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A Continual Improvement Process that Really Works

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Introduction

Continual Improvement can be defined as making changes in processes or systems to improve the ability to fulfill stated requirements. An effective Continual Improvement (C.I.) process is simply an **organized approach** to improving processes and reaping the rewards. In many businesses today the leadership team is saying or thinking "this quality system (ISO 9001, Lean, Six Sigma, et al) stuff just hasn't yielded the results we expected." Many businesses are concerned that process and quality improvement efforts have become "bogged down" in bureaucracy. The challenge is to define, implement and sustain a simple Continual Improvement Process that enables your company to become the low cost, high quality leader in your industry.

As with any other enterprise wide process or business system, the support and involvement of top management is critical. This requires more than “lip service.” How does top management show their involvement? They must 1) articulate the vision and expectations for CI, 2) provide the resources, 3) insure that obstacles are removed and 4) participate in the process. Top management must be visible participants and ask the right questions. Staying in an office and avoiding the factory floor is not an option for success in any endeavor such as this one. Visibility of top management is a key to success.

A simple plan for **Continual Improvement (CI)** that builds on effective quality management principles and philosophy should **not** "re-invent the wheel!" The five components of a simple and effective CI process are:

Figure 1: A Simple Plan for C.I.

1. **Take Care of the Basics**
2. **Focus on the Processes**
3. **Eliminate Waste**
4. **Get It Done With Teams**
5. **Measure the Results**

1. Take Care of the Basics

In the everyday affairs of business it is easy to overlook the basics. Too often businesses (or top management) become enamored with the "latest and greatest" fad instead of focusing on the fundamentals. The story is told that the great coach Vince Lombardi began practice each year with professional football players by showing them a football! Well, if someone like Coach Lombardi needed to be that basic with professional, and some hall of fame caliber, players; then we in business need to be just as diligent in understanding the basics! Effective C.I. requires a focus on basics because most sustainable improvements are made at a fundamental level in the processes of a business. The basics for any organization include:

1. Leadership
2. Employee Development
3. Processes & Equipment
4. Resource Utilization
5. Fact Based Decision Making (i.e. statistical process control)
6. Documentation that makes sense for your business

1.1 Leadership

The fundamental top management responsibility is to provide **leadership**. We manage things and lead people. While this is not intended to be a course in leadership, let's review the essentials of leadership that must be applied if your CI process is to be effective:

9 Timeless Leadership Principles

1. Honesty/Integrity
2. Trust
3. Sincerity
4. Fairness
5. Attention to Detail
6. Expectations Defined and Communicated
7. Competence

8. Keep Commitments
9. Follow-up

2 Secrets of Effective Leaders
1. Be sure people know what is expected
2. Follow-up to let people know you care

My consulting firm, Management Methods, surveyed over 500 people in leadership positions a few years ago and learned the #1 **characteristic** of a good leader is **Honesty**! In today's high-tech work place it is vital that we be honest with employees, customers and all people; and that we provide employees with honest feedback. A simple thank-you for a job well-done can sometimes do more to improve productivity than can a sophisticated software package! As John Naisbett portrayed in his book, *Mega-Trends*, the high-tech world requires a "high-touch" approach to dealing with people. This simply means that we pay attention to needs, communicate openly and readily, say thank-you, discipline when necessary, and above all be honest. (For another resource on these principles, you may want to consider ***Taking Care of the Basics, 101 Success Factors for Managers*** by Davis Woodruff and available at amazon.com and other sources.)

1.2 Employee Development

Employee development is critical for successful continual improvement. Every company needs a long term **employee development** and training plan. A system that works well for many of our clients involves identifying the competencies required for each job (ISO 9001, clause 6.2) ; breaking them into fundamental, intermediate, advanced and specialized skills; developing training modules; establishing a long term (3-5 year) employee development plan; and implementing the process.

An example of a competency matrix for a small transport company may be

similar to the one shown below:

Director of Operations	Dispatcher	Drivers	Adm. Support
Company Operations Computer System Customer Requirements ISO QMS (all documentation) Regulatory Requirements Basic Computer Skills Safety DOT requirements/updates Dispatching Process HAZMAT	Load Rack Operations ISO QMS General Safety Requirements Basic Computer Skills Customer Requirements Customer locations and tanks Safety DOT requirements Inventory management system Dispatching process HAZMAT	Product Knowledge General Loading DOT requirements ISO Awareness Must maintain CDL Truck Loading SOP Truck Unloading SOP PM SOP Safety SOP Customer relations HAZMAT	Word Processing and computer skills ISO Awareness Customer service

Figure 2: Example of a Competency Matrix

Using this matrix, a training plan can be easily prepared for each position and person in the organization. This is an approach that has been used successfully by a large number of our clients over the past years. For more information, please go to www.daviswoodruff.com to download a free article, “From Required Competencies to Effective Training.” An example of a complete training process that really works is in the following flow chart:

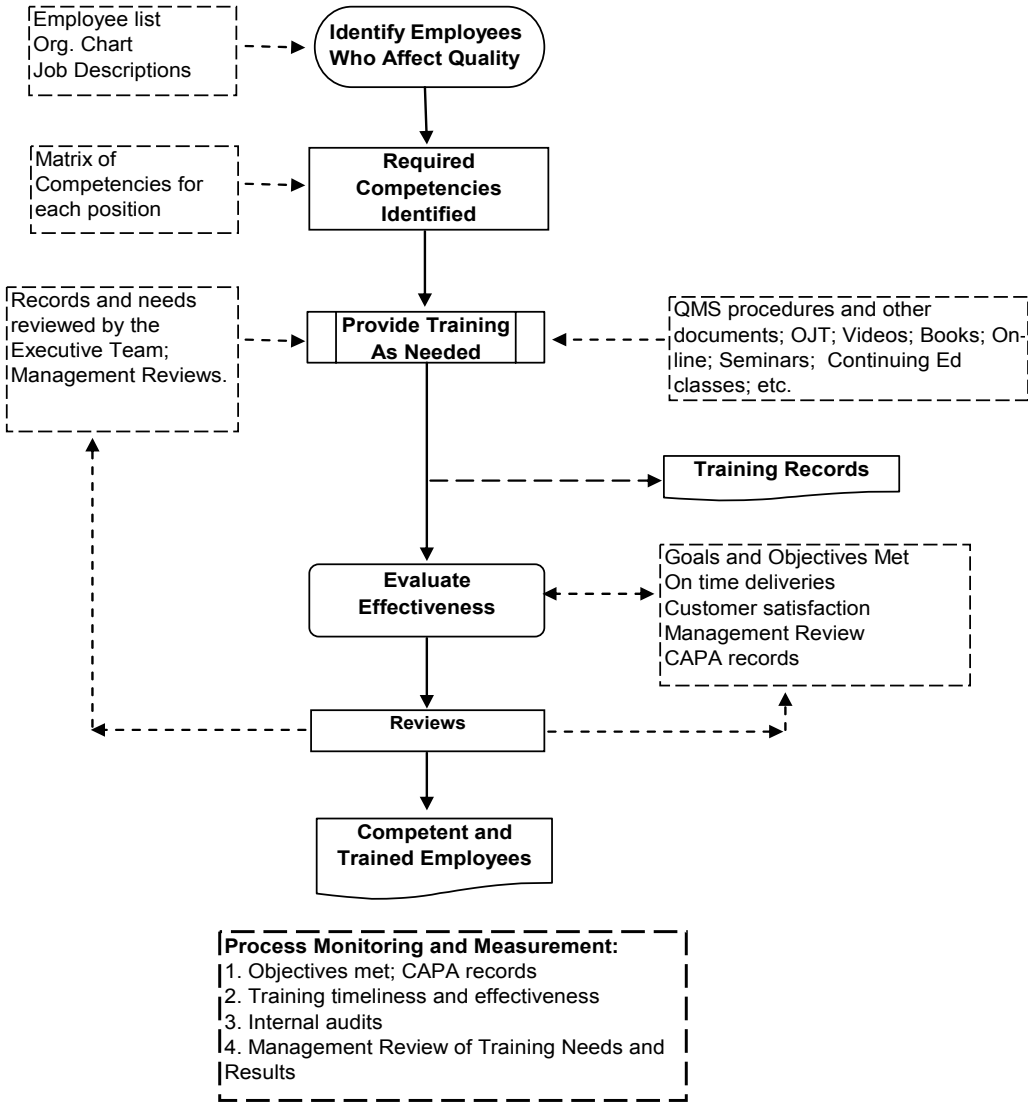


Figure 3: Example of a Training Process that Works

Remember the old question: "Could he/she do that job if their life depended on it?" If the answer is "No" then we have a training problem. While it usually isn't life or death, it is imperative that workers be properly trained to do their job. To be successful training should be needs based and delivered "just in time." Mass training usually doesn't work too well because many times someone in the organization simply

“decrees” that all employees will receive training in “XYZ” subject matter with no immediate application of the principles learned. In other scenarios, organizations may focus training primarily in one area, such as safety. While that may be good, it doesn’t address all of the required competencies needed by the organization.

1.3 Processes and Equipment

Processes and equipment represent the critical path to satisfying customer needs. Without reliable processes and having equipment available when needed, customer needs will not be met on time. Thus, organizations that are getting the most benefit from their C.I. processes will be focused on improving or streamlining all processes including maintenance and operations.

Up to date and understandable **operating** and **maintenance** instructions and plans are essential in manufacturing. These two sets of instructions can provide the basis for process and equipment reviews that we will discuss in this section. These should be legible, available, easy to use, properly approved and under a document control system (ISO 9001, clause 4.2.3).

With the Just-in-Time (JIT) and LEAN systems of today, a company must use a systematic predictive/preventive maintenance process because process upsets and equipment failure can lead to an immediate disruption in supply for a customer. The days of the "run it 'til it breaks" philosophy of equipment maintenance are gone! An unexpected shut down can be devastating to you and your customer. Effective process documentation packages will include 1) start-up, 2) routine operations, 3) abnormal conditions, 4) troubleshooting guides, 5) emergency and 6) shut-down instructions.

Procedures can be effectively presented in a flow chart, check list or outline form instead of wordy documents. **Pictures** may be the optimum approach in many cases. The simpler the instructions are presented, the better. A usual by-product of simplified process instructions is reduced variability, because people on all shifts are "doing the work alike."

Maintenance instructions and plans should include (at a minimum):

1. Preventive maintenance details
2. Operating hours between "PM"
3. Check-list for routine and break-down maintenance
4. Follow-up reporting mechanism after each major repair

Records are a key part of the maintenance process and will ultimately help reduce operating costs when used appropriately. If the repairs are the result of a system or equipment failure, then corrective action is needed to be sure that the problem was resolved and that repetitive issues are clearly identified and understood.

