
PROMOTING VOLUNTARY COMPLIANCE: LINKING COMPETITIVENESS, CORPORATE QUALITY, AND SELF-AUDITING

OLHA, JENNIFER R.¹ and MASTRANDONAS, ANDREW²

¹ Research Assistant, Law Companies Environmental Policy Center, Staff Assistant, Global Environmental Management Initiative

² Associate Director, Law Companies Environmental Policy Center, Executive Director, Global Environmental Management Initiative

2000 L Street NW., Suite 710, Washington, DC 20036 USA

SUMMARY

This paper will discuss the benefit of voluntary compliance initiatives to companies and why market-based compliance schemes provide a reasonable way for companies to conform to national or international environmental policy objectives. It will also provide examples of government-sponsored voluntary incentive programs such as the United States Environmental Protection Agency's (EPA) 33/50 Program. Finally, this paper will discuss the activities of the Global Environmental Management Initiative (GEMI)—an organization that fosters corporate voluntary compliance programs—and the necessity of self-audit programs, such as GEMI's Environmental Self-Assessment Program.

1 INTRODUCTION

1.1 Voluntary compliance and competitiveness

Voluntary compliance is a balance that is struck between regulators and business. Rather than requiring companies to meet certain rules and regulations in a pre-determined manner, regulators offer a way for companies to determine their own methods and measurements in order to accomplish environmental policy objectives.

A consensus is beginning to form among policy makers, business leaders and academics, particularly in the United States, that when the government allows business to address environmental policy goals through an open market process, companies can be most effective from a number of perspectives, including: timeliness, cost and quality.

It is an inherent value of a profit-seeking organization to seek an *enviro-competitive advantage*, a model in which a company reduces its environmental impacts in order to become more competitive in its industry. Companies can naturally move toward enviro-competitive advantage thinking by realizing that reductions in environmental impacts lead to a reallocation of finite investment resources from environmental control and management activities to other, profit-making business endeavors.

It is not to be concluded, though, that a shift from regulator-run, mandatory compliance programs and the associated enforcement function, can be replaced entirely by market-driven environmental management programs. In any scheme, there will always be laggards who will find ways to delay environmental improvement activities, possibly to secure short-term profits or for other reasons, even when the appropriate incentives are provided by government. An appropriate environmental compliance and enforcement strategy may be one in which free-market incentives are provided to companies to move toward enviro-competitive advantage while ensuring that the laggards meet environmental policy goals through traditional command-and-control/enforcement approaches. Compliance, therefore, may be best achieved by providing a mix of free market and government incentives.

In general, voluntary compliance appears to work well. Companies are both meeting and exceeding environmental objectives through voluntary programs such as the U.S. EPA's 33/50 Program, Energy Star Buildings, and Greenlights Program. As a result of these programs, companies are participating in continuous environmental improvement and pollution prevention.

2 INCENTIVE PROGRAMS

2.1 U.S. EPA programs

To foster a better relationship with companies while enhancing efforts to promote environmental improvement, the U.S. EPA has developed several voluntary compliance programs for businesses to join. Companies are encouraged to participate because voluntary compliance programs provide a method for companies to meet certain objectives without being mandated. These programs are an excellent way for companies to communicate that industry is voluntarily participating in programs that are favorable to the environment.

The concept that appears to link all government-sponsored voluntary programs is that companies are asked to meet a certain goal (i.e., emissions reduction) but are then left to determine the best method for ensuring attainment. In a sense, then, the government is fostering market-based incentives to improve business' environmental performance.

EPA has created several voluntary compliance programs such as the 33/50 Program, Energy Star Buildings, and the Greenlights Program that enable companies to use their technology and employee expertise to meet the specific goals of these programs.

The 33/50 Program was started in 1989 at the request of Congress to create a risk analysis list of sites containing carcinogens. The program's aim was to reduce Toxic Release Inventory pollutants 33% by 1992 and 50% by 1995. The 33% goal was met one year early, in 1991, which demonstrates the power of innovative efforts in the industrial sector. There are approximately 1,200 companies participating in the program to date.

The Energy Star Buildings Program is a five-stage process in which the U.S. EPA asks participants to perform energy-efficiency upgrades where profitable. A comprehensive building survey is performed which determines heating requirements, ventilation, and air-conditioning loads. The U.S. EPA is currently working with 20 buildings in a staged approach, which should take approximately 1-2 years to complete.

The Greenlights Program, initiated in 1991, is intended to promote the use of energy-efficient lighting in offices and facilities. In return for installing new lighting systems, companies receive public visibility through EPA as well as technical assistance. It is a profit-based pollution prevention program that has 1,300 participants.

2.2 GEMI programs

The Global Environmental Management Initiative (GEMI), was organized in April, 1990 for the purpose of fostering environmental excellence by business worldwide. While GEMI's 28 corporate members are based in the United States, they operate in dozens of countries and represent over \$455 billion (USD) in annual revenue. A group of such powerhouse companies (see Table 1) have the capability to lead a "corporate environmental management revolution" by developing and implementing innovative voluntary compliance programs.

GEMI members helped develop the International Chamber of Commerce's (ICC) *Business Charter For Sustainable Development*, and the organization was an initial endorser of the Charter. Through follow-up activities with the ICC, UNEP and other organizations, GEMI has worked with companies to spread the message of the Charter and to foster adherence to its 16 principles.

GEMI's first major effort was to help companies commit to continuously improving their environmental performance using "Total Quality Environmental Management", a marriage of quality

Table 1. GEMI Member Companies

Allied Signal Inc.	Consolidated Rail Corporation	Johnson & Johnson
Amoco Corporation	Coors Brewing Company	Merck & Company, Inc.
Anheuser-Busch Companies	Digital Equipment Corporation	Occidental Petroleum Corporation
Apple Computer, Inc.	The Dow Chemical Company	Olin Corporation
AT&T	Duke Power Company	Procter & Gamble Company
Boeing Company	The DuPont Company	The Southern Company
Bristol-Myers Squibb Company	Eastman Kodak Company	Tenneco, Inc.
Browning-Ferris Industries	Florida Power and Light	Union Carbide Corporation
The Coca-Cola Company	Georgia-Pacific Corporation	WMX Technologies
Colgate-Palmolive Company		

techniques and environmental management, first introduced by GEMI. The philosophy of continuous environmental improvement has been brought closer to reality with a systemic methodology that is aligned with the need to be competitive in global markets. In GEMI's second year, the organization published the *Total Quality Environmental Management Primer* to help environmental managers and others make the transition from total quality management to total quality environmental management (see Figure 1).

In 1992, GEMI broke new ground with the development of the Environmental Self-Assessment Program a self-auditing tool described in Section 2.3.

More recently, GEMI has introduced companion documents to the *Total Quality Environmental Management Primer* including an analysis of investors' environmental information needs, a primer on Benchmarking, and research on how companies apply corporate environmental management standards globally.

