The Stops and Starts of Total Quality Management

After a cloudy beginning, TQM shines through at a glass manufacturing plant in Columbus, OH.

by
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FIVE YEARS AGO, TECHNEGLAS began its long trek to total quality management (TQM). The road was bumpy at first, but the company backed up, started over, developed an organized approach, and now enjoys the realization of a successful transition.

The demand for quality

Techneglas is a world leader in the manufacture of glass for television picture tubes ranging in size from 16 inches to 35 inches diagonally. The company has been at the forefront of television glass manufacturing for more than 50 years, starting with small, black-and-white cathode-ray tube (CRT) bulbs and developing into large, rectangular, color television glass.

With approximately 1,600 employees, this Columbus, OH, plant manufactures glass for the back portion of television picture tubes, commonly called funnels, and produces the front portion of the glass, called panels, at its Pittston, PA, facility. The company also manufactures solder glass, or frit, that its customers use to bond the funnel and the panel together to make completed picture tubes.

The quality demanded for television glass greatly exceeds that for most industries. Minute defects that typically would go unnoticed in most production items can be extremely costly to television tube manufacturers. The glass goes through severe heating and cooling cycles during the manufacturing process, making it highly susceptible to defects.

Short-lived progress

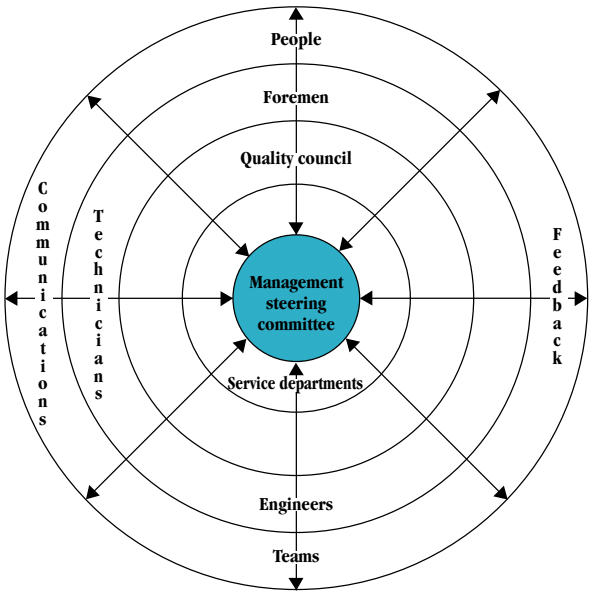
During the 1980s many Techneglas customers, including American, Japanese, and European companies, started tightening their requirements for acceptable defect levels. Techneglas realized that the quality of the glass being manufactured had to be improved to meet the ever-increasing demands of its customers.

With the need to improve quality as well as productivity, the Columbus plant attempted to incorporate statistical process control (SPC) into its operations during the mid-1980s, training more than 100 employees in this trend-evaluation tool and implementing SPC charting in some of the plant's departments. Progress, however, was short-lived and doomed to failure from the start because there was nothing in place to sustain the SPC effort.

The first organized approach

In May 1992, management at the plant requested an organized approach for developing SPC. With this directive in mind, the company hired an outside consulting firm to help with implementation and formed a management steering committee

Figure 1. TQM Implementation Wheel



(Source: $\bar{X}$R Associates, Inc., Toledo, OH)

to determine how best to introduce statistical understanding and use in the daily applications of the plant, develop a comprehensive program for achieving statistical literacy and appropriate application in all areas of the plant, and guide the concept to completion through continuing oversight and direction.

After their first meeting, the steering committee and the outside consultant realized that the program they were creating needed to be much more than just SPC. It needed to spread the concept of TQM throughout the plant. Their first task was to define the TQM concept for Techneglas, which they did as follows: "TQM is a philosophy that incorporates established fundamental concepts to improve quality and productivity through the combined efforts of all employees."

The fundamental concepts included using SPC to eliminate dependence on mass inspection of the final product, establishing teams of hourly and salaried personnel for problem solving, and establishing a two-way communication network between top management and salaried or hourly workers (see Figure 1).

The TQM implementation wheel in Figure 1 graphically shows how the two-way communication network between management and the workers operates. Essentially, people concerns are driven in and management resources are allocated out.