1.4 Resource Utilization

Effective utilization of all resources is critical to being the low cost, high quality leader in your industry. For example, utility and energy management processes can save money and improve the environment (see pdh course **G227** for more on energy management); and understanding the entire value stream of your business operations will help focus CI efforts on cost savings.

Total yield is another critical measure in utilizing resources. In some businesses yield is still defined as “output/input” when in reality it is “usable or good output/input.” One of our clients was making a tape product and simply looked at yield as yds^2

produced per lb of input resins to the process. This may be a measure of process efficiency, but is not a true measure of resource utilization. It doesn't consider inherent process waste, abnormal waste or quality issues that lead to scrap or waste. A more effective measure would be saleable or prime yds^2/lb of resin used. Then CI efforts could be focused towards identifying the top categories of waste and making process improvements to address these. When the client only looked at output/input in the original data, it was not possible to see the waste because of several reasons: 1) the theoretical or maximum possible yield was not known because the inherent waste factor was unknown; 2) equipment issues that led to certain types of waste were not documented; 3) routine or unusual quality concerns were not given proper attention because that was not considered in the yield calculations. You get the idea.

1.5 Fact Based Decision Making

Another basic is **Fact Based Decision Making** using the tools of **Statistical Process Control (SPC)**. In some companies engineers and statisticians have become enamored with complex statistical techniques and mathematical models while minimizing the use of basic tools such as control charts, histograms, run charts, flow charts, Pareto charts and Cause-Effect diagrams.

Often a simple graph of process metrics can yield information to guide continual improvement efforts and to help establish cause and effect relationships that can lead to C.I. For example process yield or process scrap when graphed and monitored daily, weekly, or monthly can show trends and help drive improvements. Other metrics to consider could be on-time deliveries, preventable customer complaints, equipment up-

time, productivity (good output only), maintenance time per work order, cycle times, inventory turns, etc. Identify those 5-7 key indicators for your business and focus on them. Make them visible for employees and get more people involved in understanding the data.

Process Control Charts (SPC) are effective and simple tools for fact based decision making. Effectively using these tools will provide information about the type and amount of variation in your processes. Unexpected and/or too much variation are enemies of continual improvement and without using control charts, one does not really know the type nor amount of variation present. While this is not a course in SPC, let me quickly point out that control charts show process performance over time, indicate the expected system variation and clearly show when processes experience special causes of variation. Process control charts are based on the random variation in a process over time and provide limits of expected "behavior" for your processes. They are based on the statistics of the process such as averages and ranges of sample variation over time.

Here is what a typical control chart might look like:

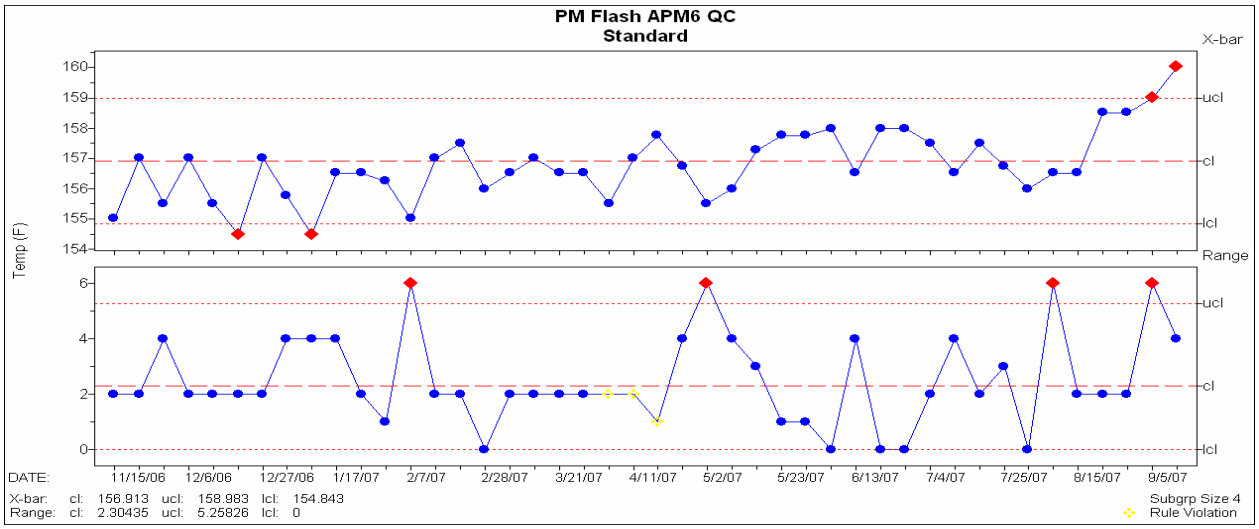


Figure 4: Example of a Process Control Chart

From this chart one would expect the process to behave between about 155 and 159. In fact, statistically, one would expect this about 99.73% of the time based on the random variation in this process. From the lower half of the chart, or the range chart, one would expect the process to vary <~5 within the sample subgroup. One can readily see when the variation is too high and when the actual process result is not within expected levels of performance. For more information, consider the text ***Statistical Process Control*** by Grant & Leavenworth (McGraw-Hill).