2.3 Environmental self-auditing

It is necessary that voluntary compliance and incentive programs have a measurement system that enables companies to rank performance against specified standards whether the standards are set externally, such as by a government, or internally, by a company. Although many companies have traditionally conducted environmental audits to ensure compliance with laws and regulations, many companies are developing comprehensive, management systems-based auditing schemes to ensure adherence to corporate policies—policies that may often go beyond regulatory requirements.

Environmental self-auditing is a valuable instrument that may be used to determine whether corporate environmental activities and conditions conform to specified criteria. Self-auditing also can be used as a means to ensure continuous improvement in the tradition of total quality environmental management. Companies that perform self-audits of management systems are often able to identify and act upon areas for improvement in a cost-effective manner before performance gaps can reach a level that may endanger natural resources or human health.

An example of a self-auditing tool is the Environmental Self-Assessment Program of the Global Environmental Management Initiative (GEMI). The Environmental Self-Assessment Program is an internal measurement tool that can help businesses measure and analyze their environmental performance and set priorities among environmental improvement opportunities.

Based on the ICC's *Business Charter for Sustainable Development*—16 principles for environmental management—the Environmental Self-Assessment Program can be used as a basis for internal decisions in the spirit of total quality environmental management. The Environmental Self-Assessment Program is a tool that measures the extent and depth of a company's management systems according to internal and external stakeholder requirements. It is:

- A desk tool, not a field instrument.
- A leading indicator of performance, not an absolute measure.
- A guide to continuous improvement based on the good faith of its user.
- A semi-subjective tool that can be consistently applied.

The Environmental Self-Assessment Program is a business tool appropriate to a wide variety of industries and companies because its design enables application and adaptation to specific business circumstances. While it is not a vehicle for external communication nor a set of standards, it does allow a company to set goals that can be measured against the 16 principles of the ICC Business Charter for Sustainable Development and provide data that may be used for internal reporting mechanisms and the development of specific action programs to improve performance.

The Environmental Self-Assessment Program is similar to other self-auditing schemes and performance measurement programs, such as the chemical industry's Responsible Care® program, though it is intended to be more broad in its application. While Responsible Care® was designed to meet the specific needs of the chemical industry, the Environmental Self-Assessment Program was developed with the understanding that it would be adapted to meet specific industry-sector, company and geographic needs.

3 CLOSING REMARKS

It is critical to ensure that voluntary government initiatives, corporate incentive schemes, and self-auditing tools are linked in order to foster compliance with national or international environmental policy objectives. Participation by companies in voluntary government programs will not be successful without an understanding that these programs complement internal corporate programs. Similarly, performance measures, such as those developed through self-auditing tools, must be directly tied to the objectives of government initiatives and corporate requirements. Through a combination of voluntary programs that allow companies to determine the most effective means for compliance and measurement tools to rank performance, governments and businesses can better work together to foster environmental excellence and business competitiveness.

***TOTAL
QUALITY
ENVIRONMENTAL
MANAGEMENT***

the primer



© 1993

GLOBAL ENVIRONMENTAL MANAGEMENT INITIATIVE (GEMI)

2000 L Street, N.W., Suite 710

Washington, D.C. 20036

(202) 296-7449

Figure 1. Total quality environmental management primer.

ABOUT THE GLOBAL ENVIRONMENTAL MANAGEMENT INITIATIVE (GEMI)

GEMI is a group of 23 leading companies dedicated to fostering environmental excellence by business worldwide. Through the collaborative efforts of its members, GEMI intends to promote a worldwide business ethic for environmental management and sustainable development, to improve the environmental performance of business through example and leadership, and to enhance the dialogue between business and its interested publics. Below is a list of GEMI's current member companies:

Allied-Signal Inc.
Amoco Corporation
Anheuser-Busch Companies
Apple Computer, Inc.
AT&T
The Boeing Company
Bristol-Myers Squibb Company
Browning-Ferris Industries
Colgate-Palmolive Company
Consolidated Rail Corporation
Digital Equipment Corporation
The Dow Chemical Corporation
Duke Power Company
Du Pont Company
Eastman Kodak Company
Florida Power and Light
Merck & Company, Inc.
Occidental Petroleum Corporation
Olin Corporation
The Procter & Gamble Company
The Southern Company
Union Carbide Corporation
Weyerhaeuser Company

The guidance included in this primer is based on the professional judgment of the individual collaborators as listed on the Preface page. The opinions expressed are those of the individual collaborators, not their organizations. Neither GEMI nor its consultants, Abt Associates, JT&A, inc., and the Environmental Policy Center are responsible for any form of damage that may result from the application of the guidance contained in this primer.

PREFACE

This primer is written for, and in a very real sense, by corporate environmental managers. To develop case materials, Abt Associates distilled the experiences of dozens of environmental managers and staffs who have provided the Global Environmental Management Initiative (GEMI) with invaluable information. The members of GEMI wish to thank the many people who helped prepare the primer.

This primer, in the true spirit of TQM, was a strong collaboration consisting of a cross-functional team including the members of GEMI, Abt Associates, JT&A, Inc., and the Environmental Policy Center.

The extensive research that resulted in this primer was conducted by Richard P. Wells, Mark N. Hochman and Stephen D. Hochman of Abt Associates, all of whom are based in Cambridge, Massachusetts.

Advising and additional editing were conducted by:

George D. Carpenter, Chairman, GEMI (Procter & Gamble)
Thomas S. Davis, Chairman, GEMI TQM Workgroup (AT&T)
Andrew Mastrandonas, Project Manager, GEMI
(Environmental Policy Center)
Allison Keeler, Assistant Project Manager, GEMI
(Environmental Policy Center)
Judith F. Taggart, President, JT&A, Inc.

The GEMI TQM Workgroup also provided valuable input:

Bob Brothers, *Eastman Kodak*
Mike Fisher, *Procter & Gamble*
Catharine deLacy, *Occidental Petroleum*
Ernie Rosenberg, *Occidental Petroleum*
Jim Leathers, *Duke Power*
David Mason, *ICI Americas*
Algirdas Vilkas, *Union Carbide Industrial Gases*

Ann C. Smith, *Allied-Signal*
Marcia Williams, *Browning-Ferris Industries*

Susan F. Vogt
Executive Director, GEMI
Washington, D.C.

May, 1992

GEMI STEERING COMMITTEE

George Carpenter, *The Procter & Gamble Company*
(Chairman, GEMI)

W. Ross Stevens, III, *E.I. du Pont de Nemours & Company*

Jonathan Plaut, *Allied-Signal, Inc.*

Polly T. Strife, *Digital Equipment Corporation*

Thomas S. Davis, *AT&T*

Dorothy Bowers, *Merck & Company*

Susan Vogt, *Environmental Policy Center*
(Executive Director, GEMI)

CONTENTS

INTRODUCTION	1
TQEM DEFINED	3
Basic Elements of TQEM	3
Identify your customer	3
Continuous improvement	3
Do the job right the first time	4
Take a systems approach to work	4
IMPLEMENTING A TQEM PROGRAM	5
Assess Your Status	5
Identify Your Customers	6
External	6
Internal	6
Learn to Use P-D-C-A	7
Learn to Use TQEM Tools	9
Cause and effect diagram	9
Pareto chart	10
Control chart	11
Flow chart	12
Histogram	14
Benchmarking	16
MEASUREMENTS AND HOW TO USE THEM	17
Summary	18
APPENDIX A: Glossary	21
APPENDIX B: Bibliography	23
APPENDIX C: List of Study Participants	25

INTRODUCTION

It was during the 1980s that world industry awoke to an operating philosophy long espoused by a visionary group of American business theoreticians. The philosophy, termed Total Quality Management, or TQM, had been embraced by the Japanese following World War II and is credited with the surge to world market dominance of that country's automobile and electronics industries in the 1970s.

