CHAPTER 4

P2 Tools

Includes:
- ☐ Using P2 Tools
- ☐ Systems Approach Tools
- ☐ Checklists
- ☐ Lessons Learned
- ☐ References

USING P2 TOOLS

P2 teams can use a variety of specialized tools to get their work accomplished. These tools provide visual aids that are essential in communicating P2 information to management, workers, and other interested parties. Tools also help P2 teams gather information and provide problem-solving and decision-making guidance to the P2 team. Finally, by using specialized tools, the P2 team can construct an action plan for each project covered by the program. This plan allows for consistent tracking by the P2 oversight committee.

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There is an endless variety of different problem-solving and decision-making tools available. Most of these tools have been used throughout the world in a variety of quality programs for more than 50 years. Only in the past 10 years or so have they been applied to P2 projects. Many small organizations have learned these tools by using the Environmental Justice manual entitled, *Nothing to Waste* (Reference 4-1). Larger organizations have often learned the tools through the various types of quality programs that have come and gone over the years. The problem is that environmental managers are often unfamiliar with such tools. This is beginning to change as more organizations seek to integrate environmental programs into their core business practices. This integration effort helps align the ways problems are addressed and solved within the organization. Keeping the P2 program independent of mainstream operations activities may limit the program's efficiency and effectiveness.

SYSTEMS APPROACH TOOLS

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An organization acts as a *system* that functions as a whole through the interaction of its parts. The Systems Approach looks at the whole organization, and the parts, and the connections between the parts. The functionality of the parts depend on how they are connected, rather than what they are. The parts of a system are all connected directly or indirectly. Therefore, a change in one part affects all the other parts. Given this interdependence, tools that address the complexity of organizations are important. There are several reasons why the Systems Approach tools meet this need and work so well in the planning and implementation of your P2 program.

First, processes that use resources and generate wastes do not always provide synoptic information clearly suited for checklist-style presentation. Instead, these processes are more than likely intertwined with other situations such as emotional distress or political issues that

arise within the organization—which in turn may stem from some difficulty with the way things work (or don't work). Because of these entanglements, too much time and energy may be spent trying to understand the situation before ever getting on to the problem-solving stage. Systems Approach tools can help.

The Systems Approach tools point out how things can be changed to conserve the use of that resource or prevent the waste from occurring.

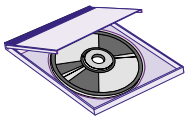
The Systems Approach tools cut through such situations. They facilitate problem solving by allowing the workers to understand why a regulated or expensive resource is being used or a waste is being generated. These tools point out how things can be changed to conserve the use of that resource or prevent the waste from occurring. This is fundamentally different from having the environmental coordinator or external assistance provider suggest a way to change the process without involving the workers in decision-making.

The Systems Approach relies on intra-organizational teams, not individual experts, to make decisions. It requires team members to analyze a resource or waste problem thoroughly, determine the underlying root cause, and generate possible alternatives. Based on this, the problem solvers can make an objective, rational, comparative evaluation. This is not to say that the team should not use the proper expertise as a resource to their work. It should. However, responsibility for decision-making should rest in the hands of team members who will implement and evaluate the proposed measures.

Because the Systems Approach is interactive and based on workers' own decision-making efforts, team members feel they "own" a portion of the analysis. Of course, employees have preferences and different points of view, and because the Systems Approach tools are "team-friendly," they allow for this. This involvement is important because an answer imposed from outside is less likely to work than one arrived at within the organization.

The Systems Approach provides management with a reasonably accurate profile of process problems.

Another consideration is the overall management process in the organization. It is important to identify the process-related reasons for resource use and loss before you can convince a manager to change the process to avoid them. In this context, the Systems Approach provides management with a reasonably accurate profile of process problems. It makes clear that, unless the problems are corrected, these and similar problems are likely to recur. Effective planning, including the revision of current strategies and policies, benefits from the use of the Systems Approach.



Checklists do have a place in P2 programs. Throughout the Systems Approach, it is useful to make lists of questions and answers for anything related to each of the tools. Such lists form an outline of the entire problem situation and are important entries in any record of the process. Some sample checklists can be found on the CD-ROM that accompanies this *Guide.*

Using the Systems Approach Tools

Many organizations are finding they have to adapt to survive in the global economy. Managers are learning new ways to run their organizations, and workers are learning how to contribute their knowledge to improving processes. By learning how to monitor, control, and constantly improve production and various supporting systems, organizations are better able to provide their customers and other interested parties with what they want, when and how they want it. These business practices lead to better decisions for the interested parties and for the organization—workers and managers alike.

The principles of quality improvement can be useful tools for achieving environmental excellence. Just as defect prevention is better than the "find and fix" approach to quality control, P2 is preferable to "end-of-pipe" control. The application of the quality improvement tools used by the Systems Approach is a powerful force in eliminating environmental inefficiencies and preventing pollution.

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Process Mapping

Getting to know more about the uses and losses of resources in a process and clarifying all that you already know are the two basic tasks of process characterization. These tasks involve information gathering, listing, sorting, and comparing.

Process characterization is the step where the bulk of your learning about the process takes place. This is where your existing systems knowledge regarding the process is revealed and organized and where new knowledge comes easily because the process-mapping tool makes all process relationships "visible." You will find that you no longer need to restrict yourself to the main process. It is now possible to look at all supporting operations—both ancillary and intermittent—to see how they impact the main process.

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Consider that every time a laboratory sample is taken to monitor a process, the laboratory creates a waste. This waste could be prevented if the sample were not taken in the first place. Of course, some monitoring is necessary and perhaps even required. This circumstance presents an opportunity to improve the efficiency of the monitoring process. Maybe you could make an argument to the regulatory agency for less monitoring based on your organization's compliance record. For example, the use of sensors for continuous monitoring would offer an alternative to traditional "grab" samples. An argument could be made and supported by the P2 program to change the sampling, thereby reducing the wastes produced in the laboratory.