People concerns include:

- Process charting and analysis
- A firsthand knowledge of problems
- A belief that best solutions come from the people closest to the process
- An understanding that a foreman's job is to remove demotivators
- Immediate corrective action
- The possibility of follow-up
- Good standard operating procedures and written communication

Management resources are allocated out to:

- Provide resources
- Provide training
- Provide guidance and direction
- Provide communication
- Provide recognition
- Make necessary cultural changes
- Carry out implementation

Techneglas then instituted modern methods of supervision to provide workers with the proper tools, equipment, and processes. These supervision methods react quickly to reduce barriers to job performance such as inherited defects, poorly maintained equipment or machinery, or poor tools. The goal was to remove all barriers that rob the workers of pride in workmanship, break down barriers between departments, and eliminate fear within the organization that might prevent workers from reporting process problems or irregularities.

The company next worked with vendors to ensure statistical evidence of product quality and instituted vigorous programs of education, self-improvement training, and training for its employees.

Goal setting

The management steering committee then developed a quality statement to be endorsed by management and the labor union, and trained all steering committee members, department supervisors, and engineers on SPC. Pilot SPC programs were started, using teams in two operating departments, training hourly and salaried personnel to sustain the programs. Chosen by the steering committee, the pilot programs had a high likelihood of immediate success and were considered crucial for the implementation process. The teams were responsible for developing the pilot SPC programs in each area.

From the start, the goal was to restrict training to employees who would be using SPC and TQM concepts. The company did not want to repeat the mistakes made in the 1980s when many people were trained who never used the principles learned. Therefore, training was limited to employees in the two departments that would need it. The theory was to start small, stay focused, and make the first pilot programs a success.

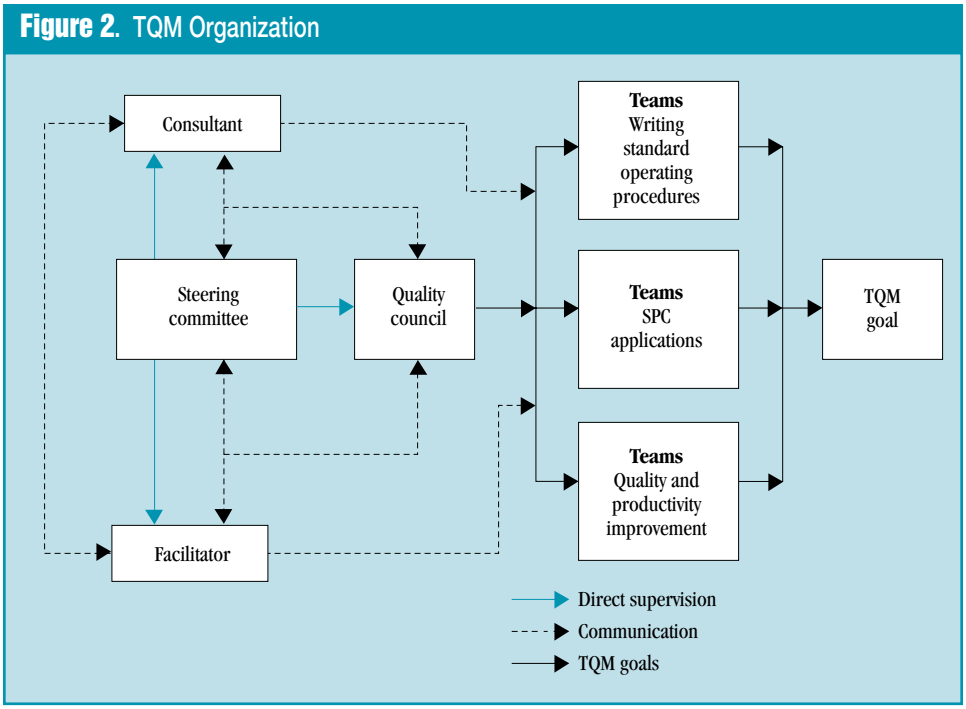
With the goal of establishing quality and productivity improvement teams, another pilot program was created in an operating department. The idea was that the success of this team would encourage other departments to start them.

The steering committee also planned to publicize the TQM program throughout the plant. It wanted the program to have high visibility.