Ironically, TQM had its origins in the United States during World War II, when American statistician W. Edwards Deming helped engineers and technicians use statistical theory to improve production quality. After the war, his theories largely dismissed by American corporations, Deming went to Japan, where he lectured top business leaders on statistical quality control, telling them they could rebuild their country if they followed his advice.

Since then, TQM has gained acceptance as a tool for improving corporate performance across all aspects of business, including environmental management. Today, many companies are learning that TQM can be an effective strategy to continuously improve their environmental performance.

TQEM DEFINED

The Global Environmental Management Initiative (GEMI) is generally credited as being the first organization to marry environmental management and Total Quality Management (TQM). This primer outlines methods of applying TQM to corporate environmental strategies, a process GEMI has identified as Total Quality Environmental Management, or TQEM.

This document is intended to help you get started, to show you how to use TQEM to continuously improve your environmental performance. In no way do these pages comprise a comprehensive training tool on Total Quality; for that, you will need to reference the many excellent books, papers, and courses already available.

This chapter explains the elements of a TQEM system. The next chapter describes how to build a TQEM system within a business. The final chapter sums up the benefits of incorporating a TQEM system in your company.

Basic Elements of TQEM

- ***Identify your customers.*** Total Quality is based on the premise that the customer is always right. In fact, quality is defined by what the customer wants. Customers can be external (i.e., consumers, regulators, legislators, community and national environmental groups) or internal (such as other departments within the company, higher management levels).

- ***Continuous improvement.*** The systematic, ongoing effort to improve business processes, continuous improvement changes the entire corporate perspective. The staff is motivated to seek innovative alternatives to outdated processes and policies. With continuous improvement there is no endpoint, only progress along a continuum.

■ ***Do the job right the first time.*** In TQEM it is essential to recognize and eliminate environmental problems before they occur. The best cure for a pound of environmental crises is an ounce of prevention. Focusing employee attention on the causes of environmental problems instead of the symptoms can reduce the cost of waste disposal, government reporting, and crisis control. By investing in prevention, a company can save on the long-term costs of compliance, resources, and unplanned liabilities.

The cost of quality is the cost that quality failures impose on your company. In environmental management, these costs are those of generating wastes that do not add to or may even reduce the value of your product or service to your customer.

■ ***Take a systems approach to work.*** TQEM teaches us to look at each part of environmental management as a system. The system includes all of the equipment and people who must work together to achieve the desired objective. Total Quality causes us to work across organizational boundaries, forming teams that represent all of the functions involved in making a system work as intended.

Interactions of people and decisionmaking procedures can be flow-charted and analyzed as a system. This focuses attention on what is wrong with the system, instead of forcing blame on an individual.

For example, in an emergency situation, a prompt and effective response results from people knowing what to do. The "first respondents" in an emergency depend on training, a reliable communications system, and well-maintained equipment. If any of these elements do not work as intended, the "system" will not work. This system includes not only people, but training, drills, and emergency equipment.

In a well-organized system, all the components (functions) work together to support each other.

In a system that is well-led and managed, everybody wins. If by bad management the components become competitive, the system is destroyed. Everybody loses.

— W. Edwards Deming, *creator of TQM*

IMPLEMENTING A TQEM PROGRAM

A TQEM system does not happen overnight. Rather, the process becomes an evolution in the culture of the organization. Therefore, it is best to begin with small steps, building support and a record of success. However, as you take those steps, bear in mind that TQEM is a program of continuous improvement in which the entire system works together to meet or exceed customers' requirements and anticipate their future needs. In a TQEM culture, teams formed from diverse functions within the organization work on a common objective.

Assess Your Status

Where are you now? Examine your company's current situation in terms of both its environmental opportunities (and vulnerabilities) and its quality practices. Ask yourself the following questions:

- How good is your compliance record?
- Have there been recent negative experiences that build a case for stopping business as usual, such as permit violations, accidental releases, waste disposal liabilities?
- Are there opportunities to ameliorate performance that will improve the company's reputation with regulators, communities, and other external customers while reducing costs (e.g., in compliance)?
- Does your company have a strong commitment to quality and customer orientation, or will this require a complete reorientation in management's thinking?
- Has your research shown that other companies have markedly better environmental management systems?

- How committed is top management to improved environmental performance?
- How ready is top management to translate this commitment into action?
- If you do not have top management support, can you build it?
- Do you have middle management support to implement a TQEM strategy?
- Who are the skeptics? How can you gain their support?

The answers to these questions will help you understand where you need to build support, what training is needed, and where some of the improvement opportunities may be.

Identify Your Customers

■ **External Customers.** Focus on the customer groups that are most critical to your company and your program. Your improvement efforts should be directed toward your customers' highest priorities. For example, many TQEM programs initially focus on regulatory agencies as their primary external customers.

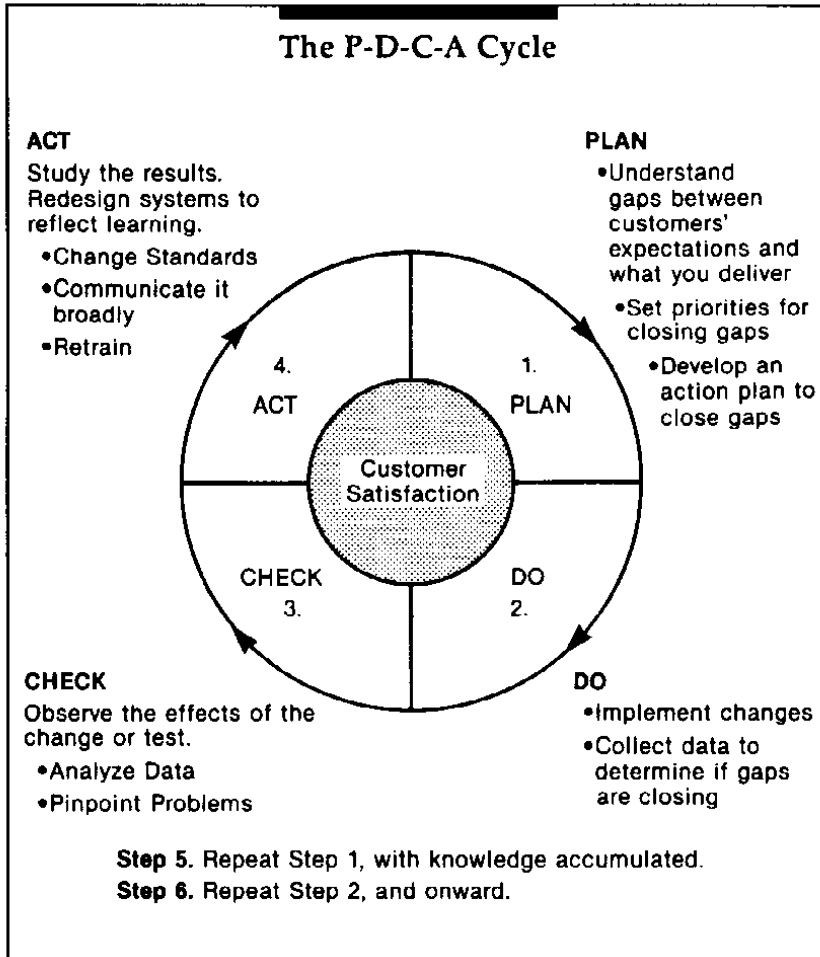
Although many managers believe that nothing can be undertaken until regulators are satisfied, it is important to go through the process of determining all the customers that you must satisfy to stay ahead of evolving customer demand. (Customers may be as diverse as local communities, or as specific as the PTA of the school down the street.)

