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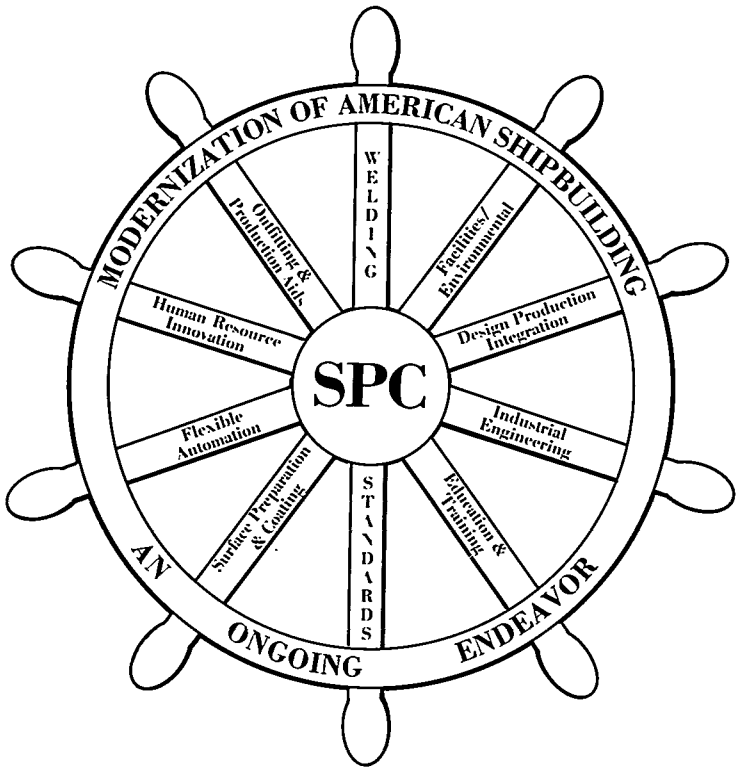

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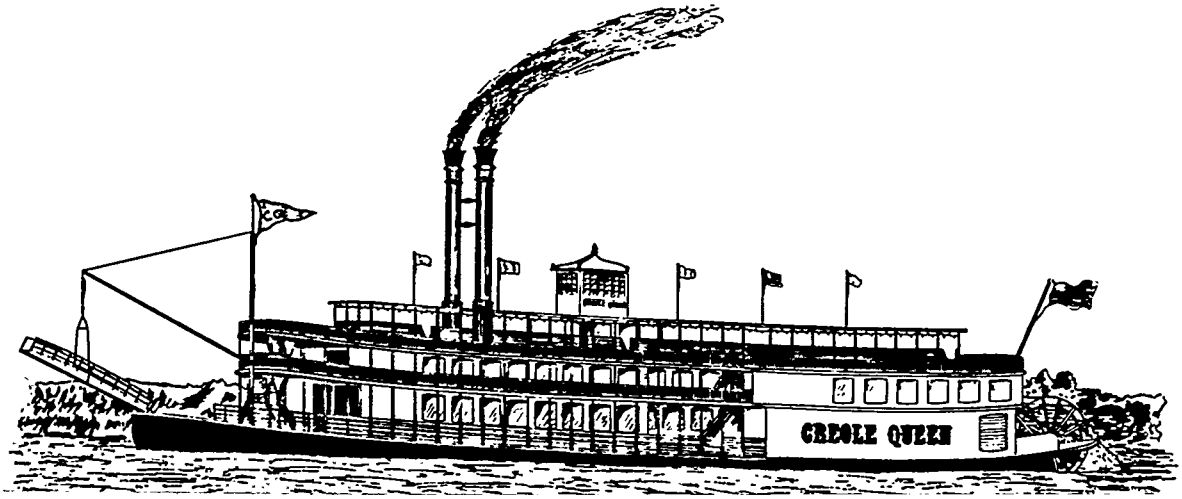

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Implementation of Total Quality Management at Pearl Harbor Naval Shipyard

No. 9

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INTRODUCTION

Pearl Harbor Naval Shipyard is one of eight public shipyard engaged in the overhaul and repair of conventional and nuclear powered surface ships and submarines of the U.S. Navy. These ships, from their power plants to their sophisticated weapons systems, are consistently on the leading edge of technology. Work performed on these ships during an overhaul, maintenance or repair cycle requires personnel in the labor force whose skills encompass a variety of vocations -- engineers, machinists, accountants, welders, computer specialists, pipefitters, riggers, crane operators, and personnel specialists are but a few of the skills required. Of prime importance in ensuring success in the business is a management structure and philosophy dedicated to continuous improvement in quality, productivity and cost reduction.

