

MAINTENANCE INTEGRATION AT THE WASTE ISOLATION PILOT PLANT (WIPP)

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ABSTRACT

Westinghouse Electric Company's Waste Isolation Division (WID) has implemented a Maintenance Integration Program to reduce costs, increase productivity, ensure operational responsiveness, and fortify a strong safety culture in its maintenance activities at the Department of Energy's (DOE) Waste Isolation Pilot Plant (WIPP). Worker involvement at the ground level contributed significantly to the success of this integration effort. Chosen to be part of a pilot program, workers from various disciplines came together to form an organizationally diverse group known as the Zone 3 (Surface Electrical) Integration Team. The purpose of the Zone 3 Integration Team was, "to provide an environment that (would) seek to continuously improve worker safety and productivity in all phases of work planning and the execution of fieldwork. This (was) achieved through the involvement, ownership, creativity, and teamwork of the Zone 3 Integration Team and the support of all WIPP site personnel."

And, as a result of this integration, facility/equipment operability and safety were significantly enhanced. Annual cost avoidance, currently at \$792,000.00, is estimated to exceed \$1 million in FY2000.

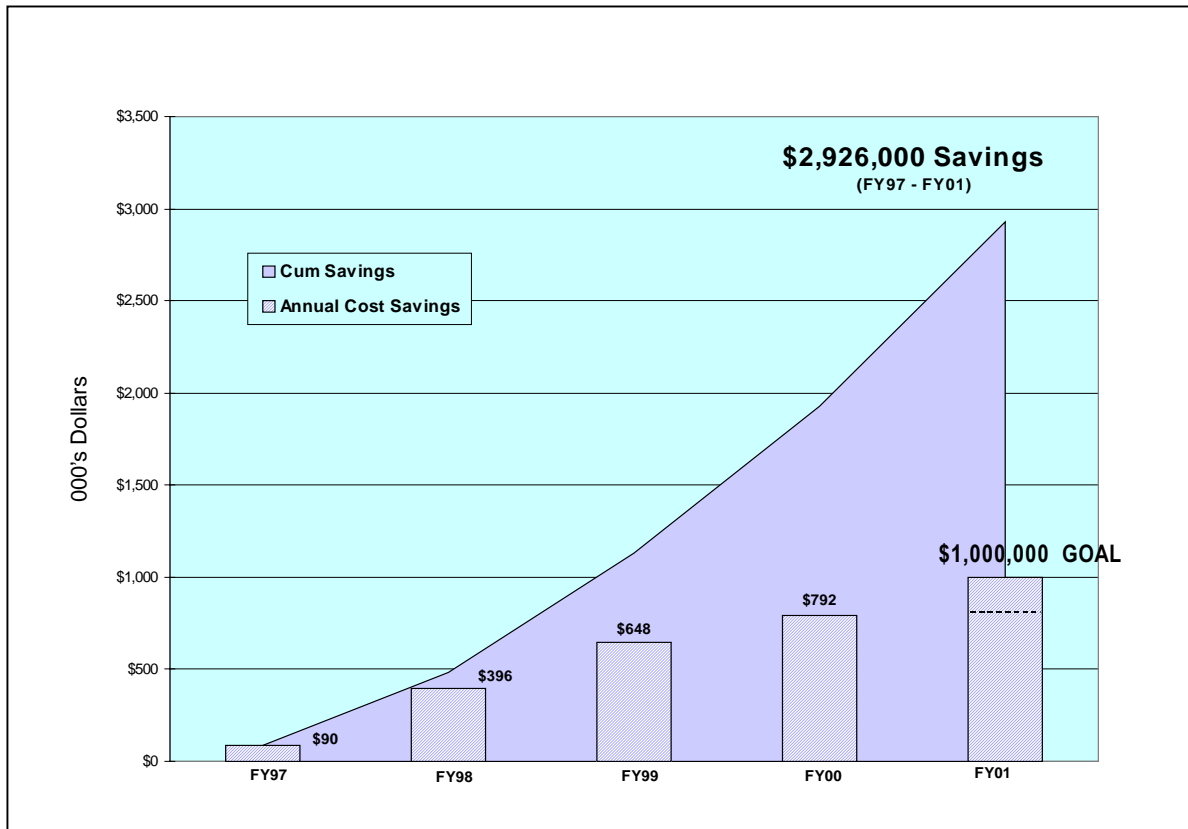
The maintenance integration program was conceived on the premise that all resources necessary to plan and execute facility maintenance safely and efficiently must live and work together under one management team. A strong commitment by senior management helped members of the Zone 3 Integration Team clear the hurdles they inevitably had to jump. This paper describes the establishment, evolution and results of Westinghouse's Maintenance Integration Program – the objectives, schedule, obstacles and results will be presented. Discussions include the evolution of the Maintenance Operations' organizational structure, user-friendly procedures, and various worker-driven productivity initiatives. Actual in-the-field performance measurement tools are presented and discussed from the workers' perspective. The less tangible benefits that were realized by the program and how these influence operational safety are also illustrated.