■ **Internal Customers.** The functions and processes within your company are your internal customers and suppliers. To determine your internal customers, ask yourself whom you are trying to satisfy: for example, to whom does your organization justify its existence at budget time?

This is a critical step. Identifying your internal and external customers will help define your organization's products and services and your measures of performance.

Learn to Use P-D-C-A

Once you have assessed your status, identified your customers, and set your improvement objectives, you need an action plan to begin the process of continuous improvement. One widely-used tool for developing an action plan is the P-D-C-A cycle.



The P-D-C-A cycle is a systematic method for continual process improvement based on the principle that you need to understand a situation or process before you can improve it. Team members must be trained to appreciate the importance of the

planning and checking phases of the cycle; in total, the P-D-C-A cycle is an essential change in organizational thinking that emphasizes data-based action.

The following factors make up the P-D-C-A cycle:

1. **Plan:** Identify customers, the customers' requirements, and how well your systems provide results that meet their requirements. Build your improvement plan on data and measurements.
2. **Do:** Follow your plan. Avoid inserting changes at this point. If a major change becomes necessary, start again at Step 1 (Plan).
3. **Check:** Observe and measure the effects of the changes you instituted, preferably on a small pilot scale to minimize disruptions. Use statistical tools whenever possible to measure the results to determine if they prove or disprove your hypotheses.
4. **Act:** Make changes in the process to reflect what you have learned; this step translates the learning into a systemic improvement.
5. **Repeat:** Repeat the P-D-C-A cycle incorporating the knowledge gained. Continue the cycle, delivering ever greater quality from increasingly robust processes.

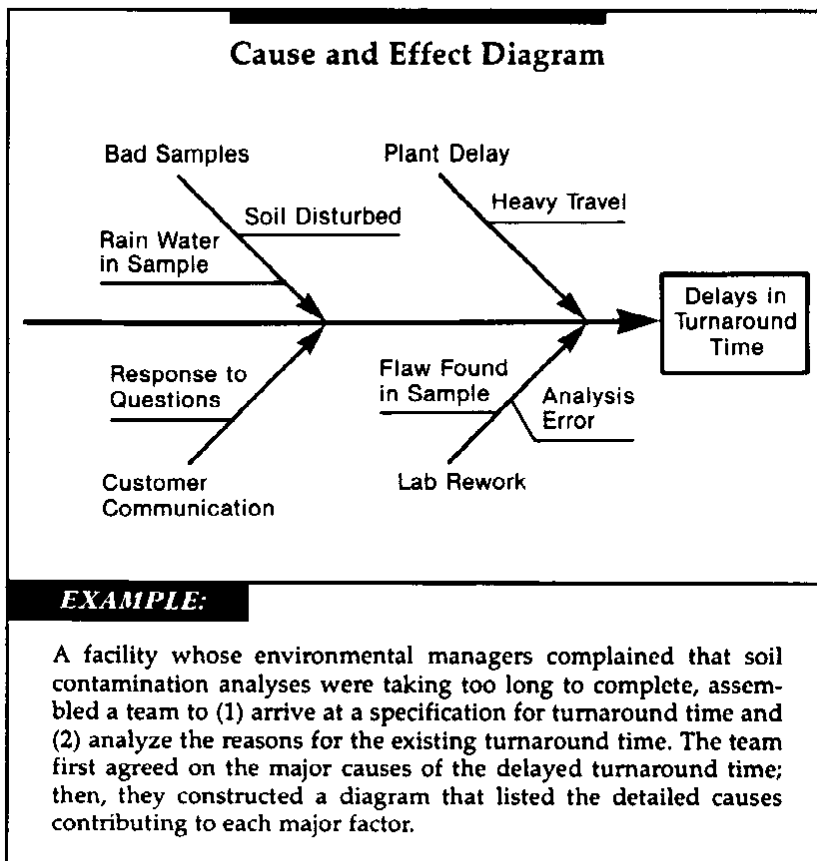
A stable system is one whose performance is predictable. It is reached by removing, one-by-one, the special causes of trouble, best detected by a statistical signal

— W. Edwards Deming

Learn to Use TQEM Tools

A way to analyze and condense information, TQEM tools help you put data in an easily understood format that identifies and clarifies underlying causes. Use these tools to discover opportunities for pollution prevention and to measure the effectiveness of improvements you've already made, as well as to improve the work processes within your organization.

■ **Cause and Effect Diagram.** A qualitative summary of all potential causes of a problem. Each response to the question "why" becomes a branch on this "fishbone" diagram until the root cause, rather than the symptom, is identified. A fishbone is often useful in focusing a team on what data they need to collect to develop their improvement plan.



■ **Pareto Chart.** A graphic tool that organizes data to identify and focus on major problems. A pareto chart takes data on a situation or process, ranks it in order, and thus focuses attention on opportunities to maximize improvement.