Along the road to TQM

This time, with map in hand, Techneglas started again on its long trip toward implementing TQM. The stops along the way

Figure 2. TQM Organization



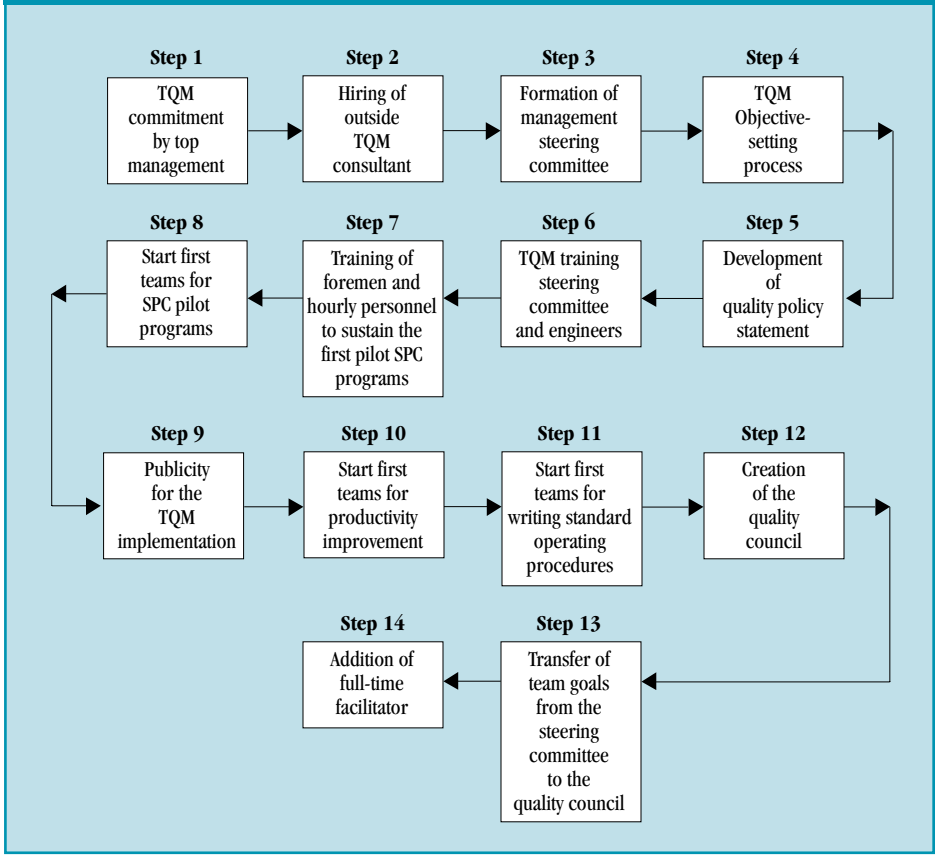
included six phases:

1. Initial TQM training. The implementation process started with the training of steering committee members on SPC and TQM concepts.

2. First pilot SPC programs. The next phase was to select two departments and a pilot SPC program for each area. The steering committee gave a lot of thought to these first two pilot programs because it was vital for them to be successful. Team members (a combination of supervisors, engineers, and hourly employees) were then selected by the steering committee for each pilot program and were given the responsibility of developing the SPC pilot programs.

3. Expansion of pilot programs. Once the first two SPC pilot programs were on board and considered successful, the steering committee requested that the other operating departments start their first pilot SPC programs. Again, the management steering committee played a major role in the selection of the pilot SPC programs in each department.

Figure 3. TQM Implementation



4. First TQM team. The next phase of the implementation process centered on the formation of a team in one department for the purpose of quality and productivity improvement. The team was to be a combination of hourly and salaried personnel, and its goal was to write a standard operating procedure. Again, as in all cases, the steering committee stressed the importance of success for this first team to motivate others to start their own teams.

It was deemed crucial that this first team be a combination of hourly and salaried personnel. The steering committee issued a directive early in the implementation phase that all teams must have a minimum of 50% hourly participation to be considered a legitimate team. For the TQM implementation to be successful, it had to include all Techneglas employees.

5. Expansion of the TQM team concept. Once the newly formed team proved successful, other members of the steering committee were encouraged to start teams in each of their departments.

6. Quality council created. By this point, in 1993, the TQM program was well under way and the beginning stages had been successful. Most of the operating departments were actively involved in the process, the quality mission statement had been issued, the pilot SPC programs were in progress, and teams had been created to support the pilot SPC programs.

The only missing element was a clear picture of how the momentum would be sustained and how continued growth of the TQM program would be ensured. So a quality council, consisting of engineers and assistant supervisors from each plant department, was created to move the implementation process another step down from the management steering committee. Each person on the quality council was responsible for TQM implementation for his or her respective area.

Meeting weekly and sharing information on TQM progress, the quality council was asked to focus on the three main areas of TQM implementation: pilot SPC applications, teams, and standard operating procedures. Departmental successes were shared at the quality council meetings each week, serving as a positive motivation for other team leaders to get programs moving in their areas. The idea was to get this key group of individuals involved in the TQM implementation process as a link between the management steering committee and the salaried and hourly employees.