Westinghouse Electric Company, through its Waste Isolation Division, is the management and operations contractor for the DOE Carlsbad Area Office's (DOE/CAO) Waste Isolation Pilot Plant, located approximately 30 miles southeast of Carlsbad, New Mexico.

Today, the WID organization is poised to continue improving its processes and maintain a focus on personnel safety while supporting the critical DOE/CAO mission. The DOE/CAO mission is "to protect human health and the environment by opening and operating the Waste Isolation Pilot Plant for the safe disposal of transuranic waste by establishing an effective system for the management of transuranic waste from generation to disposal".

Table I demonstrates the annual and cumulative cost savings attributed to the WID Maintenance Integration Program at WIPP.

Table I: WID Maintenance Integration Program Savings – Annual and Cumulative



INTRODUCTION

The Maintenance Integration Program has been a proactive approach to address the organizational change that was defined to be necessary to transition the WIPP from a research and development facility to an operational facility. The WID organization has demonstrated its ability to ready itself for the receipt and emplacement of contact-handled transuranic (TRU) waste while concurrently mining additional storage space to ensure facility capacity to meet TRU waste shipment schedules. The WIPP is operational in both these modes today.

The Maintenance Integration Program was chartered in July 1997 to lay the groundwork for the organizational changes that would be necessary for the facility to be operational as a cost effective and operationally responsive facility. Earlier that year, an internal line-management assessment identified areas within maintenance and work management that required improvements in the generation of work packages that were necessary to effectively perform fieldwork. The results of this internal assessment precipitated the subsequent actions taken to address this finding.

Upon closer evaluation, it was recognized that the existing organizational structure of WID's Maintenance Operations, effectively designed for its mission at the time, was not designed to support concurrent Waste Management and Mining activities and that substantial organizational changes would be necessary to support such day-to-day operations. When operational, it would be necessary for the entire WID organization to focus-on and be responsive to operational needs rather than previously required engineering needs and studies. Today, the WID organization has demonstrated its ability to

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change, to be responsive to operational needs, and to shift emphasis from research and development to an operational waste storage and mining facility. And, although still expanding, the Integration Program has reduced the maintenance budget by ~\$800,000 annually, has continued to standardize work processes and programs and has enhanced the overall cultural awareness of personnel and personal safety.

The culture of both the management team and workers needed to change significantly to support the concept of a worker-level team that was to challenge the established and successful processes in place. In July 1997, a Maintenance Integration Pilot Program was chartered. The foundation of the pilot program was to be established on these elements:

- Integrate and co-locate an organizationally diverse team needed to plan and execute facility maintenance autonomously.
- Establish a single line of management authority and responsibility for this team.
- Enable the team to challenge the bureaucratic ways facility maintenance is planned and executed.
- Implement the core functions and the guiding principles of the DOE's Integrated Safety Management System and Enhanced Work Planning programs.