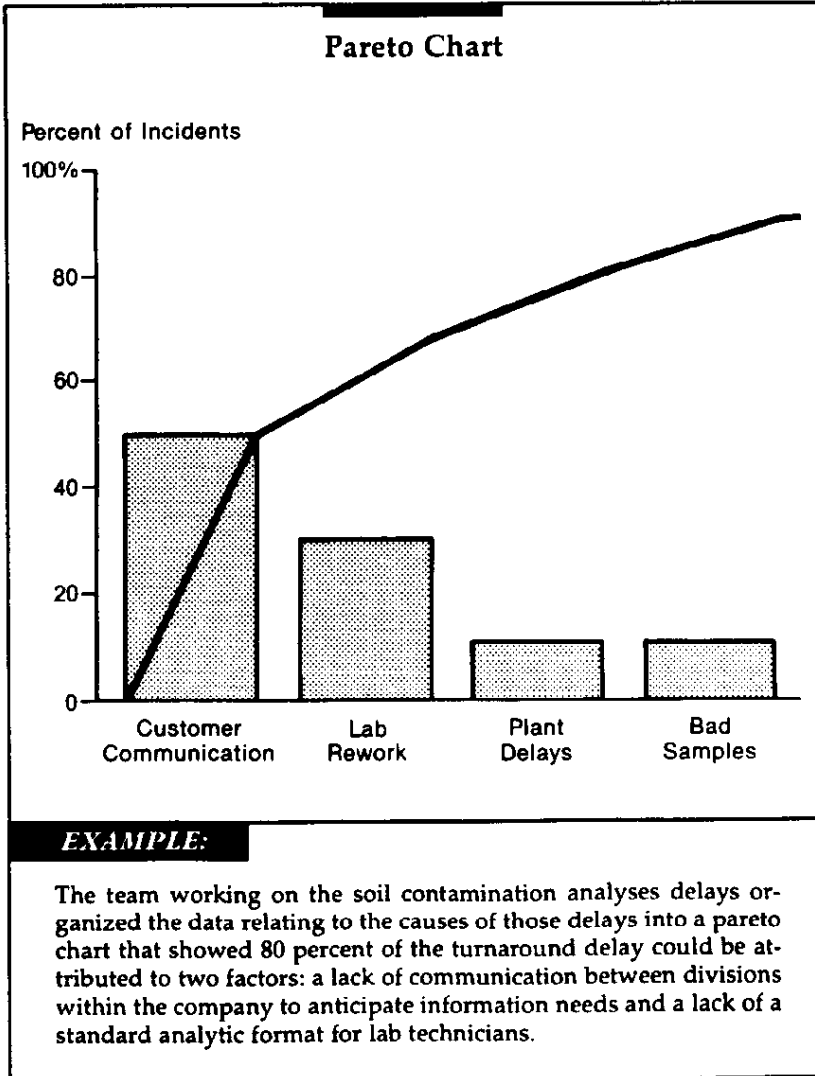
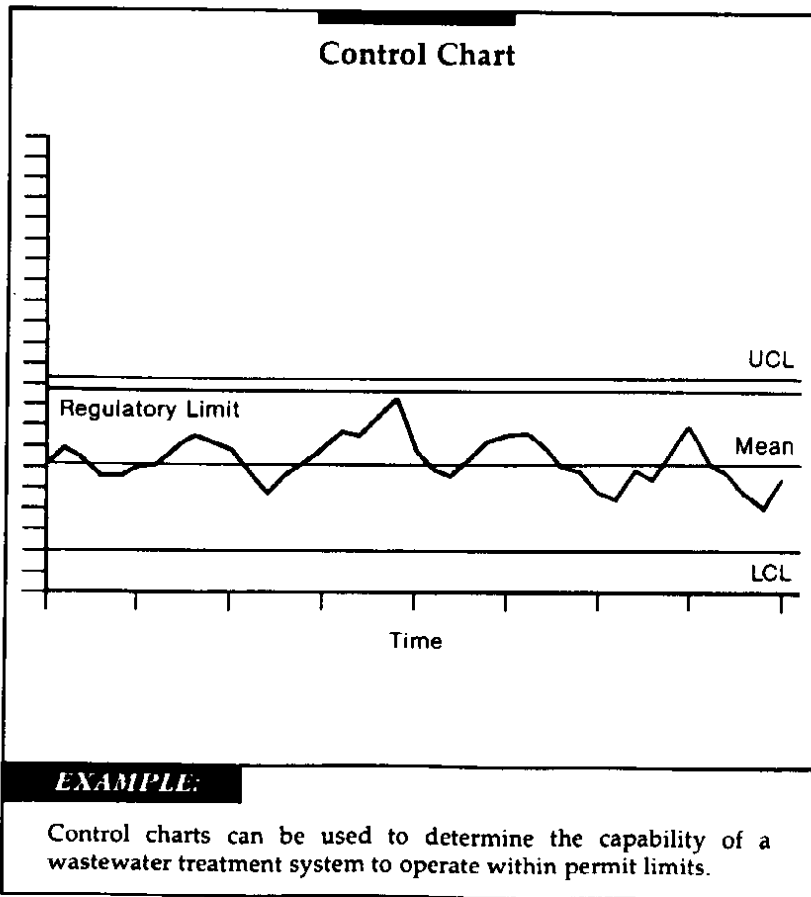


Figure 1. Total quality environmental management primer (continued).

■ **Control Chart.** A statistical tool to determine how much variability in a process is inherent (common causes) and how much is due to unique events (special causes such as fires). A control chart defines the expected performance range (or control limits) of a process or system. Control charts can help you understand the variability exhibited by normal systems.



■ **Flow Chart.** A schematic showing the relationship between process steps that helps illustrate any significant deviations from the ideal process. A flow chart often follows a pareto analysis to define the process and decide where to make changes that will improve the process.