Recognizing that increased productivity and reduced costs are end products of quality improvement, Pearl Harbor, in April 1986, elected to adopt Dr. W. E. Deming's management fundamentals. The purpose of this presentation, therefore, is to discuss the strategy and methodology which is being used to apply Dr. Deming's principles to the complex world of ship overhaul and repair.

GOAL

The goal at Pearl Harbor Naval Shipyard is to reduce costs in order to remain competitive. To achieve this goal, the shipyard has adopted the strategy directed toward "process improvement". This process management approach is based on the philosophy of Dr. W. Edwards Deming and Dr. J. M. Juran. Dr. Deming states his aim is the transformation of the American style of management. He does not tell how to make this transformation, but he provides fourteen Management Principles as a guide. It is top management's responsibility to infuse these principles functionally and operationally into the shipyard organization and to provide a plan for their implementation. A brief description of these principles is given below:

1. Constancy of purpose
2. Refusal to accept mistakes/ defects
3. Cease dependence on mass inspection
4. Single-Source Suppliers, Buy on quality, not price
5. Search for problems
6. Training for all employees
7. Leadership
8. Communication, drive out fear
9. Remove barriers between departments
10. Goals, Posters, Quotas, Slogans
11. Use statistical methods
12. Workers' right to pride of workmanship
13. Retraining
14. Top Management's Commitment

Pearl Harbor is currently in the process of internalizing and institutionalizing the Deming principles. This means shipyard managers must embrace these principles and apply them in the management of shipyard activities. Management words and actions must reflect and be consistent with these principles. Shipyard policies, procedures, instructions, and daily operations must also be consistent with this philosophy.

In recognizing past practice and management styles cannot be changed overnight, Pearl Harbor accepted the fact that this change in management attitude and behavior will take three to five years. The change process begins by generating awareness through training in the basics of the Deming Principles, problem solving techniques

and statistical methods. The manager then has the opportunity to practice and apply these new ideas and techniques in his/her own environment. The restructured environment is established as part of the change process by the Shipyard Commander and the Steering Committee which has been formed to perpetuate on-going process improvement. The new structure encourages managers to spend a minimum of 10% of their time working on the problems of tomorrow. As managers participate and become more comfortable and adept with these new methods, they see the results of not only their efforts, but also of the entire shipyard's efforts to effect continuous improvement. As the goal to constantly improve becomes a way of life at Pearl Harbor, the result will be a reduction in overhaul and repair costs, and significant improvement in Pearl Harbor's competitive position and its ability to provide jobs and job security to a dedicated workforce.

MANAGEMENT'S RESPONSIBILITY

Deming point out that eighty-five percent of all problems in an organization are system problems and, therefore, are the responsibility of management. Moreover, the systems and processes that an organization uses are created and established by management. Therefore, managers must understand how to analyze systems processes and create a structure that allows all levels of the workforce to be involved in process improvement and control.

It is critical for the top management team to be a role model in the execution of its responsibilities in the transformation process. The team must change its fundamental ideas about how to manage shipyard work and its role with the people. Top management cannot delegate this responsibility; they must actively lead in helping resolve all types of shipyard problems.

Management must learn to think analytically through the process of quantifying and measuring problems. Deming's approach emphasizes making decisions based on facts. Data must be collected, analyzed, and used to identify and solve problems. Statistical process control (SPC) and other quantitative methods provide the tools necessary to collect and interpret data. Training must be provided to develop management understanding in the use of these tools and techniques. Even more important is the use and application of these tools on real problems. Guidance must be provided.

JOB SHOP BUSINESS

Many examples of the application of the Deming Philosophy come from industries where mass production and its associated repetitive processes play an important role. Examples may show a production line capable of producing 500 cars per day. Generally, most examples illustrate the repetitive nature of processes. In comparison, the ship overhaul and repair business on sophisticated Navy ships differs greatly. It may take six months to several years to overhaul a ship. Shipyards are in the Job Shop business. Some jobs occur only once a year, while new Ship Alterations require entirely new techniques and approaches. The job shop business requires a significant amount of planning up front to order materials, develop software, sequence work, and coordinate the trades involved. Actual work is complicated by limited space access onboard ship. But even with these differences, ship repair effectiveness can be markedly improved through process improvement, i.e., looking for ways to streamline processes.

Although much of ship overhaul and repair business is job shop in nature, there are many processes utilized repeatedly. For example, welding, machining, pipe fitting, painting, valve repairs, software development, etc.; all of these processes can be improved by reducing variability that occurs today. By understanding what causes variation in our processes, and by observing, analyzing and controlling variability, we can improve our quality and reduce our costs.

NEED

The need to improve the way Pearl Harbor manages and conducts overhaul and repair work is directly influenced by the interrelationship of the following factors:

(1) High Cost: Cost of overhauls and repairs have been spiraling upwards.