Process characterization makes P2 opportunities visible. Worksheets probably do not do this effectively. Diagrams are often a better tool. Connections between all work steps help clarify the causes

Connections between all work steps help clarify the causes for resource use and waste generation.

for resource use and waste generation. Every use of a resource in a process represents an opportunity to conserve the use of that resource. Every loss of a resource in a process represents an opportunity to avoid that loss. Taking advantage of these opportunities benefits everyone in the organization. The discovery, correction, and prevention of waste generation should be the responsibility of everyone in the organization.

An effective means to characterize processes is with a hierarchical process map.

An effective means to characterize processes is with a hierarchical process map (Figure 4-1). In most organizations, process documentation is typically organized into categories such as company, facility, product line, and department. Much process documentation is then carefully filed away in reports or databases that most people do not review on a regular basis. This information may take the form of process flow diagrams, flow charts, value stream maps, process and instrumentation diagrams, machine configurations, arrow diagrams, box diagrams, floor plans, or other schematic depictions. All of these process characterizations suffer from complexity—too many objects on a single page.

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It has been widely recognized that most people can only "see" up to six objects at a time and comprehend visually what they mean. Hierarchical process maps (Reference 4-2) allow only three to six objects on a page. The entire process must be depicted in three to six boxes. Sub-processes can be used to provide detail at the next level but are also restricted to the three-to-six-box rule. The assemblage process steps constitutes a node tree which establishes the relationship and connections between the work steps at each level. In a Systems Approach, every work step is connected to every other work step in this diagram, which depicts the entire *system.* There are two very important rules associated with process mapping:

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1. The process maps must help the P2 team understand the process better than they could through other means.
2. These same process maps must help the P2 team communicate what they plan to accomplish to management and other interested parties.

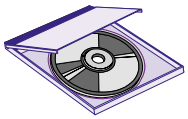

Figure 4-2 shows examples of process maps. You can find other examples of process maps on the CD-ROM accompanying this *Guide*.

Using Maps as a Template

Some organizations think of a process as a single box with its inputs and outputs. Using this model, it is difficult to change an entire process to make P2 happen. By using the process map as a template, process documentation can be organized by, and linked to, individual work steps in the process at the lowest level. All standard operating procedures (SOPs), best management practices (BMPs), regulations,

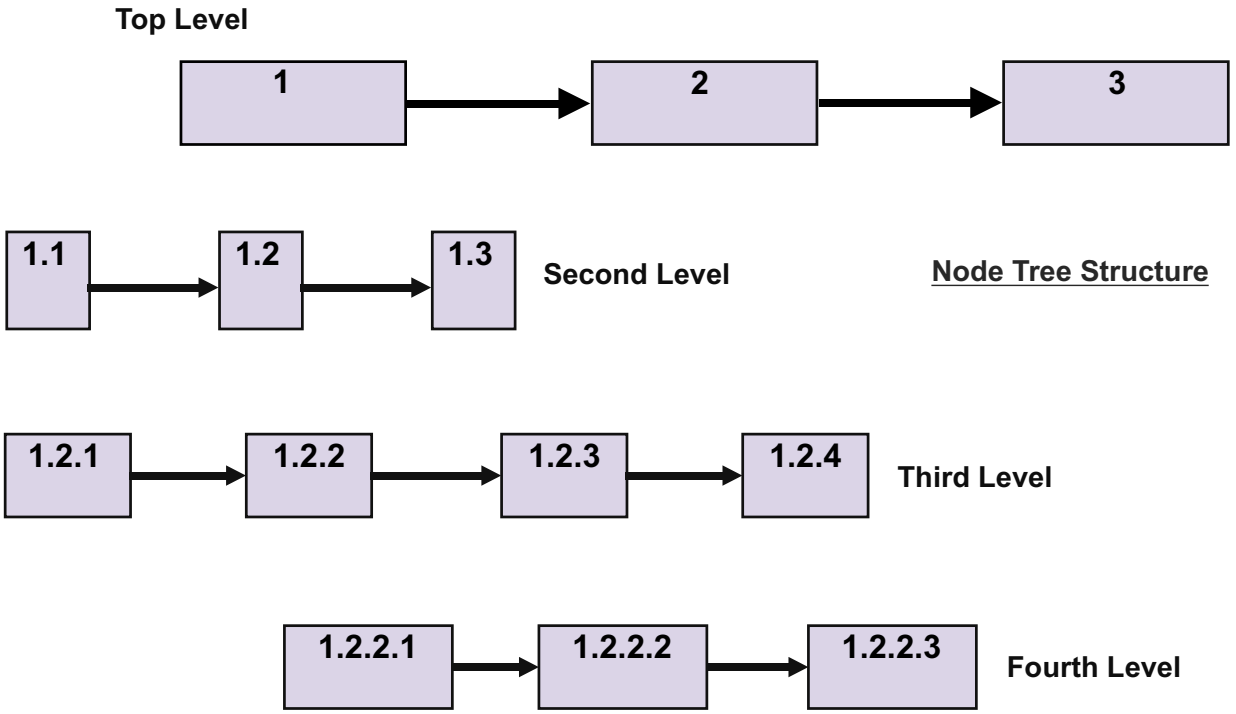

Figure 4-1. Hierarchical Process Map Structure.

maintenance requirements, glossaries of terms, and material safety data sheets (MSDSs) can be filed by work step using the process maps. What you may find when using the process maps is that many problems are associated with a single work step. It may then be easier to focus the P2 activity on that work step. This focus is necessary to help P2 activities succeed in the day-to-day operation of the organization.

While many process map designers simply use pencil and paper, hierarchical process maps can also be computerized using inexpensive, off-the-shelf software commonly used to prepare organizational charts (e.g., VISIO®). If the organization decides to computerize the process information, everyone involved in a particular work step can have access to all the information on that work step using an Intranet or other electronic or hard copy means. Using process maps as a template helps an organization keep track of resource use and loss by each work step in a main process, or in supporting ancillary and intermittent processes.