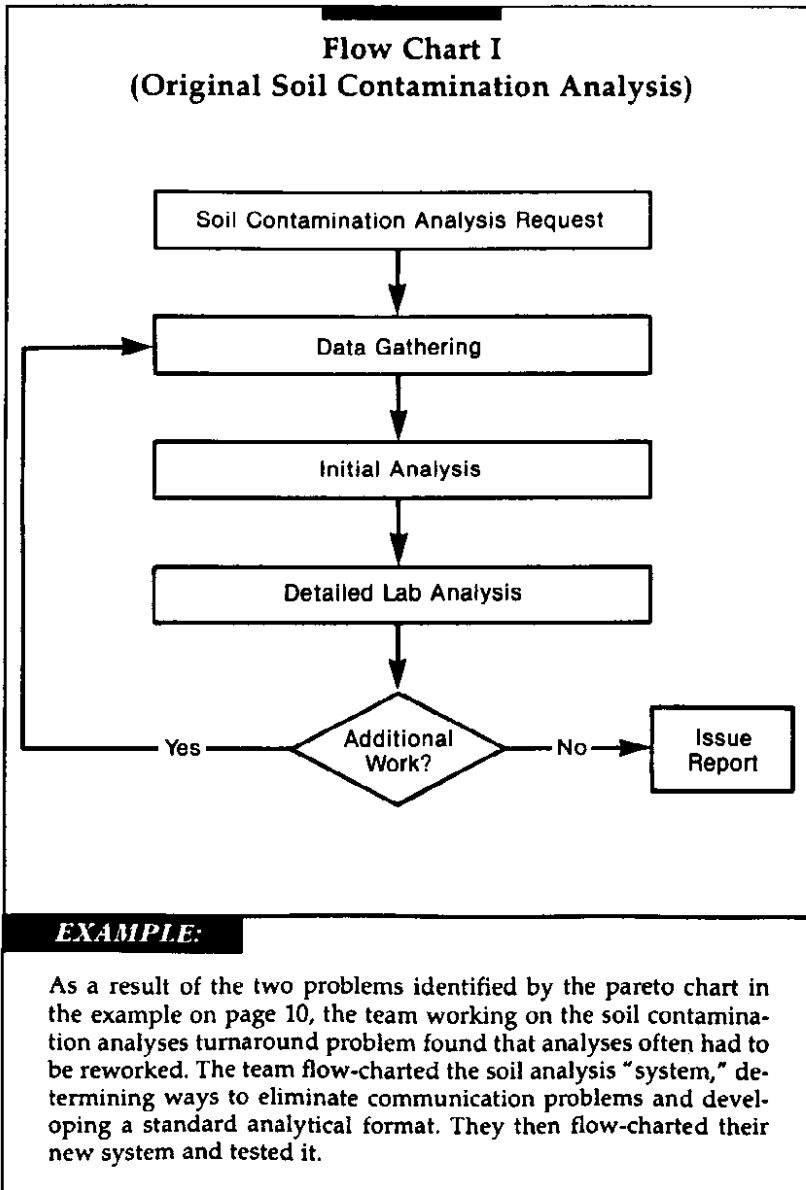


Figure 1. Total quality environmental management primer (continued).

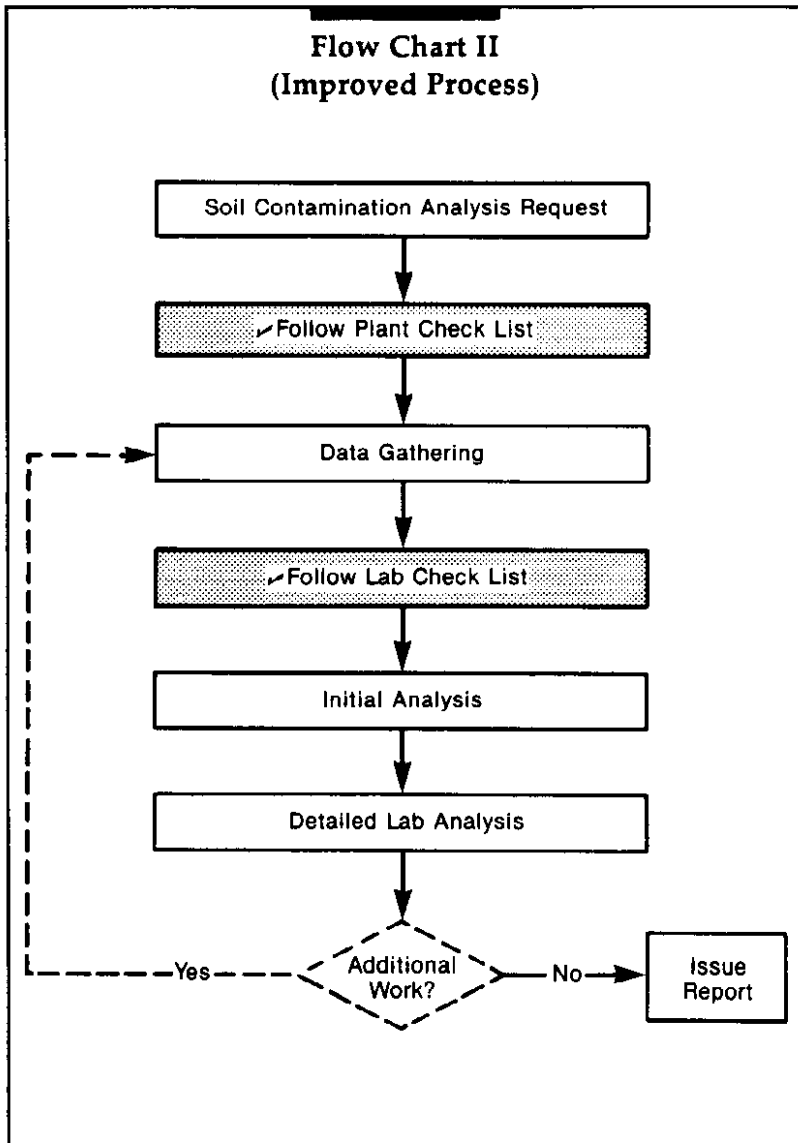


Figure 1. Total quality environmental management primer (continued).

■ **Histogram.** A graphic tool that displays the distribution, spread, and shape of a set of data from a process. If the collected data show that the process is stable and can be predicted, then the histogram can also be used to demonstrate the capability limits of the process.

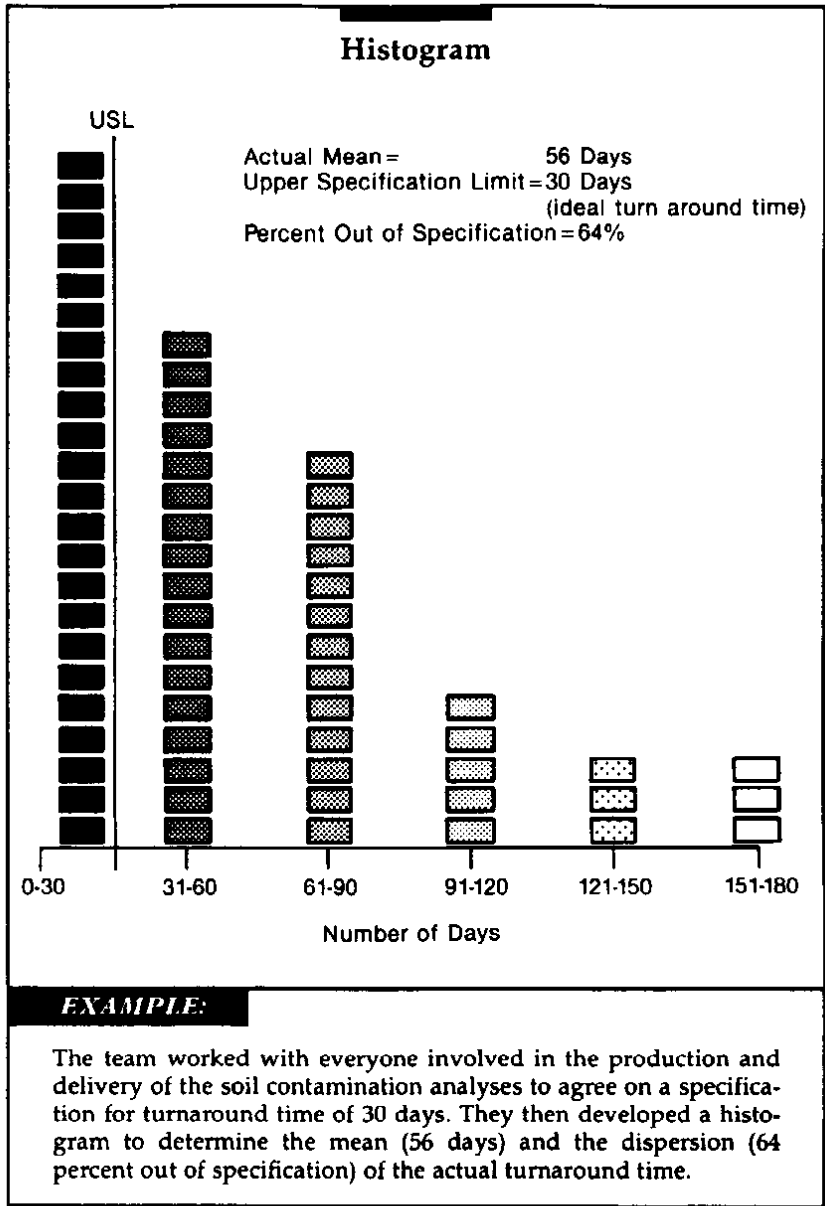


Figure 1. Total quality environmental management primer (continued).