(2) Reduced Budget: The Navy's share of a reduced federal budget must be stretched over an expanded fleet.

(3) Competition: The public shipyards have begun competing with the private sector for Navy work. Pearl Harbor expects to competitively bid on future overhaul work packages.

(4) Need for Improvement: There is a great need for improvement at Pearl Harbor Naval Shipyard. It is estimated that a minimum of 15% of our

time and money is spent on rework alone. If our experience is typical of the eight public shipyards that employ approximately 60,000 people, this means that the equivalent of 9,000 or more people, that is, the equivalent of another shipyard, are spending full time doing nothing but rework. At the same time, tremendous savings can be realized by reducing work and improving processes that produce an acceptable product without rework. Although most current processes eventually produce a quality output, they are very costly, overly complex, and include too many bottlenecks and inspection points. Obviously, all processes, must be streamlined to reduce the excess fat. These two elements, reducing rework and streamlining processes, are the key areas to focus on in process improvement.

(5) The Impact of Japan: Japan has become the exemplar in the world for quality and productivity. They have excelled at being able to produce a product or a service and doing it right the first time. They have set the example for continuous improvement. Their ability to reduce variation in a process and produce uniform output has resulted in higher quality and reliability and a minimized cost by eliminating rework.

THE EVOLUTION OF QUALITY

In the 1930's, Walter Shewhart, a statistician at Bell Laboratories in New York, developed techniques to bring industrial processes into what he called "statistical control". Shewhart, through the use of statistical analysis techniques, established a method for defining the limits of inherent or random variation in a process. Once the variation was determined, process control limits were mathematically determined. From this, a process control chart could be constructed which would provide a real time measure of process variability as work was being performed. By collecting in-process measurement data at selected intervals and entering it on the control chart, the actual performance of the process could be tracked. Review of the control chart could then trigger action to adjust or modify the process if it began to deviate from the norm and thereby prevent the production of a defective product. Workers could be trained to do this charting themselves, thus giving them greater control over their jobs and allowing them to make adjustments on their own. Dr. Deming studied with Shewhart and included these theories on quality control as a basis for his own work. The theories were put into practice during World War II, and the result was our ability to produce a quality product from the assembly line without the need for 100% inspection. Because of the resulting increase in productivity, we were able to provide the forces in the field with the quantity and quality of materials needed in the war effort; a significant factor in our eventual victory. However, after the war, the high consumer demand for products placed the emphasis on quantity, not quality; therefore, the use of Shewhart's theories was no longer seen as important. Paradoxically, General McArthur was assisting Japan in the rebuilding process, and invited Deming to help with the census. While Deming was in Japan, he was also asked to present his ideas on quality to the Japanese Union of Scientists and Engineers (J.U.S.E.). The rest is history. The Japanese accepted these ideas and began massive training in statistical methods. Since 1950, the Japanese have become one of the world leaders in quality and productivity and a major competitive force in the work marketplace. It was not until the 1980 presentation in the U.S. of the NBC white paper, "If Japan Can, Why Can't We?" that American business took serious notice of Dr. W. Edwards Deming and his fourteen principles of management philosophy. Since 1980, many of the Fortune 500 companies have embraced the Deming principles and have improved their quality and productivity significantly.

The evolution of quality improvement at Pearl Harbor up until 1981, for the most part, was seen as the responsibility of the Quality Assurance Department. Like many organizations across the country, Pearl Harbor had made a token effort in support of the "Zero Defects" program in the 1970's. This program was a good example of the slogan approach to quality improvement with no plan of action nor a defined methodology on how to reach this goal. In 1981, in an attempt to apply a methodology, the shipyard initiated a Quality Circle program and within one-and-one-half years had expanded to 35 active circles. However, due to a lack of constancy of purpose, lack of management support, and changes in upper level managers, the number of active circles dropped to two in 1984. Again, due to a change in top management in 1986, the QC program was revitalized and is currently at 20 active circles. In 1984, another Quality Improvement Initiative was established to address the issue of rework. This program later became known as the Problem Recurrence Elimination Program (PREP). PREP coordinators were assigned in the various shops and departments, and a

system was established to identify and record rework along with a computerized database for tracking. This program grew, gained manager and shipyard support, and is both active and very successful today. The databank is used to direct shipyard improvement efforts which have resulted in millions of dollars saved.

