



TenStep Supplemental Paper

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Prudent For the Environment, Prudent For Business?

Any defects within a process, contributes to poor environmental performance for a company

In the 1950's, the Japanese approached W.Edwards Deming, an American statistician and management theorist to help them improve their war shattered economy. By implementing Deming's principles of Total Quality Management (TQM), Japan experienced dramatic economic growth. In the 1980's, the United States could see its own world market fall sharply unlike Japan. Very soon the American industry rediscovered Deming.

As companies gear themselves to meet specific requirements of individual customers, it becomes necessary to have a system in place. The system can be recognized only through a TQM concept, as everything has to be done correctly the first time.

In the recent years, TQM has conquered almost every sphere of the global corporate world and has been implemented in large multinational companies. Total Quality Management (TQM) is now practiced not only in business but also in the military, education, and non-profit organizations including libraries.

In the past, the quality control efforts focused more on detecting errors by inspecting the products that were already produced. However, this process resulted in a lot of rework and waste. With the implementation of TQM principles, the quality control effort in the organization is based on prevention and continuous improvement. Continuous improvement involves seeking opportunities every day for making changes for the better.

Improvements can be with respect to the workplace, processes, products or even internal and external communication. TQM focuses on addressing the root causes of the problem and eliminating the errors cost-effectively.

A unique feature of the TQM principle is that, it makes employees aware of the problems. By doing so, the process creates interest in the employees to become familiar and address workplace issues. Thus, TQM initiates the creative capabilities of employees.

Total Quality Environmental Management:

Effluents that are generated within a manufacturing process leads to poor environmental performance for a company. TQM tools and its principles help in improving environmental performance of a process by helping to identify and eliminate these effluents. Hence as TQM is used to identify and eliminate inefficiencies and defects in a process, Total Quality Environmental Management (using the same analogy of TQM) can help improve the environmental performance of a company.

Tools for TQEM

TQEM principles can be implemented by using various tools like:

- Pareto Charts.



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- Cause and Effect Diagrams.
- Control Charts.

These tools serve various purposes such as:

1. Addressing the root cause for pollution and then taking steps to prevent them.
2. Identifying the probable causes for pollution.
3. Implementing a certain level of pollution that is predictable from the process.
4. Implementing a plan to address and prevent the pollution from occurring.

Pareto chart: It is a chart or a graph depicting each problem along with the frequency of the occurrence. It can be created thus:

- Create a table listing all observed causes to a problem occurring at a particular stage. Identify the number of occurrences of each cause over a fixed period of time. Rather than attacking the causes randomly, a Pareto Analysis will help identify the top 2 or 3 causes that are the major contributor to the problem. This helps to identify the causes that need to be tackled first.
- The Pareto Charts provide a detailed analysis of information that helps in providing a starting point for a TQEM program.

Cause and Effect Diagram:

Cause and effect diagram allows the team to identify, explore and graphically display, in increasing detail, all the possible causes related to a problem so that the root cause(s) can be identified.

The cause and effect diagram allows the problem to be examined by all the team members. It is developed through brainstorming efforts. This brainstorming method addresses all the root causes of the problem and shifts the focus from symptoms.

Once the root cause(s) of the problem is discovered, rectification becomes easy. If rectification is not achieved, the cause and effect diagram may indicate the best potential areas for further exploration and analysis.

The cause and effect diagram is popularly called as the fishbone diagram since it resembles the skeleton of a fish.

Control Charts

The tool that is used for determining process variability is called a Control chart. Control charts map the capability of a process to meet the tolerance specifications laid out in the design. The chart contains a centerline that represents the average value of the quality characteristic corresponding to the in-control state.

Two other horizontal lines, called the upper control limit (UCL) and the lower control limit (LCL) are also drawn. These control limits are chosen so that if the process is in control, nearly all of the sample points will fall between them. As long as the points plot



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within the control limits, the process is assumed to be in control, and no action is necessary.