IN THE BEGINNING

The kick-off of the Integration Program was marked with the selection of an organizationally diverse group of 20 workers from various disciplines who were assembled and became known as the Zone 3 Integration Team. The team was comprised of representatives of Engineering, Industrial Safety, Quality Assurance, Operations, Work Management, and Maintenance Craft personnel. The purpose of the Zone 3 Integration Team was, "to provide an environment that will seek to continuously improve worker safety and productivity in all phases of work planning and the execution of fieldwork."

After predictable confusion and several false starts, it was evident that the team itself was not functioning beyond its day-to-day responsibilities of getting maintenance done, although a substantial level of effort was being put into the program. This was a problem in that the acknowledged charter was to improve performance and enhance personnel safety as well as achieve its core responsibilities of planning and executing facility maintenance. After 3 months, worker frustration and limited tangible results were threatening the functionality of the team. Intervention was required to understand why the program was showing signs of failure so prematurely.

With assistance from an independent management consultant, the team was able to identify the problem areas, work through the related issues and re-start the program with renewed enthusiasm. Inability of the team to function as change agents and an autonomous team, due to lack of experience in such an environment, precipitated much of the problem. With professional support in organizational development techniques and team building, the team was able to establish a self-defined mission statement, improve communications both vertically and horizontally, and secure clear and unilateral support from senior management. Ultimately, the team did develop a strong sense of autonomy and authority that proved to be essential in accomplishing the challenges it was to face in order to achieve its objectives.

Shortly after the Zone 3 Integration Team was formed in July 1997, the team identified several areas of opportunity, known as "initiatives," where process improvements could be (and needed to be) realized. Several initiatives had been taken-on and accomplished by a variety of subgroups within the Zone 3 Integration Team and have included, as necessary, other WID organizations. These initiatives included design and implementation of Personal-Locking-Devices, reduction of Measurement and Test Equipment, streamlining administrative and technical procedures, weekly worker-level meetings, enhanced schedule

practices, etc. One initiative identified by craft personnel as an opportunity that, although not easy to achieve, would yield significant benefits was the Skill-of-the-Craft (SOC) initiative.

SKILL-OF-CRAFT WORK PROCESS

The SOC work process developed by the Zone 3 Integration Team broke ground on a new way of performing low risk, routine maintenance tasks by confidently applying competent craft skills and eliminating low value-added administrative controls. An estimated 32% of the corrective maintenance work packages completed in the previous fiscal year (FY 1996) would have been considered SOC type work, as defined today. The new SOC process resulted in improved work flow and resource utilization, as well as enhanced personnel safety and quality of work. Formal corrective maintenance work packages, that would have reasonably taken hours if not days to assemble and obtain the required review and approval were reduced to minutes – the time required to type the information into the computer.

In addition to successfully addressing this complex process improvement, the Zone 3 team concurrently addressed other initiatives while developing the SOC process. These initiatives eliminated the practice of bringing procedures to the field for completing low risk routine maintenance tasks and providing a way to easily document even the simplest maintenance task.

The Zone 3 Integration Team-Leader championed the SOC initiative. He accomplished this through a series of individual and group meetings with representatives of the Zone 3 Integration Team and compiling the information into what was later adopted as the Zone 3 SOC work process. During this time the team received and reviewed SOC program documentation from other DOE sites and discussed with site representatives the advantages and disadvantages based on experience with their SOC programs. The approach capitalized on the experiences of other DOE sites, input from the Zone 3 team members, and worked within WID policies and procedures. And, a specific “task list” was developed that listed the type of maintenance activity that was eligible for use of the SOC work process.