The current Shipyard Commander, Captain Robert Traister, arrived at Pearl Harbor Naval Shipyard in January 1986 and brought with him a background of experience at Electric Boat, Litton Industries and Puget Sound Naval Shipyard. He was familiar with the processes and problems associated with the building, overhaul, and repair of Navy ships. Although these shipyard had different strengths and weaknesses, all experienced being caught up in fighting fires on a daily basis. Unfortunately, it was his opinion that they had failed to make any significant improvement over the long range. He saw occasional successes, yet all shipyards lacked overall effective planning and coordination. They were bound up in unnecessarily costly processes. .pa However, one element of the operation which he found successful was the "tiger" or "project" team approach. These teams were made up of a relatively small number of key people with the necessary experience and background to work on a specific task. They would meet periodically on their special assignment and perform the detailed planning and then ensure the project was correctly managed during the execution phase. They were able to continuously identify unforeseen problems and then readily resolve them. This project approach is used successfully today not only at Pearl Harbor, but in all shipyards in order to focus work groups on complex tasks and evolutions. It is an example of a technique that works. Many of the factors that make this approach successful are included in the Deming Philosophy.

Captain Traister was well read in the management philosophies of Drucker, Juran, Deming and Crosby. He was absolutely convinced that "process improvement" was a necessary part of the long-term shipyard improvement equation, and he initiated a shipyard-wide effort in process management. By April of 1986, he issued written direction to all Departments and Offices making it clear that he wanted everyone in the shipyard involved in process improvement. An enclosure to this internal direction was a 55 page guide that outlined the "Management Approach to Productivity Improvement". Shortly after that, 22 top managers attended a five day course given by the University of New Hampshire entitled the "Group Approach to Problem Solving (GAPS)". Immediately following this, another group of 22 top managers attended another five day course given by the National Summit Group entitled "Quality, Productivity and Implementing SPC". Following the training, a Steering Committee of Department and Offices heads as assigned to establish and manage future process improvement policy and direction. The Steering Committee made two key decisions: (1) to hire an outside consultant for one year to assist the shipyard in its implementation efforts and (2) to develop an internal education program to train project teams and managers in the problem solving tools and techniques. The training program was to be an interim step to get the remaining shipyard managers trained and involved in process improvement until the consultant arrived. By the end of 1986, 12 interdepartmental teams and 375 managers and supervisors had been trained. The idea was that managers/supervisors were to put these tools to work in finding and solving problems in their own work area (Deming's Point Number 5: Find problems). A sub-steering committee was assigned the task of writing a solicitation to hire an outside consultant. The completion of this process took one year.

IMPLEMENTATION - PHASE I

This section describes the process improvement structure established by Captain Traister and the Steering Committee and covers the period of 1986 to 1987. Phase II begins with the arrival of the consultant in June 1987. The structure incorporates all the elements that go together to make the implementation process work: moreover, these elements integrate the ingredients of the Deming philosophy into continuous process improvement. This structure evolves and changes continually as it is refined and improved through actual use at Pearl Harbor. This paper is a description or "snapshot" of where Pearl Harbor currently is in this process. Some of these elements were already in place while others have been added since the recent emphasis on Total Quality Management (TQM) began. Due to a lack of publicity, the program has been seen as "quiet"; therefore, one drawback is that the workforce perceives fragmentation as these old programs now merge with new elements.

A description of each element is provided below.

Shipyard Commander

The Shipyard Commander, i.e., the Chief Executive Officer, is the most critical element in causing continuous process improvement to take place. He is the role model for others to follow. Without his commitment, dedication, belief, involvement, support and constant everyday pushing of the program, any effort such as this one is doomed. For example, Captain Traister has participated in all 25 training sessions conducted to date. In these sessions, he spends considerable time explaining to each class of 25 shipyard managers why this process is necessary, how it works, and gives examples of its success. In addition, he attends and chairs two one hour process review sessions each week where presentations are made on process improvements throughout the shipyard. Each week he chairs the Steering Committee, which provides direction and guidance for the TQM program. He constantly queries managers and those directly involved in improvement projects with questions such as:

"What is the criteria?"
"What will you measure?"
"How will you know if you have improved?"
"You need more data."
"You must establish a database."
"What is your plan to follow up?"
"You need to break the job down into smaller pieces."
"Why does our procedure cost more than other Shipyards?"

Managers and supervisors who have received the benefit of the training all agree that the Shipyard Commander is a critical element in Deming's "transformation". From the top down, and total process needs to be both stated and used repeatedly throughout the entire management structure in the shipyard.