Another simple tool is the Pareto Chart, which is really just a bar graph arranged in order of importance or occurrence. These are based on the Pareto Principle, or the 80/20 rule which tells us that 80% of our problems come from 20% (or less) of the reasons or causes. Here is an example of a Pareto Chart:

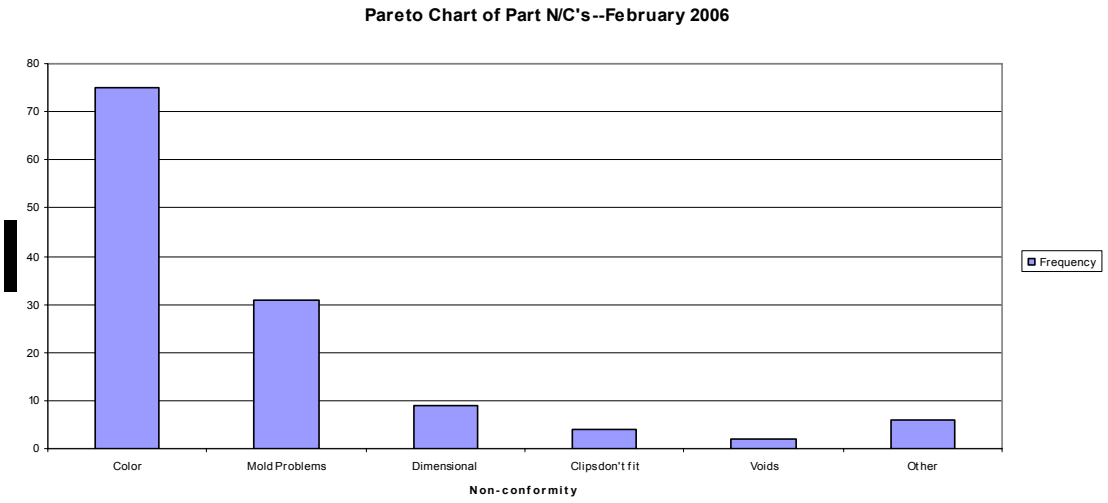


Figure 5: Pareto Chart Example

While it may be necessary to use more sophisticated techniques at times, the simple tools, when properly used, yield an abundance of information about most processes. Employees and managers should be trained in appropriate methods and encouraged to use simple statistical tools for Continual Improvement. While this is not

intended to be a course in statistics or problem solving, one can easily find many useful references on the internet and in books that are readily available and written in understandable formats.

1.6 Documentation

Complete **documentation** is an important consideration with the continuing emphasis on quality management systems such as ISO 9001 (i.e. clause 4.2.3); TS 16949; ISO 13485; AS 9100, ISO 17025, etc. Proper documentation is nothing new for an effective total quality system. Here is an example of a simple procedure using a flow chart approach:

Purchasing **SOP 740P001**

Effective Date: May 15, 2008

Scope

XYZ Industries operations that require product quality related purchased items.

Purpose

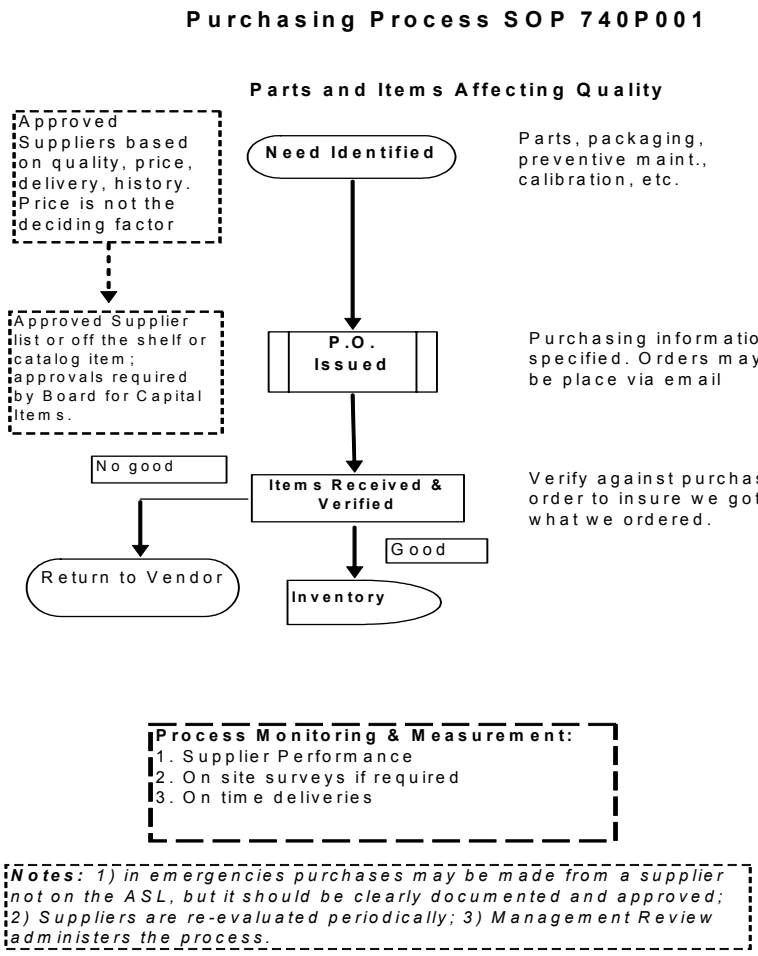
To define the policies governing purchases of supplies, materials and services that are related to product quality.

Reason for Revision

May 15, 2008, reviewed and flow chart added. May 25, 2004 Added to procedure for verification of purchased material.