However, a point that plots outside of the control limits is interpreted as evidence that the process is out of control, and investigation and corrective action is required to find and eliminate the assignable causes responsible for this behavior by alerting the TQEM team. Some of the environment parameters are, total liquid and solid waste, energy consumption, or safety and environmental incidents.

TQEM tools help organizations to continuously monitor the environmental performance. Improving the environmental performance is not only good for the environment and community but also for business.

Quality success at Flynt

Flynt Fabrics produce knitted fabric. The company's CEO and President envisaged an environment friendly, world-class manufacturer of knitted fabric. In order to achieve this goal it implemented TQEM tools. The experimentation process was first carried out at the company's plant in Graham in North Carolina. Prior to the implementation of TQEM tools, the knitting facility faced a problem of large amount of waste being produced. This had been a result of increasing failure rate. To solve this issue, Flynt implemented various TQEM tools like Pareto charts, Control charts, Cause and Effect Diagrams and brainstorming.

After applying TQEM tools, in 1993, the company achieved a success rate of 99.116 percent (by producing quality products in the first time itself). Consequently, the solid waste decreased to a large extent.

After successfully implementing TQEM concept at Graham facility, Flynt went on to implement the concept at its finishing plants at Burlington and Hillsborough in North Carolina. Flynt took TQEM a step further and implemented tools like design of experiments (DOE) at the plants. Apart from this, it also carried out a detailed study on product reliability and capability in its effort to improve product performance and quality.

Source reduction activities through TQEM

Baxter Healthcare Corporation is a pharmaceutical company, which produces intravenous fluids. The company produces intravenous fluids and necessary plastic packaging at its site.

As the company dealt with various plastic packaging and intravenous fluids, they produced large amounts of waste. In order to reduce this and the resulting toxicity of waste entering the waste stream, Baxter designed some source reduction activities with the aid of TQEM tools.

Source reduction can be defined as, "any action that avoids the creation of waste by reducing waste at the source, including redesigning products or packaging so that less material is used".



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Few source reduction activities

- Normally, Freon was used as a cleaning agent to remove grease from the mechanical parts. . As part of the source reduction activity Freon was replaced with Isopropyl alcohol. This was because Freon produced the ozone destroying chlorofluorocarbons. Consequently, nearly 2.15 tons of Freon usage was eliminated.
- Baxter installed a new program called *Lone Pine* to increase its control on the inventory. This led to efficient usage of laboratory chemicals and reductions in the number of expired chemicals rejected. Thus, there was a 790-pound reduction in the rejected expired chemicals wastage.
- Initially, the company used a boiler, which was fuelled by using oil to generate steam. As part of the source reduction activity, oil was replaced by wood waste from the sawmills. This change in fuel reduced the company's expenses on oil. Moreover, wood is more environment friendly than oil, which produces sulfur dioxide emissions. The replacement of oil with wood resulted in reuse of 7005 tons wood waste.
- After plastic products are produced, the plastic scrap and edge trimmings that are produced along with the product are sent to the company's extrusion plant. Thereby the company could avoid the costs of dumping the waste into the landfills, and reuse 2771 tons of plastic wastes and scrap.
- Baxter implemented a *Safety Kleen* Solvent substitution program. This program aimed at replacing hazardous solvents with non-hazardous ones. This method helped reduce the company's costs of disposing chemicals that were considered as hazardous waste.
- The wastes obtained in the production plant like paper, cardboard and plastic were sold to vendors. By selling these materials to vendors the company realized savings of \$204,000 in revenues annually. The plastic reuse method at the plant gave the company a total savings of \$1.7 million every year.

Any waste or inefficiency leads to poor environment performance within a process. TQEM tools provide companies a systematic method to carry out the continuous improvement in the environment performance. By applying TQEM philosophies, organizations can seek to discover reasons for poor quality and environment performance and address them.