Steering Committee

The Steering Committee's purpose is to establish policy and direction for TQM. It is chaired by the Shipyard Commander and meets weekly for an hour-and-a-half. It's members include some 25 managers, made up of Department and Office Heads in all major functions. This Committee identifies high cost processes for review and assigns interdepartmental members to work on these projects. Steering Committee activities have included viewing the Juran, Conway, and Deming video tapes, and arranging for guest speakers that are further along in implementing the Deming principles. One month was spent reviewing all process improvement projects underway in each Department. This thorough overview gave everyone an opportunity to see what is going on and to provide feedback. The Steering Committee works closely with the consultant in developing a clear understanding of Deming's 14 points. Subcommittees will be formed to study a specific number of the 14 points, and they will define them operationally and functionally within the shipyard. Through this process, the Steering Committee will become the champions of the 14 points; moreover, they will become a resource and resolver of any questions regarding these principles.

Rework

The Problem Recurrence Elimination Program (PREP) has been actively involved in identifying rework for three years. PREP is composed of 12 full time and 12 part time coordinators assigned from the various shops and departments. These coordinators have been trained in process analysis and improvement, and spearhead projects that have been identified as rework problems.

Plans for the future include on-going documentation of discrepancies on critical submarine components and systems. These discrepancies will be documented during assembly, shop and shipboard testing. This enormous databank will be used to:

- identify problem process
- prioritize process improvement needs and efforts
- confirm effectiveness of process improvement actions
- demonstrate process control effectiveness

By continually improving shipyard repair processes, the shipyard will be able to reduce the number of problems, maintain a corporate memory databank, and get repair processes under control.

Training

Deming emphasizes a continuing training and education commitment for all employees.

The employees must understand the total assigned job, requirements, procedures and policies. Most important, the employee must be given the opportunity to apply classroom training in the workplace so that the knowledge and understanding is internalized. In other words, the employee must be qualified to do the job. Training must be continually improved and updated to meet changing requirements, and the shipyard must allocate resources to fund this

training. Statistical methods are used to determine if processes are in control and if training is needed. To achieve this training goal at Pearl Harbor, an interdepartmental team was established to set up a Skills Tracking System. This system lists the skill and training requirements, dates that training was last attended, and the jobs that were worked where training was applied. This system will be used, along with the workload forecast, to determine future and on-going training requirements.

This section describes training that the shipyard developed to get started in process improvement. The purpose of this training was to train interdepartmental project teams and shipyard managers in the Deming Philosophy, problem solving, team building, and statistical methods. It was initially seen as a 3-4 month interim action before the consultant arrived; however, as it turned out, it was a one year effort. During that one year, 19 interdepartmental project teams and 600 managers were trained. Since the overview training was limited to three days, it provided only an introduction to shipyard managers on the basic concepts. It was presented in a top down approach, i.e., managers should not attend unless their supervisor had attended first. This unwritten rule was about 70% effective. Class size was limited to 20-25 people.

Subject matter included introduction, background, Deming video entitled "Road Map to Change", Shipyard Commander's presentation, working as a group, defining and understanding the problems, flow charting, cause and effect diagrams, data collection, data analysis, pareto, trend charts, histograms, scatter diagrams, control charts, solutions, and a 6 hour group application of the problem solving tools to a case study.

In addition to the above training, 6 shipyard managers were sent to a 4 day seminar given by Deming himself in May 1987.

Process Review

Currently, approximately 100 improvement projects are being tracked and monitored. This number is increasing as managers and supervisors begin to identify and attack problems in their own areas. At the present time, the Shipyard Commander, the Planning Officer, and the Production Officer hold a Process Review meeting every Wednesday and Friday between 0700 and 0800. Presentations are made on the progress of improvement projects and top management has the opportunity to provide approval, feedback, and direction at these meetings. With this meeting, the Shipyard Commander is modeling what he wants to eventually see at the shop and department level. As the number of improvement projects continues to increase, each shop and department will establish its own internal Quality Assurance Program or Quality Review Board. These Boards will be responsible for reviewing improvement projects to ensure they are progressing and receiving necessary management attention.

Interdepartmental Teams

Shipyard operations involve many complex and costly processes. These processes require input from numerous trades and codes throughout the shipyard because they cross department boundaries. These processes are further complicated by their own undocumented evolution and by the many imposed governmental regulations. The Steering Committee identifies not only the high cost processes, but also the ones which continually result or hinder productivity year after year. These processes are pinpointed as potential projects for improvement, and they represent major cost savings. Once the Steering Committee selects such a project, the next step is to nominate a project manager from the Steering Committee to be responsible for the project. The project manager serves as a link between the team and the Steering Committee, and he/she provides status to the Steering Committee on the team's progress.

The project manager selects a team leader, and the two together determine the required trades and codes that are needed to resolve the problem. Once the team members are identified, the entire team attends a three day training in the Deming Philosophy, problem solving tools, and Statistical Process Control (SPC). After completing the training, the team spends the remaining two days getting started on their project. From here on, the team averages four hours per week working on their projects. Typically, they hold two meetings per week for two hours.