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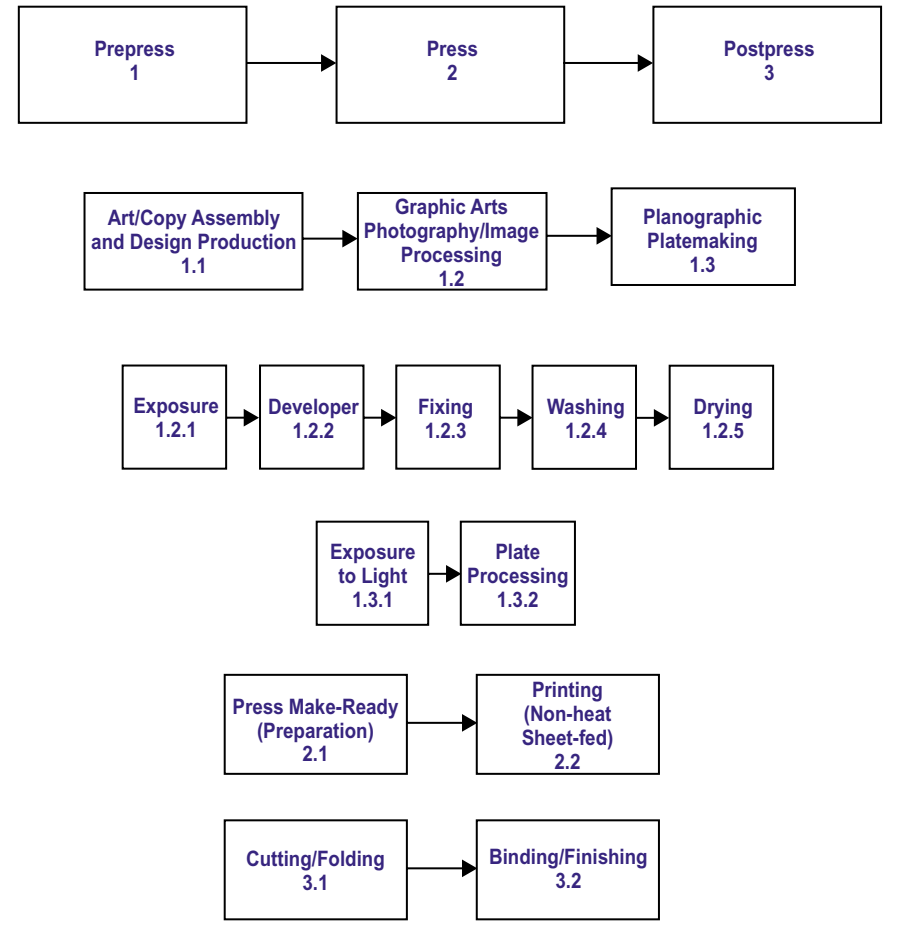
All resources (e.g., energy, water, and materials) can also be tracked (Reference 4-3) on the same process map (Figure 4-3). The term *non-product use* means that the resource does not become part of the interim or final product. The term *non-product loss* means that the resource is lost in that work step as a waste, discharge, or emission. Process losses can be classified by medium (air, water, solid waste, spills/leaks, and accidental losses). Costs can also be tracked by pro-



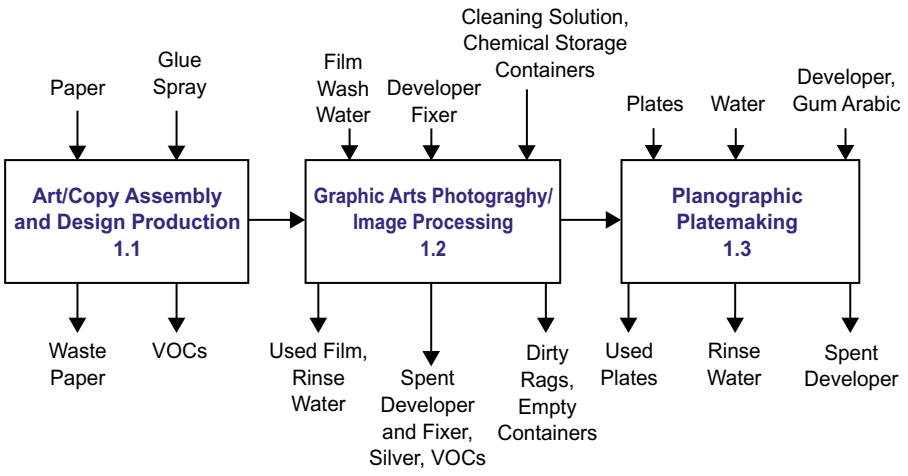


Figure 4-2. Hierarchical Process Maps.

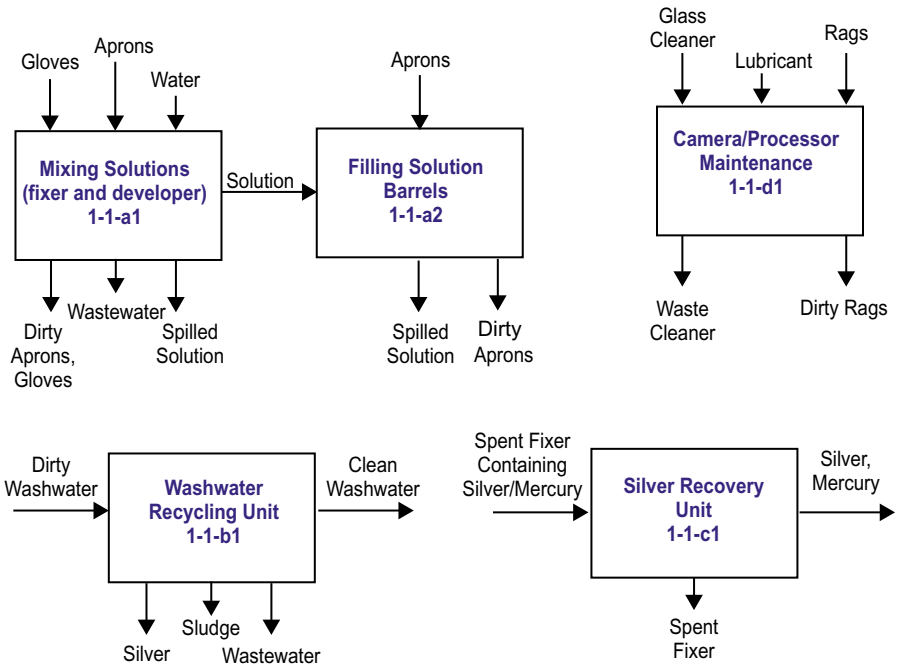


Figure 4-2. Hierarchical Process Maps (continued).

