25–0.75%

Maintenance Cost in Typical and World Class Companies

including planned periodic, corrective, and predictive processes. Quality maintenance equals quality products.

Let us never forget Equipment Reliability Impacts not just product quality but total cost per unit produced, safety, etc.