Procedure

The process and procedure are as follow:



1. At this time there are no requirements for on-site verification at sub-contractor or vendor premises. Should the need arise, it will be added to the SOP.
2. Records of vendor performance are reviewed at least annually during Management Review. This includes price, delivery, quality concerns and general satisfaction with the vendor.
3. Vendors may be removed from the approved vendor list at management's discretion.

Approval

_____ May 15, 2008

Executive Director Date

Figure 6: Example Procedure for Purchasing

Complete documentation includes an up to date quality manual, product

traceability, training plan, training records, operating procedures/instructions for product or service realization, relevant safety and environmental information, corrective actions, preventive actions and process descriptions. The documentation should tell us "how to do the work", describe the "work to be done" and record "how the work was done." This documentation must be a part of the C.I. process. When the “way we do the work” is clear to all employees, then it is a rather straightforward task to review the documentation with all shifts and areas that are affected to **identify system improvements** that can be made or **best practices** that can be transferred to other areas of the business or even to other facilities within the organization. And, please remember that documentation for the sake of documentation is an exercise in futility; NOT continual improvement!

Taking care of these basics will enable businesses to move Continual Improvement out of the bureaucratic quagmire onto the path of measurable results that help reduce costs and improve quality.

2. Focus on Processes

In many companies CI processes began by using SPC Charts to monitor key product variables. A customer's desire to determine process capability for certain product parameters may have led to a product focus instead of a process focus. If no corrective and/or preventive actions are taken immediately, then nothing is different from the traditional inspection approach to quality or continual improvement.

To understand your processes more in depth, begin by identifying the core processes and then flow charting the overall system of processes at a high level. Next, each process should be flow charted at a more detailed level. This can be readily accomplished by utilizing a team of knowledgeable personnel with the assignment to flow chart the **all** of the business processes. Be sure to include information flow and process monitoring and measurement. To illustrate with an example, a high level flow chart might look something like this (this one has the ISO 9001 clauses shown just for reference):