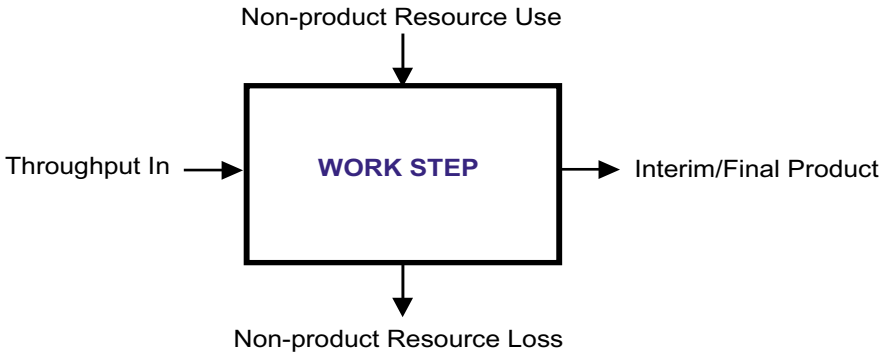


Figure 4-3. Using the Process Map as a Resource Accounting Template.

cess work step. Spreadsheets can be linked to the objects in a computerized process map, as well as to word processing files. Keeping track of this information is useful for helping rank-order P2 opportunities by cost. This can all be accomplished using your organization's charting software.

Determining the Cost of the Loss

Gathering accurate cost information is important for justifying investment in P2 alternatives.

Gathering accurate cost information is important for justifying investment in P2 alternatives. This cost typically needs to be collected by work step because this is where the P2 will be applied. There are three types of costs that should be tracked:

1. General ledger costs
2. Cost of the lost resources
3. Activity-based costs associated with the management of the non-product loss

For each loss identified in the process map, the P2 team should examine the "chart of accounts" to see if the cost is tracked by the accounting department in the general ledger. For example, if an organization generates solid waste, there may be a cost for the disposal contractor in the general ledger. The chart of accounts provides a vendor number and/or other code for this payment category. It is important to remember that the general ledger typically tracks *only* money that goes in and out of an organization (i.e., payment for invoices and payroll and revenues or financial allocations). It *does not* track internal transactions (e.g., environmental coordinator preparing a permit). These internal transactions are activity-based costs that will be discussed in more detail below. All cost data obtained from the general ledger is quite accurate and does not involve estimates of any kind.

A second cost category is associated with the cost of the resources that become non-product outputs or process losses. For example, when a part is spray painted, some of the paint does not end up on the part. This overspray is probably captured on a paint filter in the ventilation system. If 60% of the paint is incorporated on the part (i.e., interim product in throughput), 40% of the paint is lost from the work step (i.e., non-product loss). The cost of this lost paint should be added to the general ledger cost associated with this loss along with the cost of the paint filters (i.e., the intent of purchasing the filters was only to dispose of them after they captured droplets of paint, preventing these drops from getting into the air handling/treatment system). The plastic bags in the wastebaskets in your office represent a similar case. Your building management firm purchased those plastic bags intending to throw them away, thereby making the custodian's job easier. The cost of all the bags that are purchased must be added to the cost of your solid waste disposal bill along with the estimated cost of everything else that you purchased and threw away in that wastebasket.

To obtain the cost of the losses, it is often necessary to confer with the purchasing department. Some of these costs are estimated since they may be split between product and loss, such as in the paint example. Sometimes you throw away a container included in the cost of the product inside the container. Of course, because estimates are less accurate than the general ledger costs, you may want to estimate conservatively to maintain the credibility of your analysis.

A third cost category is associated with the activity-based cost of managing the loss. If the loss is regulated (e.g., hazardous air pollutant, hazardous waste, or wastewater priority pollutant), there are a number of activities that may be required by the regulations. You first must determine all the activities that must be performed for the non-product losses from each work step at the lowest level in the process map. Then you must estimate the cost associated with each of these activities. The total activity-based cost associated with each loss is added to the total cost of the loss associated with the general ledger cost and the cost of the lost resources.

Often the cost of a non-product loss will triple when adding the cost of the lost resource (i.e., the second cost category above). If the loss is regulated, the activity-based cost of managing the loss may increase this composite cost to five times the original general ledger cost.

Often the cost of a non-product loss will triple when adding the cost of the lost resource (i.e., the second cost category above). If the loss is regulated, the activity-based cost of managing the loss may increase this composite cost to five times the original general ledger cost. Obviously, there are large variations in the true cost of the non-product losses. However, capturing *all* the cost components is necessary because if the loss can be prevented, all of this money is saved, not just the general ledger cost of the loss.

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Selecting P2 Opportunities

Information gathered in the process-mapping phase of the P2 program can be used to select P2 opportunities on which to focus for problem solving and decision-making. This is generally more useful than relying solely on a walk-through or other P2 assessment. However, walk-throughs using process maps are essential to the proper verification of the information in the maps. Some P2 programs target opportunities by trying to eliminate costly compliance issues associated with the use or loss of regulated materials. Other P2 programs seek to address targets that have been pre-selected by management or environmental personnel. Each organization has its own means for selecting P2 opportunities. However, there is a tool that can be used to help the P2 team through this process.

If all the P2 opportunities identified in the process maps were arranged in order of their true cost to the organization, you would find that 20% of the P2 opportunities provide approximately 80% of the cost benefits.