These interdepartmental teams incorporate all the ingredients of the Deming Philosophy, i.e., breaking down barriers between departments, two way communication, and managers demonstrating their leadership ability by helping to remove barriers that hinder the team's progress and success. These teams become the example of how process improvement works for other shops and departments.

They are a vehicle that allows the shipyard to experience the Deming principles at work.

Nineteen Interdepartmental teams have been established at Pearl Harbor to work on the following high cost processes:

Scheduling
Steaming Deficiencies
Special Hull Treatment
System Certification
In Place Valve Repair
Electricity Usage
Discrepancy Reports
Key Operation Closure
Controlled Industrial Material
Steam Plant Cleanliness Control
Design Support Services
Material Kitting
Shift Turnover
ATMAS
Refrigeration
Skills Bank
Test Memos
BQQ5 Upgrade
Clean Van

Typically, a team will make a status presentation to the Process Review Board 1-3 months after they complete training. This gives management an opportunity to ask questions and provide feedback. The final presentation is made when the team is ready to implement their improvement action. After management's approval is received and after the changes are implemented, the team follows up to ensure that the plan of action is implemented properly. They also collect data to ensure that the improvement words and meets the desired goal. Only when the team has institutionalized the change can it step away from the project.

Departments

The Shipyard Commander has tasked each Department to identify and work on five improvement projects and to report the status to him quarterly in writing. Each department identifies high cost problems in their area and assigns team leaders and members to attack those problems. Several departments have established more than five projects. The awareness of the opportunity for fertile areas to improve becomes more and more apparent.

Managers and Supervisors

The model for individual managers and supervisors is to spend 10% of their time (four hours per week) dedicated to process improvement. This means meeting with (1) their subordinates, and/or (2) their counterparts plus managers to identify problems. This becomes a schedule and behavior that is on-going for constantly improving processes by identifying and eliminating problems one by one.

Currently, very few individual managers/supervisors are involved independently other than the projects discussed above. More and more pressure is being directed toward getting all personnel trained actively involved. Pearl Harbor has trained more than 600 managers to date and only a handful are involved in improvement projects.

This is a weak area in that managers and supervisors are not applying the tools and techniques learned in training; therefore, their ability to internalize these skills is jeopardized.

Quality Circles

The Shipyard Commander's goal is to get all the managers and supervisors trained and onboard with the Deming Philosophy and "process improvement" before addressing the workforce regarding Quality Circles. The point is that the Quality Circle program that began in 1981 had little or no management support. Before the shipyard establishes any future Quality Circle policy, all managers must first be trained and actively involved. It is important that managers and supervisors understand the Deming Philosophy and process improvement before the concept is introduced at the workforce level. Every effort must be made to eliminate lip service.

IMPLEMENTATION - PHASE II

Phase II began with the arrival of the consultant in June 1987. Up to this point, the shipyard established a system and structure to get "process improvement" underway. Although slow in development, the shipyard moved steadily and positively toward getting everyone involved. The Deming principles were addressed superficially. The video tape, "Roadmap to Change" (Deming Philosophy), had been shown to all managers and discussed briefly in the three day training.

Why a Consultant?

Deming recommends the use of a consultant and, of course, consultants recommend consultants. The shipyard made the decision early on to bring in outside assistance for the following reasons:

The payback from the expected cost savings will more than compensate for consultant's services.

Pearl Harbor lacks "hands on" experience in applying statistical methods and the Deming principles.

Consultants offer expertise, credibility, and direct "hands on" experience that will provide a faster and smoother transition.

Consultants have encountered and dealt with the barriers and pitfalls of implementation and developed strategies to minimize these problems.

The following criteria were used to evaluate the background and experience of the contractors and the personnel involved in the contract:

- teaching experience/ expertise
- problem solving and team building
- statistical process control
- Deming principles
- record of successful implementation
- size and type of organizations served
- response from references contacted

Consultant Services

In late May 1987 the contract was awarded to Process Management Institute (PMI). PMI, recommended by Dr. Deming, will provide four different specialists from their staff during the one year contractual period. The contract includes the following services.

1. Top Management

Mr. Louis Schultz, president of PMI, will present a three day seminar to top management at the shipyard. The title of his seminar is "Managing in the New World Wide Competitive Society".

Topics include:

- History of Competitiveness
- Need for Change
- Deming's Deadly Diseases
- Deming's 14 Principles
- Funnel Experiment
- Bead Box Experiment
- Consequences of Staying "As Is"
- Process for Change
- What's Required to Make It Happen
- What We Would Like to See at Pearl Harbor
- Obstacles

This seminar will initiate the contract and provide managers with an overview of their new role.