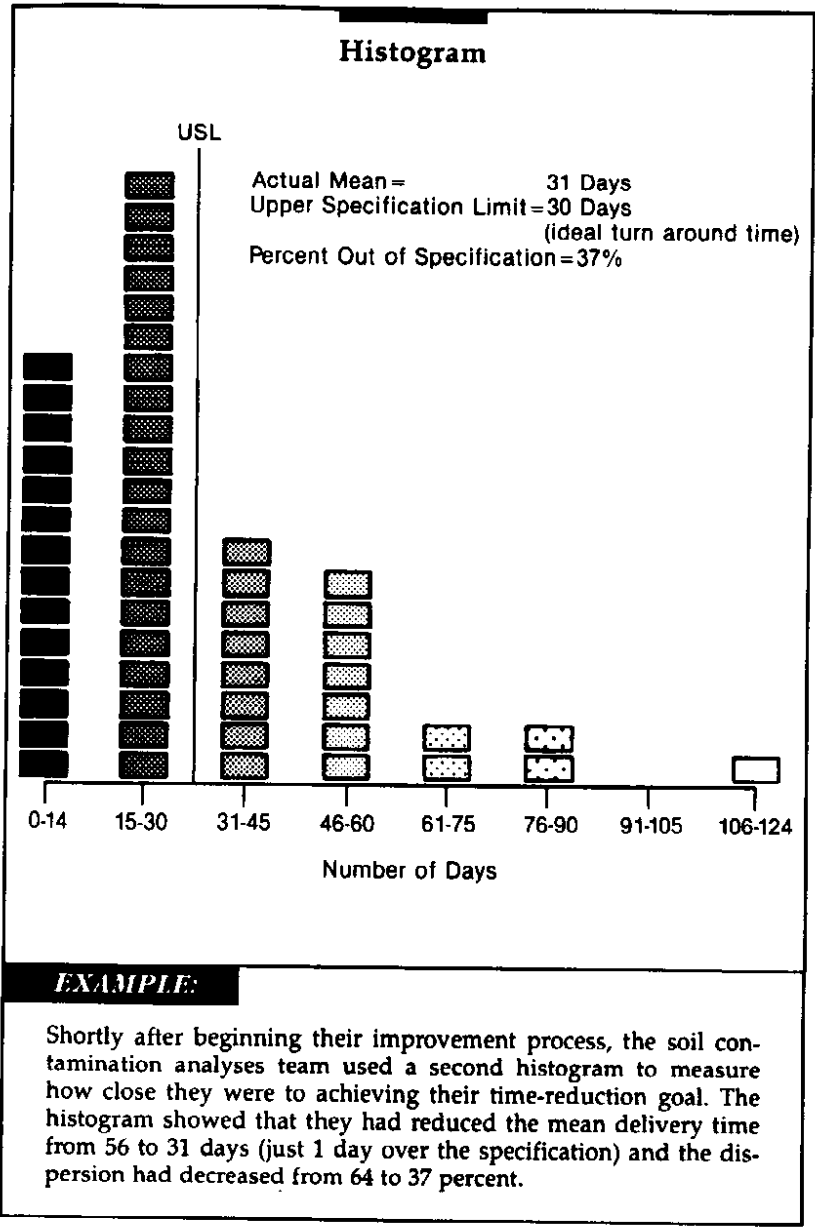


Figure 1. Total quality environmental management primer (continued).

■ **Benchmarking.** Benchmarking is simply comparing one of your processes to a “best-in-class” example, either within or outside your company. This helps you in two ways: all participants benefit from the other’s experiences and the “best-in-class” comparison can provide powerful justification for your own investment in continuous improvement.

However, benchmarking takes time, both to find the appropriate “best-in-class” example and to compare processes, so use the following guidelines:

1. Define and rank customer values. Benchmarking should focus on characteristics that customers value most highly; therefore, research on customer preferences may be necessary.
2. Establish partnerships with outside research sources. Independent researchers and consultants with whom you build a long-term, confidential relationship can identify benchmarking targets and help your staff conduct the comparison.
3. Gain cooperation of benchmarking targets with *quid pro quo*. Benchmarking usually means sharing data. This exchange can take several forms. Among them is a compilation by an independent researcher that gives each company aggregate sets of data for comparison.
4. Adopt a procedure that assures a thorough comparison. A list of guidelines follows:
 - Focus benchmarking on well-defined customer values or significant problems.
 - Assemble a cross-functional benchmarking team capable of completing the comparison and utilizing its findings.
 - Map your own process and measure its inputs and outputs.
 - Collect secondary data from trade publications and other public sources.
 - Determine both similarities and differences in your comparison and trace the causes.
 - Use the comparison as impetus for continuous improvement.

MEASUREMENTS AND HOW TO USE THEM

Measurement in both the “plan” and “check” portions of the P-D-C-A cycle is a prime component of your continuous improvement TQEM process. Before you start your TQEM program, take baseline measures; this will establish a basis for comparison with subsequent measures to monitor improvements.

Whenever you implement a new environmental measurement system, or change an old one, you should simultaneously identify measures that will tell you if the system is delivering the desired results. A company can use measurements to, among other things, get feedback on how customers are responding to the changes. Measuring your customers’ opinions of your product or service will, over time, tell you if your improvement efforts are really addressing your customers’ needs.

Effective measurement begins with customer requirements and monitors performance in terms relevant to your internal and external customers.

Measurements may be both direct and indirect, but the real secret lies in selecting measures that truly monitor performance and improvement: you need to know how well you are meeting your customers’ requirements even as you reduce your own costs and improve your workplace environment.

A company must customize its measurement procedures. For example, a measurement system may be based on broad categories such as regulatory audits, monitoring results, and inspections. Or, as is the case with most companies, you may prefer a more detailed measurement process that could include such diverse topics as:

- Percentage of trained personnel
- Total personnel
- Total production
- Total liquid and solid waste

- Total safety and environmental investments
- Total safety and environmental expenses
- Energy use
- Total safety and environmental personnel
- Frequency of environmental audits
- Existence of emergency planning and drills
- Environmental and safety incidents

The list is endless.

Use numerical measures and tools such as histograms, pareto charts, and statistical control charts whenever possible both to improve management oversight and to strengthen the credibility of the process.