If all the P2 opportunities identified in the process maps were arranged in order of their true cost to the organization, you would find that 20% of the P2 opportunities provide approximately 80% of the cost benefits. Conversely, the remaining 80% of the P2 opportunities provide 20% of the true cost benefits. In most cases, you will find the 80/20 rule (also called the *Pareto Principle*) to be a great guide for selecting P2 opportunities (Figure 4-4). Most organizations use Pareto analysis in

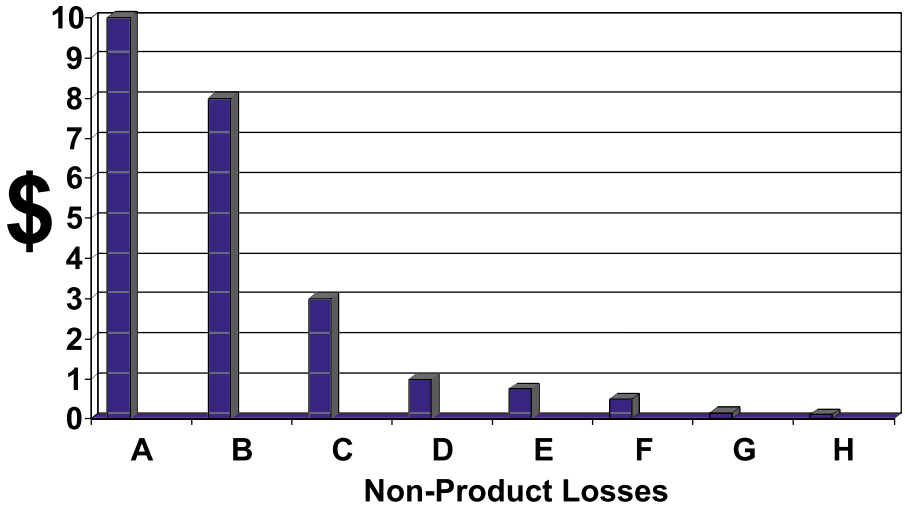

Figure 4-4. Pareto Diagram Showing True Cost Versus Waste Type.

some aspect of their work (Reference 4-4) to help focus their efforts. This tool dates back to 1897 and has the greatest staying power of any of the tools presented in this *Guide.*

Quality improvement experts advise concentration on the "vital few" sources of problems and avoiding distraction by those of lesser importance. The term for this process is called *rank ordering.* Pareto analysis is a rank-ordering tool. However, the fact that you have rank ordered your P2 opportunities does not mean you shouldn't address the easier opportunities early on. Early in a P2 program, projects must be carefully selected to ensure the greatest chance of success. P2 teams may be tempted to immediately tackle projects that are too large or too diffuse for them to handle. Too often, these projects may seem necessary to gain and maintain management approval for the P2 program. The resulting frustration only dampens enthusiasm for the prevention effort. Avoid bogging down in P2 opportunities that offer minimal cost benefits. Instead, focus your long-term efforts on the 20% where the true cost savings may be found. This approach maximizes the value of the P2 program to the organization. Pareto analysis helps identify the most obvious opportunities for improvement in present operations.

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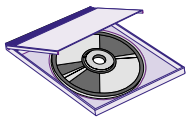
It is interesting to note that focusing on wastes by volume or weight may cause the P2 team to overlook some important wastes. In some cases, small volume wastes may be responsible for the highest costs. An example of this involves laptop computers that become contaminated when used in radiologically controlled areas. Contaminated laptops represented only a very small volume of the mixed radioactive waste

from a National Laboratory in the United States. However, the cost of disposal was the highest of all the items considered in the analysis. Other examples of the use of Pareto analysis are presented on the CD-ROM that accompanies this *Guide.*



Analyzing Root Causes

"Root cause" is the basic reason that a resource is being used or a process loss is occurring. If this cause can be eliminated, the resource use or loss would be prevented. This approach is the very basis of P2.

Root cause analysis refers to the process of identifying causal factors. Most people involved in P2 are ardent problem solvers, but in their haste to get to a solution, some may skip over this very important problem-solving activity. P2 teams which skip this important step may simply take the most obvious action, rather than the one that would best solve the problem.

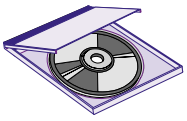
Root cause analysis teaches organizations to look at all potential causes: materials, technology, work practices, and people.

For example, when faced with environmental problems caused by a toxic chemical, P2 "problem solvers" might initially assume that the best way to address the issue is to find a "safe" substitute. In fact, the problem may be caused by *how* the company is using the chemical, rather than by the chemical itself. Changing work procedures or equipment or training employees more effectively might offer a better and/or less costly solution. Root cause analysis teaches organizations to look at all potential causes: materials, technology, work practices, and people.

Root cause analysis can be an effective management tool for determining the true or actual cause of resource use or loss in a process, facilitating effective corrective action, and preventing recurrence of the problem. It also provides obvious opportunities for improvement since it identifies both the underlying reasons for problems and the obstacles to correcting them.

The cause and effect diagram (also known as a fishbone diagram) provides an effective tool for conducting root cause analysis.

The cause and effect diagram (also known as a fishbone diagram) provides an effective tool for conducting root cause analysis (Reference 4-5). Studies have found that this tool is the most widely used problem-solving tool in the world. However, it takes a little training and experience to use this important tool effectively. This tool is to be used by the P2 team, not by individuals. It provides a useful graphic to explain to management and other interested parties exactly what may be causing a problem. Once the diagram has been completed, the P2 team can count the number of causes found. The 80/20 rule can be used to help focus on the most probable causes by drawing circles around the 20% of the causes that may account for 80% of the problem. The P2 team will be more effective if it has this understanding and focus before attempting to generate P2 alternatives. An example of a cause and effect diagram can be found in Figure 4-5. Other cause and effect diagrams are included on the CD-ROM that accompanies this *Guide*.