2. SPC Internal Consultants

A group of 25 people assigned from the various shops and department will receive in-depth training in statistical methods. They will be taught to apply these methods to projects within the particular shop or department where they are employed. These "internal consultants" will work with their management and project teams on improvement projects; moreover, they will become a resource in the shipyard to draw from in the application of SPC. The training they receive includes a minimum of one week in the classroom followed by several weeks of applying the SPC tools and techniques to real Shop/ Department projects.

3. Project Teams

Problem solving, team building, and SPC training will be provided for selected improvement projects. Upon completion of the training, the teams will work with the internal consultants, their Department Managers, and the Consultants in applying the skills and techniques to specific problem areas. This training covers five days and is followed by the team meeting four hours a week to work on their project.

4. Facilitation and Consultation

Continuous full-time facilitation on the application of the Deming principles, problem solving techniques, and statistical methods is required throughout the one year contract period. The consultant will work with top management, the Steering Committee, Department and Office Heads, the internal consultants, and the project teams. This hands-on application phase is a critical step for managers to internalize all aspects of the Deming Philosophy.

RESULTS AND EXAMPLES

Pearl Harbor's progress will be assessed in two areas: (1) reduction in cost of SSN 688 Class overhauls, and (2) implementation of a process management system.

SSN 688 Class Overhaul Costs

Pearl Harbor has completed two SSN 688 Class overhauls, has two currently in progress, and has two more planned for the future. Manday expenditures exceed those of other overhauling activities by the percent shown below:

SSN 688 Class Overhauls	Manday Expenditures in Excess of Other Shipyards (percent)
First (1984)	25%
Second (1985)	22%
Third (1986)	16%*
Fourth (1987)	11%*

* = Projected

The Shipyard is committed to reducing costs and the time to overhaul SSN 688 Class ships. Only by attacking the costly and time-consuming processes, project by project, and getting everyone involved can the shipyard achieve its goal. As shown by the figures above, the shipyard is making progress and still has a long way to go.

Significant Improvement Projects

Pearl Harbor's strategy on specific high cost SSN 688 Class processes is to:

(1) Identify high cost job orders by comparing our costs with the NAVSEA Cost Estimating Standard (CES) and those of other shipyards.

(2) When appropriate, break down the costs of the large complex processes into smaller segments to determine where the higher costs are originating.

(3) Assign a project team of managers close to the process to streamline it and eliminate the excess fat.

The above approach is best exemplified by the Special Hull Treatment process. The shipyard has recently completed its first of six scheduled ships. Cost figures are significantly less than original estimates, and below all other activities involved in this process. At the 70% completion stage, the second ship cost indicators suggest further significant reductions in total cost. Pearl Harbor has set an example for this process in the ship repair and overhaul industry.

Reasons for this success include:

(1) The work was packaged into nine zones that allowed accurate tracking of costs. Accurate and honest charging was achieved; this allowed the process to be controlled.

(2) A project team was established early on to improve this process. The process was flow-charted extensively to better understand how the process worked and determine where improvements could be made. Improvement actions have been implemented and significant cost reductions have been documented.

(3) People close to the process have created an on-going process improvement attitude that has developed a pride that fosters continuous improvement.

The examples below are SSN 688 Class processes that have been identified and had project teams assigned. For those that have implemented at least one improvement action, cost reductions of 10 to 100% have been documented. Taking all improvement projects into account, approximately $15 million in actual savings and $30 million in cost-avoidance have been recorded. Further cost reductions are anticipated on these processes on future ship overhauls as the shipyard maintains its commitment to continuous improvement. Eventually, problem prevention and continuous improvement will become a way of work life for all employees.

Example Project Job Order Titles

Design Services
Design Support
Fire Watch Services
Certification
Built-in Tanks
Air Conditioning
Hatches
Propulsion Lube Oil Flush
Lighting
Ship's Service Motor Generator
Oxygen System

The above projects are only a sample of the 100 to 120 improvement projects currently in progress at the shipyard.

Implementation of a Total Quality Management

The goal is to actively involve all employees in the continual pursuit of quality improvement in shipyard processes. This new management style is modeling by the Shipyard Commander and the Steering Committee downward into each Department and Shop. In the same way, the Department Head meets weekly with senior Department Managers to identify and work on quality problems under their responsibility. Problems are defined, prioritized, quantified, and flow charted. Data is collected, analyzed, and decisions are made based on facts. Causes are identified, verified, and corrective action is implemented. To ensure that the actions are implemented to their satisfaction, tracking and monitoring is initiated. Further, data is collected to ensure that improvement in the process actually occurred and that gains are held. This Departmental Management Team becomes the example and steering arm for process management to evolve downward into the middle management level. As other managers and employees see top management actively participating, and as this evolutional process continues, the entire workforce will eventually become involved and committed to continuous involvement and thereby ensure the ultimate success of the shipyard.