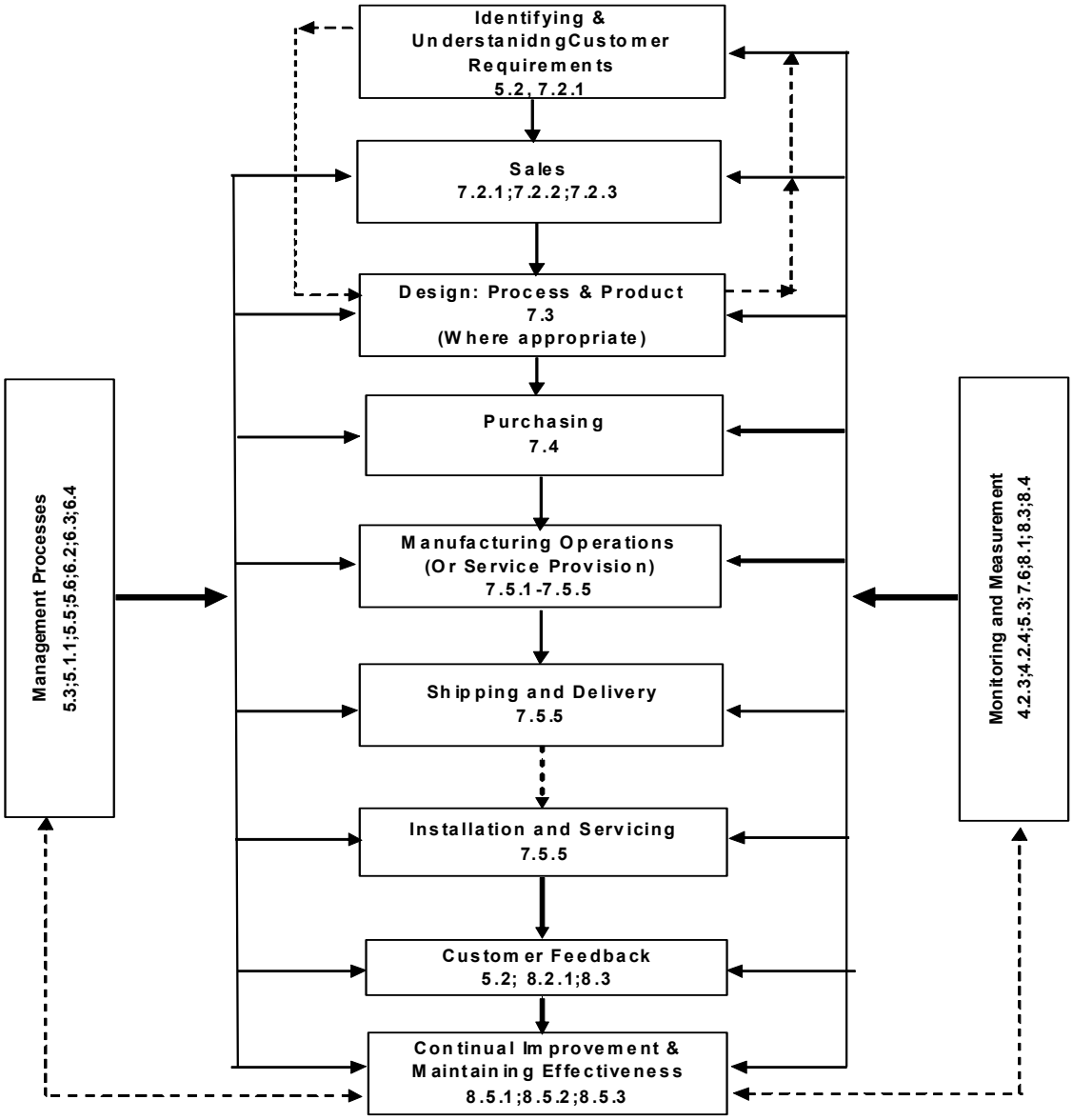


Figure 7: High Level Process Flow Chart

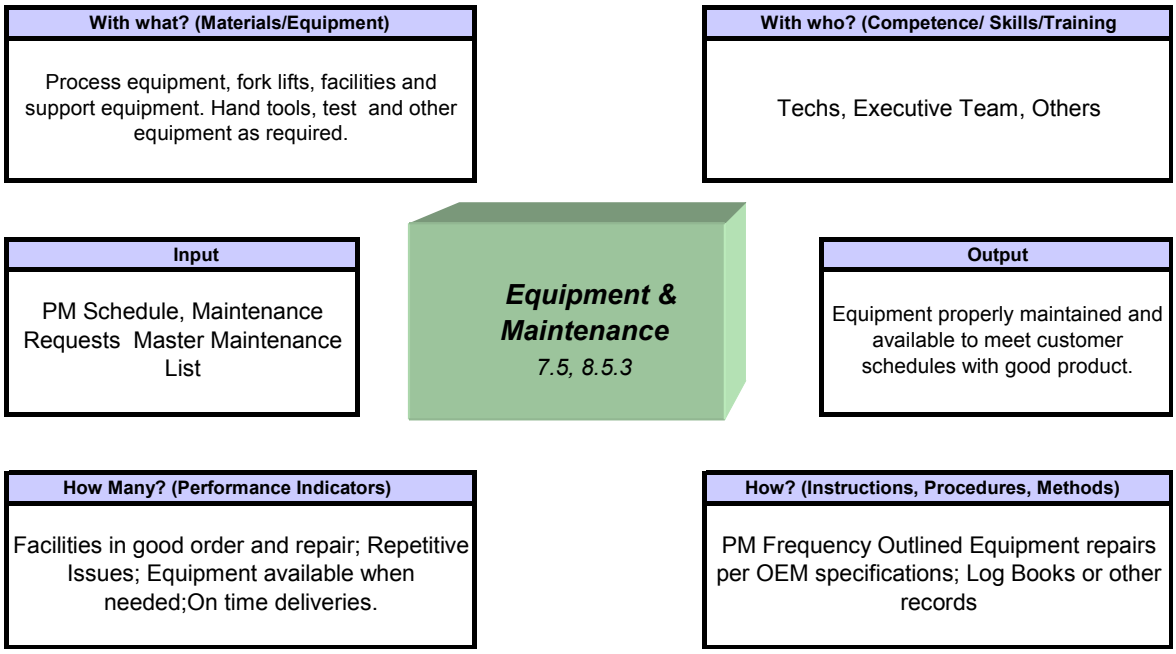


Figure 8: Another Flow Chart Example for Maintenance Processes

2.1 Process Focus

Shifting to a **process focus**, encourages work on problem prevention and maybe even re-engineering the process for quantum leap improvements. A simple first step is what I call "Process Analysis for Understanding." Here is an approach that has proved to be effective in many situations. First is an outline of the technique, followed by a worksheet that gives you a tool for gathering and using the information.

2.2 Process Analysis for Understanding

What?

- A tool to aid in analyzing processes
- Looks for inputs and outputs and linkages or “hand-offs”
- Focuses on how the work is to be done in a given process
- Prevents missing key information about a process

When?

- Use to study a process or nonconformities within a process
- A tool for continual process improvement and with PDCA
- Helps identify effective process improvements

How?

1. Identify the Process
2. List inputs and outputs
3. Identify the steps (hint: develop a flow chart)
4. Determine how the work is being done and managed
5. Identify how the process performance is being measured
6. Identify the **linkages** between processes (i.e. “hand-off from previous and to the next process in the sequence of processes)
7. Identify how this process is measured or monitored
8. Evaluate and document how the work can be done better
9. Implement the improvements

Benefits

1. Provides an orderly approach for process improvement
2. Helps in simplifying processes
3. Focuses efforts on continuous improvement
4. Can be used on any process

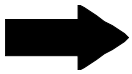
2.3 A Simple Tool for Analyzing Processes

Process Analysis Worksheet

Process: _____ **Date:** _____

1) Inputs
(List)

1) What is the work to be done?
(Develop simple flow chart)



Outputs
(List)

2) How is the work being done?
(Process steps, problem areas ,procedures)

3.How is the work being managed?
(Responsibility, accountability, expectations, goals)

4) How well is the work being done?
(Cost, cycle time, quality issues; key indicators)

5) How can we do the work better?
(Continual improvement plans or steps)

Process Analysis Team : _____

Date: _____

2.3 Using Process Analysis Information

After the basic analysis is done, Cause-Effect relationships among process variables and product characteristics could be identified. A team that is knowledgeable of the process can work together to identify the top 3-5 **process variables that impact the final product**. Using the **Plan-Do-Check-Act** (P-D-C-A) cycle along with appropriate statistical methods, this team can begin to reduce variation in the process.