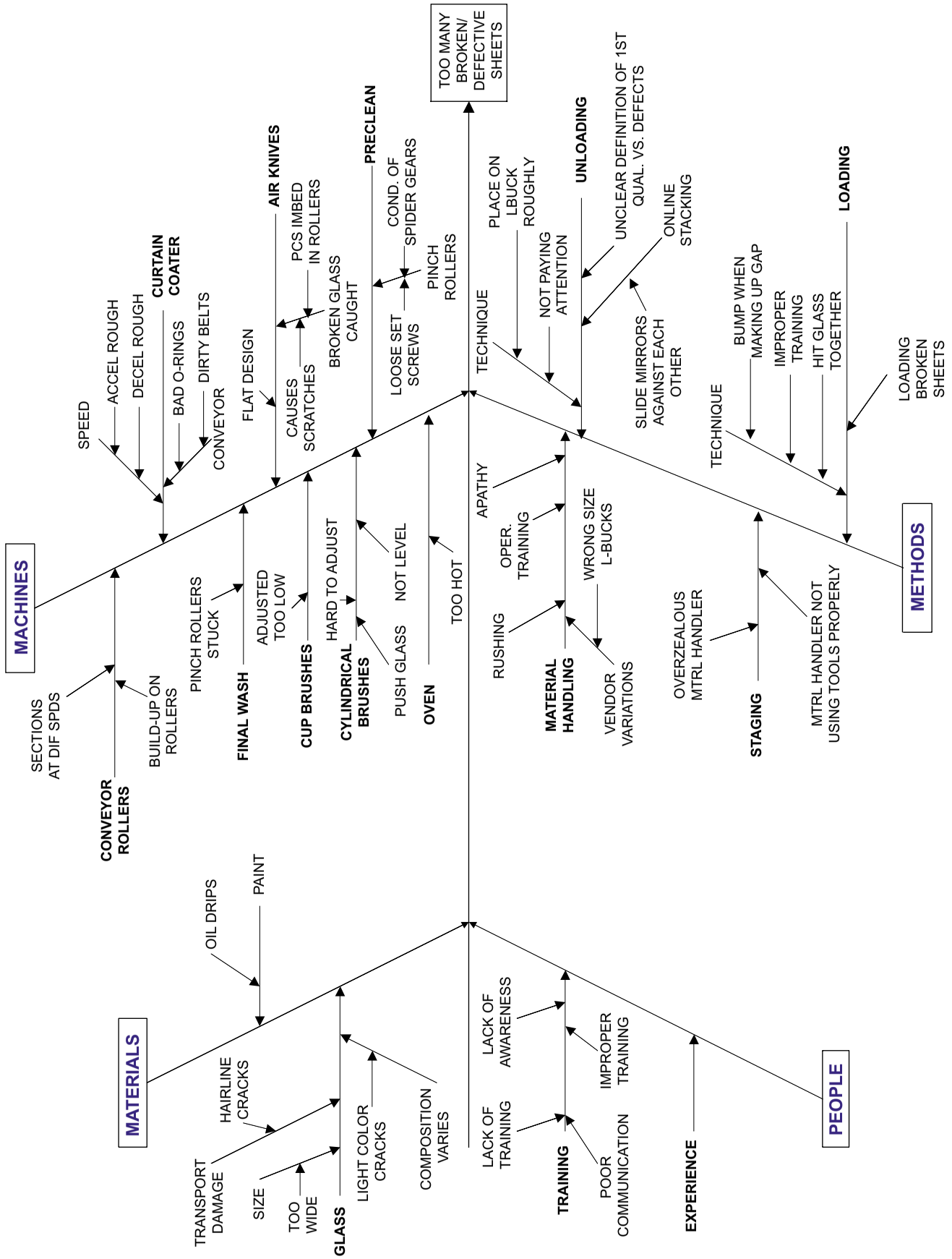


Figure 4-5. An Example of a Cause and Effect Diagram.

Generating Alternative Solutions

Every P2 approach has some method of deriving alternatives for solving the P2 problem. Some P2 practitioners restrict themselves to only a small number of P2 alternatives for a given problem because they have not performed root cause analysis (and thus may lack key information) or because the P2 team members are not adequately involved in the process of deriving alternatives. P2 literature (i.e., case studies and success stories) provides only some ways to address each problem. An expert may offer limited tried-and-true solutions. Your organization's P2 team should feel confident that it may develop equally effective alternative ways to address the situation.

The Systems Approach operates on the theory that "the only way to find a good P2 alternative is to have many P2 alternatives."

The Systems Approach operates on the theory that "the only way to find a good P2 alternative is to have many P2 alternatives." A good method for generating alternatives is "brainwriting," a technique similar to brainstorming, but tends to be less restrictive (Reference 4-6). Brainwriting is a written form of brainstorming that uses forms like that shown in Figure 4-6. It takes advantage of the fact that many people are much more likely to write down their ideas than say them. This brainwriting technique allows resource people (i.e., those not on the P2 team, vendors, or technical assistance personnel) to lend their expertise in generating alternatives. Brainstorming is a very widely used tool for generating alternatives. Some organizations use a tool known as an affinity diagram. No matter what your preference, the quantity of alternatives is what counts. Experience has shown that brainwriting is often

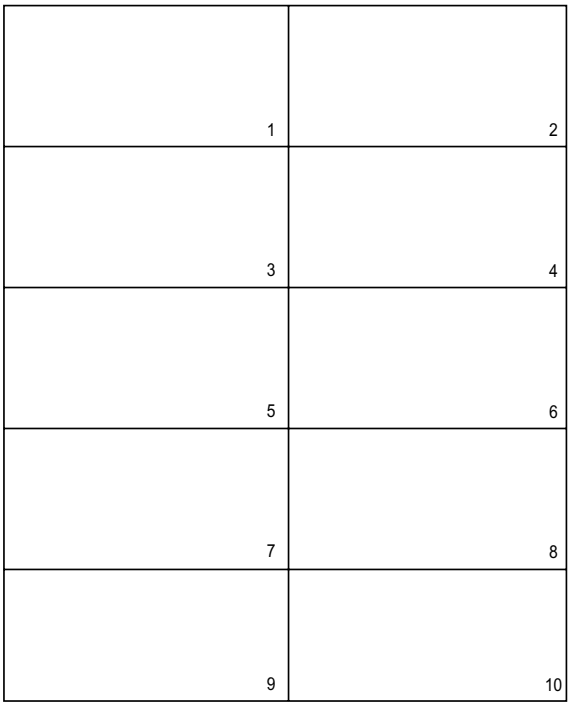


Figure 4-6. Form Used for Brainwriting Exercise.

able to help the P2 team generate as many as 18–40+ alternatives in a short period of time.