To date, the Steering Committee and the Process Review Board are the two driving forces molding the Process Management System in the Shipyard. Shops and Departments review their improvement projects before they are presented to the Process Review Board. Not all Department Heads and Senior Managers meet on a weekly basis. Middle management participation is still fragmented at this stage of development, and it includes involvement on interdepartmental and department projects. The current number of 100 to 120 improvement projects represents involvement of about 10-12% of shipyard employees. As yet, no concerted effort has been initiated at the workforce level. Once all managers have been trained and are actively involved, then the workforce will be addressed. Currently, 600 of the 800 shipyard managers have attended the three day basic introduction.

Areas for Improvement

As the shipyard takes advantage of the outside consultants' expertise, the following areas will be addressed in greater detail:

(1) Statistical Methods. The internal consultants will learn statistical methods in depth and begin to apply them in their shop or department.

(2) Union. The relationship between management and the union is seen as adversarial and requires considerable improvement. Steering Committee members have been appointed to discuss union concerns with anticipated changes resulting from policy to proceed with the program. It will require the union be kept well informed regarding process improvement changes that affect the workforce. Several union officers have attended the training program and have expressed agreement with the direction.

(3) Deming Principles. The Steering Committee plans to establish subcommittees to address the 14 points in detail. In particular, hard spots will be identified as they relate to the rules and regulations that exist in the Federal and Navy systems.

(4) Constancy of Purpose. In order to prevent the constancy of purpose from being jeopardized by the eventual reassignment of the Shipyard Commander in the summer of 1988, it is critical for the Steering Committee to ensure that the program survives the transitional nature of military managers at the shipyard.

CONCLUSION

People close to the implementation process inside the Shipyard see the effort moving forward very slowly; authoritative sources outside the shipyard believe the shipyard is moving too quickly. 1987-88 will be a major thrust forward as the outside consultant will be assisting the shipyard full time. Top management will tackle the 14 points in detail, and the 25 "internal

consultants" managers trained in SPC will apply statistical methods in their departments. In addition, new project teams will be formed and trained by the consultant. Therefore, the expectation at this time is through the combined efforts of all these groups. the pacing between theory and practice will become more balanced.

There is no turning back. Pearl Harbor Naval Shipyard must reduce costs and be competitive to stay in business. A new management style is evolving, but not until future cost indicators are evaluated and full employee participation is realized will the extent of the success of the effort be known.

ADDITIONAL RESOURCES

Video Cassettes (Rental/Purchase)

University of Michigan
Transportation Research Institute
2901 Baxter Road
Ann Arbor, MI 48109

ATTN: AVMAST Library Coordinator
Phone: (313) 763-2465

ED18 Statistical Techniques for Quality and Productivity in the Shipbuilding Industry (Session 1)

ED19 Statistical Techniques for Quality and Productivity in the Shipbuilding Industry (Session 2)

ED20 Statistical Techniques for Quality and Productivity in the Shipbuilding Industry (Session 3)

ED21 Statistical Techniques for Quality and Productivity in the Shipbuilding Industry (Session 4)

ED22 Dimensional Accuracy Control and Statistical Methods

DE2 A Call to Arms by William Conway

DE3 Why Productivity Increases as Quality Improves

DE4 The 14 Steps Management Must Take, Part I

DE5 The 14 Steps Management Must Take, Part II: Obstacles to Success, I

DE6 Obstacles to Success, II

DE7 Uses of Control Charts

DE8 Discovery and Correction of Faults of the System, Part I

DE9 Discovery and Correction of Faults of the System, Part II

DE10 New Principles of Training and Supervision (I)

DE11 New Principles of Training and Supervision (II)

DE12 Quality and the Consumer Inspection of Incoming Materials and Products, I

DE13 Inspection of Incoming Materials and Products, II

DE14 Quality and Productivity in Service Organizations

DE15 Operational Definitions, Conformance, and Performances

DE16 Dr. Deming Discusses Quality and Productivity with Dr. Myron Tribus

DE17 William Conway, President, Relates the Nashua Corporation's Experience

DE18 Action Plans for Implementing Quality and Productivity (Part 1)

DE19 Action Plans for Implementing Quality and Productivity (Part 2)

DE20 Action Plans for Implementing Quality and Productivity (Part 3)

USN43 Quality Circle/A Time for People Building and Management Support

Other Available Videotapes

American Supplier Institute, Inc. (Producer) Continuous Improvement. Romulus, MI: Producer - (1983)

Center for Advanced Engineering Study, MIT (Producer) Action Plans for Implementing Quality and Productivity. Cambridge, MA: Producer - (1984)

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