Here is an example of Cause-Effect diagram developed by a team of knowledgeable people who used the information to prioritize, define and implement continual improvement actions on a measurement process:

C.I. Project: Reduce Measurement Variation in Chemical Analysis

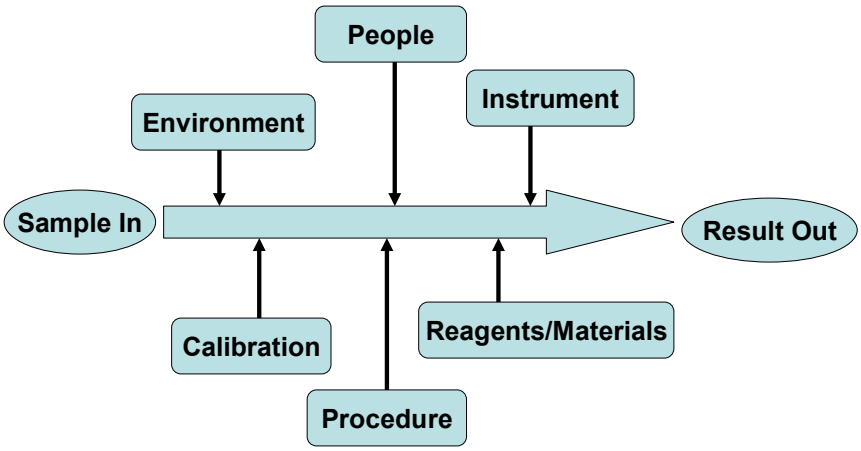


Figure 9: Example of Cause-Effect Diagram

2.4 Reducing Variation is the Goal

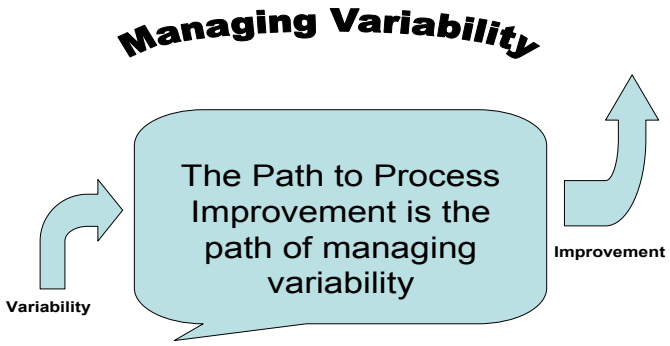


Figure 10: Managing Variability

Reducing system variation is the long term goal. Variability in a process can be defined as "the difference in things that should be alike." Remember, management is responsible for the system. Processes that "behave" with a predictable degree of uniformity are results of eliminating sources of variation over time. Process Control Charts (SPC) are the only tools that will let you know if you have special causes of variation present or jus system, or common cause, variation present. These charts will show long term trends as well as short term "spikes" in processes and provide the information to really improve the processes and measure the results. Control Charts give signals when processes don't behave as expected. They are simple, yet very powerful tools to use in reducing variation. Working on the system encourages long term changes aimed at reducing variation and yields effective Continual Process Improvement.

The shift to **process** thinking from traditional **product** thinking is a major step in getting CI efforts on the path to effectiveness. Establishing process monitoring and

measurement criteria along with specific goals or targets is a key to success with process improvement and CI (and is required in ISO 9001, clause 8.2.3). This **transition** enables management and employees to make long term changes to improve the consistency of processes and simplify the "work to be done."

3. Eliminate Waste

An often missed opportunity for continual improvement is eliminating **waste**. Waste can be defined as anything that is non-value added. When the entire value stream is considered, waste can really mount up in terms of dollars, time, resources, re-work, etc. Waste can involve process scrap, re-worked products, re-done reports, waiting on parts, etc. With this broad definition, it's easy to understand the importance of eliminating waste!

3.1 The Categories of Waste

In most organizations there are at least 7 major categories of waste:

1. Measurable scrap including process waste and product scrap, etc.

2. Waiting on materials, people, parts, decisions

3. Performance barriers such as procedures that were developed in a front office with insufficient (i.e. “NO”) understanding of the impact on the work being done.

4. Dissatisfied customers, so measure customer satisfaction.

5. Dissatisfied employees who are not being productive and this is usually traced to issues in leadership.

6. Damaging goods, facilities, equipment either accidentally or heaven forbid, on purpose; but most likely inadvertently such as running equipment without proper preventive maintenance

7. Doing things over because they weren’t done right the first time. Too often is a result of communications issues when requirements were not clearly understood.

3.2 Identify and Eliminate Sources of Waste

Now it is time to identify the major sources of **waste**. These can be categorized as costs, time, occurrences or other categories meaningful to your business. Use the tools we’ve been discussing. Control charts can show you when variation is the culprit

that requires a concerted CI effort. Pareto charts are powerful tools to identify the top problems. The tough question becomes, "How can we do the work better?" Cause-Effect diagrams and flow charts make it possible to focus on eliminating the waste that's been identified. **Root Cause Analysis** techniques can be applied to eliminating waste which will make a significant impact in most businesses.

A unique approach that a client used to identify waste and make it visible was to actually “build” a Pareto Chart of scrap outside the employee entrance to the plant. They took the scrap for one week and created “piles of waste” by each category of nonconforming parts. This visible reminder highlighted the need to eliminate waste and provided essential information about what areas to attack first in their continual improvement process.