To help encourage P2 team members to "think outside the box," it is important to get each team member to express the "most outrageous alternative that just might work." This gets everyone involved in using a bit of creativity to address the P2 problem at hand. Even "wild" concepts may trigger a search for alternatives that are a bit unusual but could work in the case under consideration. This technique is called "provocation." Employing worker knowledge and a little creativity has led to many successful P2 projects.

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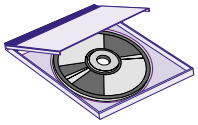


See Figure 4-7 for a listing of brainwriting alternatives for a common problem. Other examples of brainwriting alternatives can be found on the CD-ROM that accompanies this *Guide.*

Install a closed-loop (fully recycling) system.
Fully automate the system to control drive speed.
Use water-saving nozzles.
Wash less frequently.
Put dehumidifier in room to collect water vapor.
Use high-pressure jet spray (rinse/clean in one step).
Redesign water application.
Hand wash.
Reduce evaporation by lowering room temperature.
Try to collect evaporated water.
Use multistage washing process.
Only use undercarriage spray in winter.
Only wash vehicle once a week.
Dip vehicles in a tub-like device.
Lower temperature of water to decrease evaporation.
Use drying apparatus so vehicles do not drip dry.
Use a switch to activate/deactivate each step.
Close garage door before starting washing process.
Spit shine.
Use a squeegee to scrape off excess water.
Change soap application method.
Use alternative to city water source.
Use fewer absorbent sponges (less water trapped).
Use rental cars (rental agency will wash).
Redesign collection of water.
Drive through faster.

Figure 4-7. Brainwriting Alternatives for an Automated Vehicle Cleaner.

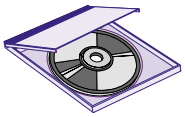
Selecting an Alternative for Implementation

The bubble-up/bubble-down tool is an excellent means for prioritizing and selecting an alternative to implement from a long list of possibilities.

Selecting a P2 alternative for implementation is facilitated with decision-making tools such as a *criteria matrix* (also known as a *selection grid*) or *bubble-up/ bubble-down* (also known as *forced pair analysis*). These are prioritization tools. The bubble-up/bubble-down tool in particular is an excellent means for prioritizing and selecting an alternative to implement from a long list of possibilities (Reference 4-7). When using this tool, the P2 team is allowed to examine only two alternatives at a time. They must ask which is best and use general criteria

such as the effectiveness of the alternative, the ability to implement the technique, and the cost associated with that implementation. This method of discussing the various alternatives is very interactive. Other tools do not allow for a lot of verbal communication among P2 team members. This communication leads to more information that will ultimately help facilitate implementation of the selected alternative.

Alternatives that "bubble up" to the top are typically easy to implement and have a relatively low cost. These alternatives may be characterized as the *low hanging fruit* or *quick wins.* Little or no capital is required to implement these alternatives and work can begin right away in most cases. If good cost data is collected, these "quick wins" can generate savings that can be reinvested by the organization to create more prevention and value. Alternatives that currently fall below the grouping of quick wins are generally more effective at preventing resource use and process losses. However, they may require more study and capital investments. Since it will take time to test and study these alternatives in an engineering feasibility study (See *Waste Minimization Opportunity Assessment Manual*, EPA/625/7-88/003 and *Facility Pollution Prevention Guide*, EPA/600/R-92/088 on the CD-ROM for more information on conducting a feasibility study), the P2 team can be working on the problem with the higher ranked, albeit less effective, alternatives. The results of the feasibility study will be useful for preparing a capital justification request to use the more effective alternative at a later time. Continual improvement can be maintained in a P2 program in this way.

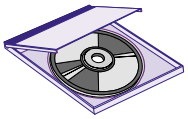


The alternatives, in order of priority, are as follows:

1. Simply reduce the soap input in the car wash
2. Use high-pressure water instead of soap
3. Alter the soap application step
4. Use degradable soap
5. Install a closed-loop system
6. Use alternative cleaning materials
7. Use a local, off-base car wash
8. Use rental cars instead of owning/maintaining
9. Locally treat the water before discharge to sewer
10. Drive less, walk more, use bicycles
11. Reuse dirty/soapy water
12. Install a new/improved car wash
13. Use a softening agent to take the soap out of the water
14. Handwash the cars
15. Use ultrafiltration to filter the water
16. Dry-clean the cars
17. Ultrasonic cleaning
18. Ablative paint for cars
19. Use dirt-colored cars
20. Paint the cars with slippery paint
21. Do not clean the cars at all
22. Buy new cars constantly

Figure 4-8. Bubble-up/Bubble-down Example.

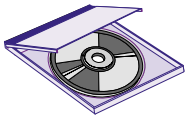
Many P2 practitioners currently use prioritization tools. One limitation, however, is that they begin with a finite set of potential solutions to choose from because they have not used a method such as brainwriting to generate sufficient alternatives. An example of the prioritization of the alternatives generated in the previous step may be found in Figure 4-8. You may note that alternatives can be grouped in different combinations during the bubble-up/bubble-down procedure. Other examples of the use of bubble-up/bubble-down can be found on the CD-ROM.



Action Planning

A formal action plan should be prepared for every P2 activity that is planned for each year of a P2 program.