The quality council concept was considered by the steering committee to be a crucial step in the implementation process. The quality council started meeting weekly in August 1994, and so far there has been excellent participation from the group. Sharing successes and failures in council meetings is proving to be of great value to the implementation process, as is the feedback provided to the management steering committee. Success can be contagious.

The seventh phase: Adding a TQM facilitator

Early in 1996 a TQM facilitator was added to the organization. The original role of the facilitator was to work closely with all teams, facilitating their meetings, keeping them on track, and acting as liaison between the steering committee, quality council, and teams, plus numerous record-keeping tasks and publici-

ty assignments. But it soon became obvious that this job was too big for one person to handle. At the end of 1996, Techneglas counted 51 teams and 370 team members.

A solution was found: The facilitator and the outside consultant offered facilitator training classes so each department would have its own facilitator. The response was excellent, and by the end of 1997 Techneglas had almost 50 facilitators on hand.

The TQM organization

Figures 2 and 3 show the organization Techneglas used for its TQM implementation and the steps taken along the way. With the steering committee to guide and direct the program, the outside consultant to advise, the quality council to relay information between teams and upper management, and the facilitator to coordinate functions and publicize activities, Techneglas has taken giant strides toward full TQM implementation.

The company did not want to repeat the mistakes made in the 1980s when many people were trained who never used the principles learned.

As of May 1997, the quality policy had been drafted, 324 employees had received thorough training in statistical methods, and SPC pilot programs had been very successful; 14 had been either completed or were in progress. Hourly personnel were doing SPC charting, and two departments significantly tightened specifications using SPC control. While the team status is continually in flux as teams reach their goals and disband and as new teams start up, at the end of May 1997 Techneglas had 51 teams and 348 team members who had written 87 standard operating procedures. By the end of December, the standard operating procedures numbered 116.

Perhaps it is premature to say that the program of TQM implementation will be successful at Techneglas, but all signs indicate that the program is alive, thriving, and moving ahead at an accelerated pace.

Since the implementation process started in May 1992, there has been continual progress in meeting SPC, team, and standard operating procedure goals. This progress, in large part, is a result of the organization that was created for TQM implementation at the plant.

Throughout 1997, the steering committee and quality council laid out rigorous goals: an increase of the hourly team involvement, an increase in the number of plant SPC applications, and an increase in the number of standard operating procedures written. It also worked to develop team participation awards and improve publicity for the program.

Quality and productivity

Techneglas has not attempted to correlate the TQM implementation with quality and productivity, but the company has continued to make significant improvements in both areas over the past five years. Techneglas continues to believe that it is through people involvement that true and lasting quality and productivity improvements are made. The plant continues to believe that TQM implementation is the key to continued improvement for the future.

One team's example

In September of 1995, plant management requested that its Production Engineering Testroom reduce scrap being generated from the testing area. A salaried engineering team was formed immediately and programs were initiated that provided significant savings of glass. Because of the TQM program, the department supervisor started four hourly teams, one from each shift, to address the same issue. Moreover, an outside facilitator was hired to meet with the Testroom teams.

The four hourly Testroom teams doubled the number of funnels saved by the salaried engineering team, proving the theory that people actually doing the work have the best understanding of the work and that everyone is needed to improve quality and productivity.

Techneglas has a strong commitment to TQM. The program follows the fundamental concept of doing things right the first time—through the use of SPC, teams for quality and productivity improvement, writing standard operating procedures, and good two-way communication.

From the beginning of the program, Techneglas formulated a long-term plan that not only allowed for SPC training and implementation, but also focused on improved quality and low-cost performance. The company established a quality statement early in the process, outlining the following objectives to manufacture quality products that meet the expectations and requirements of their customers:

- We will continually reduce the variability of our processes.
- We will maintain competitive levels of quality and productivity.
- We will develop additional skills in our employees through education and training to enhance each person's job performance.
- We will demonstrate a strong commitment to quality through the use of TQM principles of SPC and teamwork.

Techneglas has based its planning on the premise that people must communicate, motivate, and lead more effectively—and stay with the basics. Having created a management structure that allows everyone to participate in the established TQM program, Techneglas is not just waiting for the future but is creating it with investment in its people. The company realizes it is people who make the difference. Teams and teamwork are powerful concepts at this Columbus facility.

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