Measuring progress and sharing results as TQEM evolves affects the process significantly by documenting accomplishments, identifying areas for improvement, inspiring pride and encouraging momentum, justifying the need for more resources, and providing information for other needs.

Summary

Business must resolve to continually improve environmental performance not just today, but tomorrow and into the future. TQEM gives you the tools to meet this challenge; you have but to use them thoughtfully and continually.

As you build your system, keep in mind that TQEM demands of its practitioners that they continually question "business as usual." That includes such fundamental questions as

- Are you staying in touch with your customers to be sure you're providing what they want?
- What is the company's impact on the environment? And how is this changing?
- How important is environmental performance to each set of customers?
- What future customer needs must the company satisfy? And, is a mechanism in place to anticipate both problems and needs?

Change is the one constant today: the process that works for you today may not meet tomorrow's requirements. Follow the road map provided by TQEM to anticipate the future for your environmental business. Always remember that the continuous improvement process that is TQEM can be summed up in less than a dozen words:

***No matter how good you are, you can
always be better.***

APPENDIX A

GLOSSARY

- ***Benchmarking:*** The technique of comparing one of your processes to a “best-in-class” example, either within or outside your company.
- ***Cause and effect:*** A qualitative summary of all potential causes of a problem. Each response to the question “why” becomes a branch on this “fishbone” diagram until the root cause is identified.
- ***Continuous improvement:*** The systematic, continual process of improving business processes.
- ***Control chart:*** A statistical tool to determine how much variability in a process is inherent (common causes) and how much is due to unique events (special causes such as fires). A control chart defines the expected performance range (or control limits) of a process or system.
- ***Cross-functional team:*** A team of experts from every element of the process who work together to continuously improve customer-driven processes.
- ***Customer:*** Anyone — either within or outside your organization — to whom you supply a product or service.
- ***Fishbone:*** Another term for “cause and effect.”
- ***Flow chart:*** A schematic showing the relationship between process steps that helps illustrate any significant deviations from the ideal process.

- ***Histogram:*** A graphic tool that displays the distribution, spread, and shape of a set of data from a process.
- ***Pareto chart:*** A graphic tool that organizes data to identify and focus on major problems.
- ***P-D-C-A:*** A systematic data-based method for continual process improvement rooted in the principle that you need to understand a situation or process before you can improve it.
- ***Root cause analysis:*** Another term for “cause and effect.”
- ***Shewhart cycle:*** Another term for P-D-C-A.
- ***Specification limits:*** Performance standards set by internal or external customers.
- ***TQEM:*** Total Quality Environmental Management
- ***TQM:*** Total Quality Management

APPENDIX B

BIBLIOGRAPHY

- Abt Associates Inc. *Consumer Purchasing Behavior and The Environment: Results of an Events-Based Study*. Cambridge, MA: Abt Associates Inc., 1990.
- Abt Associates Inc. *Customer Research Data for the TQEM Handbook, Global Environmental Management Initiative*. Cambridge, MA: Abt Associates Inc., 1991.
- Abt Associates Inc. *Environmental Management: From Compliance to Strategy*. Cambridge, MA: Abt Associates Inc., 1991.
- Aguayo, Rafael. *Dr. Deming: The American Who Taught the Japanese About Quality*. New York, NY: Simon & Schuster, 1991.
- Augsburger, Robert, et al. *Corporate Environmental Solutions Project: Independent Study Project*. Stanford, CA: Stanford Graduate School of Business, 1991.
- Deming, W. Edwards. *Out of the Crisis*. Cambridge, MA: Massachusetts Institute of Technology, Center for Advanced Engineering Study, 1982.
- Deming, W. Edwards. *Quality, Productivity and Competitive Advantage*. Cambridge, MA: Massachusetts Institute of Technology, 1982.
- Global Environmental Management Initiative. *Corporate Quality/Environmental Management: The First Conference*. Proceedings. Washington, DC: Global Environmental Management Initiative, 1991.
- Goal/QPC. *Benchmarking*. 1991 Research Report. Methuen, MA: Goal/QPC, 1991.
- Goal/QPC. *Cross-Functional Management*. 1990 Research Report. Methuen, MA: Goal/QPC, 1990.
- Goal/QPC. *The Memory Jogger: A Pocket Guide to Tools for Continuous Improvement*. 1991 Conference Edition. Second Edition. Methuen, MA: Goal/QPC, 1985, 1988.
- Ishikawa, Kaoru. *Guide to Quality Control*. White Plains, NY: Quality Resources, 1982.

-
- Ishikawa, Kaoru. (D.J. Lu, trans.) *What is Total Quality Control? The Japanese Way*. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1985.
- Juran, J.M. *Juran on Leadership for Quality: An Executive Handbook*. New York, NY: The Free Press, 1989.
- King, Bob. *Better Designs in Half the Time: Implementing QFD Quality Function Deployment in America*. Third Edition. Methuen, MA: Goal/QPC, 1989.
- Kleiner, Art. *What Does It Mean To Be Green?* Boston, MA: Harvard Business Review, August 1991.
- Senge, Peter M. *The Fifth Discipline: The Art and Practice of the Learning Organization*. New York, NY: Doubleday/Currency, 1990.
- Stalk, George, Jr., and T.M. Hout. *Competing Against Time: How Time-Based Competition is Reshaping Global Markets*. New York, NY: The Free Press, 1990.
- Walton, Mary. *The Deming Management Method*. New York, NY: Putnam, 1986.

APPENDIX C

TQM STUDY PARTICIPANTS

We would like to thank the following companies for participating in our study of the uses of TQM in environmental management.

3M	ICI Americas, Inc.
Allied Signal Inc.	John Fluke Manufacturing Company, Inc.
American Electric Power Company	Johnson Yokogawa Corporation
Amoco Corporation	Kansas Gas and Electric Company
AT&T	Kawasaki Motors Manufacturing Corporation, USA
Barnes Group, Inc.	Kentucky Utilities Company
Basin Electric Power Cooperative	Kiewit Holdings Group, Inc.
Baxter Healthcare Corporation	Masco
Calcomp, Inc.	Merck & Company
Central Illinois Public Service Company	National Semiconductor Corporation
Champion International Corporation	New York Power Authority
Cobe Laboratories, Inc.	Nipsco Industries, Inc.
Deere & Company	Occidental Petroleum Company
Dentsply Holdings, Inc.	Pall Corporation
Digital Equipment Corporation	Procter & Gamble Company
Dow Chemical Corporation	Sinclair Oil Corporation
Duke Power Company	Smith & Nephew, Inc.
E.I. du Pont de Nemours & Company	Sun Microsystems
Eastman Kodak Company	Texaco Chemical Company
Florida Power & Light Company	Union Carbide Corporation
Foxboro Company	Union Oil Company of California
G. Heileman Brewing Company	Uno-Ven Company
General Chemical Corporation	W.R. Grace & Company
General Dynamics Corporation	Warner-Lambert Company
Genlyte Group, Inc.	Xerox Corporation
Goulds Pumps, Inc.	