Finally, a formal action plan should be prepared for every P2 activity that is planned for each year of a P2 program (Reference 4-8). In the rush to implement, P2 practitioners should not overlook the need to formalize their action plans. Each action plan should list the P2 alternative that will be implemented and show the sequence of steps necessary to implement the alternative. The person responsible for ensuring that each step is completed should be indicated in the action plan. Performance of that step must have some recognizable goal that must be reached. A metric should be devised to measure the progress toward meeting that goal and to provide a time frame for reaching the goal or completing that step. Finally, an indication of the resources required to reach the goal should be included in the formal action plan.



A sample form for use as an action plan is shown in Figure 4-7. Some action plan examples can be found on the CD-ROM that accompanies this *Guide.*

When P2 programs are audited on an annual basis, the auditor can select action plans and confirm that the work indicated actually has taken place. Periodic assessments of P2 program status depend on information like this to serve as the basis for measuring progress.

ALTERNATIVE SELECTED: Date:

Action	Responsible Person	Performance	Monitoring Technique	Completion Deadline	Resources Needed
1					
2					
3					
4					

Figure 4-9. Example of an Action Plan.

CHECKLISTS

Checklists are often necessary tools for P2 programs. A checklist helps guide an organization's activities and progress. Checklists provide important steps and method information for measuring operational performance and effectiveness and help the organization collect and organize data for assessing its current status and how well it is operating. It is useful to make lists of questions and answers for anything related to each of the problem-solving and decision-making tools presented in this *Guide.* Such lists form an outline of the entire problem situation and are important entries in any record of the process.

Checklists also help the P2 facilitator and P2 teams by providing guidance for further action and indicate things to do, process components to visit, people to see, and questions to ask. By devising a series of checklists, the P2 team provides itself with a means to review the entire resource use or loss problem.

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Checklists are a handy way to jot down ideas as they arise for possible use at a later date. As the checklists increase in size and number, they can be reorganized and combined to simplify dealing with the problem as a whole and to clarify its parts. Checklists help the team organize the tasks and provide an overall view of the situation, its requirements, attributes, alternatives, and consequences.

Here are some simple steps for deriving checklists for a P2 program.

- ❑ Determine the purpose and intended use of the checklist.
- ❑ Perform research to ensure that the checklist covers all requirements and asks for specific data to be recorded.
- ❑ Provide space for checking off completed steps, ideas, or data items.
- ❑ Ask the subject matter expert to review the final draft of a checklist to ensure that nothing of importance has been overlooked or omitted.
- ❑ Perform revision and pilot-test the checklist before placing it into use.

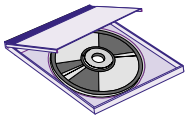
P2 teams should compose checklists that complement the process they use in their P2 program. The various components of a typical P2 effort using the Systems Approach tool are listed so that a P2 team may use checklists to achieve better results in these areas:

- ❑ Keep track of the process characterization effort, including all ancillary and intermittent operations.
- ❑ Assure proper resource accounting for uses and losses at the work-step level.

- ❑ Gather the true costs for each work step in the process characterization effort.
- ❑ Gather information for rank ordering of P2 opportunities.
- ❑ Select a P2 opportunity to analyze.
- ❑ Make sure that all causes in each cause category are considered in the root cause analysis for the selected opportunity.
- ❑ Document the search for potential solutions and alternatives.
- ❑ Gather information on each alternative to be used in the prioritization effort.
- ❑ Document the selection of the best alternative for implementation.
- ❑ Test the completion of the action plan.
- ❑ Track the implementation of the solution and evaluate progress.
- ❑ Test the use of each of the P2 program elements in this process.
- ❑ Test the overall P2 program effectiveness.

The periodic use of checklists generates a consistent means of assessing progress.

The periodic use of checklists generates a consistent means of assessing progress. Checklists should be designed to provide managers and P2 team members with a tool for assessing the significant characteristics of each step in the Systems Approach, checking the vital "how to" of each step, and analyzing in greater detail how well the tools are being used.



A number of checklists can be found in the CD-ROM that accompanies this *Guide.* You should be able to use and customize these electronic documents to fit the needs of your organization.

LESSONS LEARNED

Tools take time to master, but they help foster skills that the P2 team needs to characterize the process, solve problems, and make decisions.

Tools take time to master, but they help foster skills that the P2 team needs to characterize the process, solve problems, and make decisions. The repeated use of the tools makes P2 team meetings more productive. Many people avoid the use of tools because they believe that it takes too long and the benefits are not worth the effort. The tools lead to increased focus and questioning. P2 teams that use the root cause analysis tool usually derive a minimum of 20 P2 alternatives for future consideration. In contrast, teams that do not use the tool typically limit themselves to three or four alternatives.

The more methods and tools that you have time to use, the better the P2 program will be in the long run. Limiting tool selection can impair the development of the P2 program.

Continual improvement is important to focus the organization on P2 success. Organizations strive to improve, but few understand the difficulty in trying for continual improvement. Frequently, organizations initially set percentage improvement goals beyond their reach with too little information. P2 is based on achieving many successes over time. Many of the problems of organizations have evolved over many years and cannot all be solved at one time. The organization can use Systems Approach tools to generate the information effectively and use it to set goals during the development of the action plans. Although it is important to focus improvement efforts on critical issues (Pareto diagrams), improvements can be made little by little until these major issues are resolved.

Organizations strive to improve, but few understand the difficulty in trying for continual improvement.

Incremental improvements can lead to breakthrough improvements. This is accomplished by learning from the improvements and seeking to make larger improvements. Incremental improvements also allow for "quick wins." These little victories, when accompanied by cost data, help maintain management approval for the P2 effort. Continued funding of P2 projects also provides the time for breakthrough improvements to materialize.

Checklists are useful tools for gathering information and data and tracking progress of the problem-solving and decision-making method. However, they are relatively ineffective at communicating that information to management and other interested parties. Each of the Systems Approach tools has a visual output that is much more effective in this regard.

Making P2 a way of life in order to achieve success takes more than words; it requires action. Action plans provide documentation for these actions and a means of tracking P2 progress over time.

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