Management must provide leadership in the **waste reduction (elimination)** efforts. The gains made by eliminating waste translate directly into **reduced costs**, **increased productivity** and **profits**! In the example above, it took some courage on the part of the top management team to just pile up the waste outside the plant for a week, because by making it visible the expectations for continual improvement were raised to new levels within the organization and back at the home office as well.

4. Get It Done With Teams

The fourth part of the CI plan is **Get it Done**. This is where the work really takes place! How do we "get it done?" **Teams**. Small teams (5-7 people) of experienced and knowledgeable employees who are trained in the team process and empowered to make decisions can focus the organization on Continual Improvement. Too often, groups are sort of put together randomly, with no training in the team process or the tools of Continual Improvement and expected to come up with revolutionary improvement. That's a prescription for frustration and failure. Continual Improvement teams should be cross-functional, knowledgeable, trained and have some "clout" within the organization. They should be able to make decisions, inform the proper people and implement improvement actions.

What the Teams Do

"The Team Top 10"

1. **Focus on the Process**
2. **Use an organized approach to understand the process**
3. **Use the tools of SPC to make fact based decisions**
4. **Understand & simplify the procedures or other documentation**
5. **Identify the sources of waste**
6. **Communicate closely with management and employees**
7. **Take it easy, go slow, digest what you learn "small bites"**
8. **Document the team's function.**
9. **Document results/implement changes.**
10. **Follow-up to hold the gains.**

Figure 11: How the Team Gets Results

5. Measure the Results

Without tracking results it is impossible to measure the benefits of your CI process. Use a simple tracking mechanism such as an excel® file or easy to use data base that will enable you to quickly summarize projects and results. As in most things the most significant measure may be in $$$, however other measures such as reduced change-over times, improved run lengths, pounds of scrap eliminated, cycle time improvements, reduction in customer issues, etc. may also be effective. Select the measures that make sense for your business, but avoid the temptation to make it complex or cumbersome! Remember, the goal is to continually improve processes without increasing bureaucracy.

The Plan-Do-Check-Act (PDCA), or Deming Cycle is simple way to monitor and measure results. The Deming Cycle is shown below along with an easy to use tool to help you use the PDCA approach more effectively:

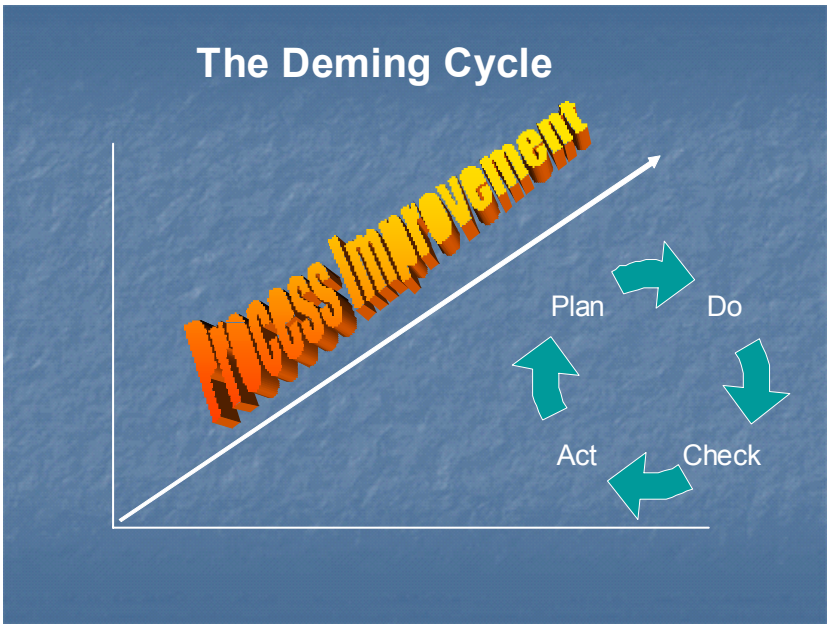


Figure 12: The C.I. Process Using The PDCA Cycle

P-D-C-A Worksheet

Plan List the steps in the action plan to implement specific corrective actions or problem solutions based on root causes. Be sure to include specific steps, timetables, responsibilities, measurement.	**Do** Implement the corrective action plan and be sure that all documentation that needs to be changed is updated. Don't forget the forms! Follow-up on the implementation according to specified responsibilities.
Check The specific items to measure, check or verify should be specified in the PLAN. Check these items and record the results. Look for differences in what you expect and what you actually experience.	**Act** As a result of measurements (checks), take the appropriate actions and repeat the process. This may be the most important step to having effective corrective actions.

Fig. 13: PDCA Worksheet

Summary

Becoming the Low Cost, High Quality Leader is about Process Improvement and an organized approach using simple tools to insure a systematic effect on your processes.

Following these simple steps and strategies while using the tools of C.I., an organization can move from being "bogged down" in bureaucracy to a continual improvement process that really works while working towards the goal of being the low cost, high quality leader in your industry.

After experiencing early gains, a renewed effort is required to achieve **breakthroughs** that lead to increased **process knowledge** over time. Increased process knowledge yields effective, long term, **continual improvement** measured in terms of reduced variation, reduced waste, lower costs and improved productivity. Remember, the goal is to become the low cost, high quality leader in your industry.

The keys to success are **leadership and commitment**. Effective leaders enable empowered employees to improve processes. When an organization commits to integrating these principles into their business as "the way we do the work" the continual improvement processes will be effective.

We used to say “if you always do what you always did, you always get what you always got.” The new reality is:

“If you always do what you always did,

you will fall behind the competition!”