Cornerstone to the Zone 3 SOC process was the ability for the craft manager to confidently assign qualified craft personnel to specified SOC task list assignments. This confidence was assured through a “justification matrix” implemented and a Job-Hazard-Analysis performed for each craft and SOC task, respectively. The justification matrix links craft qualifications and training through the site Systematic Approach to Training (SAT) program to each item on the SOC task list. An assessment of craft skills and training required to perform each SOC task item is cross-referenced to the associated SAT training records to assure competence. The craft manager is then responsible to ensure that the craft are qualified to perform each SOC task prior to assignment of that task to be performed.

Within 10 months, the Zone 3 Integration Program demonstrated substantial performance improvements in addition to a 25% increase in productivity and zero OSHA recordable accidents or injuries. The program was then rolled-out to three additional zones (Zones 2, 4, and 5) which comprised the balance of Surface Maintenance Operations. Eight months later the Integration Program incorporated Underground Maintenance Operations (Zone 1), closing the door on the last independently operating maintenance organization at the WIPP site. With each phase of the Integration Program (pilot program, expansion to all Surface Maintenance, and incorporation of Underground Maintenance), appropriate support personnel were re-aligned to ensure that the right number of safety, quality, engineering and maintenance personnel were assigned to their respective areas (zones) of responsibility.

THE RESULTS OF THE PILOT PROGRAM

By the end of February 1998, quantitative performance results attributed to the Zone 3 Pilot Program, and more specifically to the Zone 3 Integration Team’s efforts, substantiated the expansion of the Integration

Program to all of Surface Maintenance Operations. The results of the Zone Integration Pilot Program in Zone 3 are summarized in Table II, below:

Table II: Results of the Zone Integration Pilot Program in Zone 3

- No OSHA recordable accidents or injuries
- Improvements in key maintenance performance areas:
 - Increased Schedule Performance to ~85% from ~35%
 - Reduced Work Suspensions from ~40% to routinely < 5%
 - Reduce Work Emerged onto Schedule from ~40% to routinely <5%
- Improved facility condition measured by:
 - Reduced the Out-of-Commission equipment list to '0' for 11 consecutive weeks
 - Improved Field-Work-Completion activity by 500%
 - Reduced the Corrective Maintenance Backlog by 42%
 - Reduced Modification Backlog by 48%
- 25% improvement in productivity – reduced 5 full-time positions through attrition

EXPANSION OF INTEGRATION

The positive results of the pilot program led to the expansion of the integration program to all maintenance operations. This expansion occurred in phases between May 1998 and February 1999. Just 19 months since inception of the Pilot Program, all zones were united under one Maintenance Program. The integration of necessary resources was an essential element. Personnel safety, productivity, and continuous process improvement were an integral part of the new maintenance vision.

With the growth of WID Maintenance Operations, the management team was feeling its own growing pains. New managers were assigned, re-assigned and grouped with people they were not accustomed to managing. Based on the experience of the startup of the Zone 3 Pilot Program, the Maintenance Manager conducted many one-on-one interviews with his expanded management team members to assure that they understood the history of the integration program, as well as the need for it and its' effectiveness. As a result, an all managers off-site meeting was planned to openly discuss the needs, concerns, and ideas of the management team. As a result of that off-site meeting, a new maintenance vision was born, “(to) increase our value to the customer by SAFELY reducing the cost of maintenance.” The management team went on to describe what the organization would look like or behave like if the vision were a reality – what attributes would a maintenance organization have if it were able to provide “...value to the customer by SAFELY reducing the cost of maintenance.” These attributes are referred to as complex goals. A complex goal is a multi-faceted goal that would have to be attained if the organization were to make their vision a reality. Six complex goals were defined, and each would require the successful completion of numerous discrete goals in order to achieve the individual complex goal. The defined goals are Autonomy, Productivity, Standardization, Team Building, Communication, and Safety-Development-Well Being of the workers.

These complex goals were later discussed with the workers who subsequently participated in the identification of needed enhancements that would contribute toward various complex goals. The enhancements or discrete goals (referred to as initiatives) would need to be successfully completed in

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order to achieve the complex goals. The workers were actively involved in the successful achievement of these initiatives. Some of these initiatives include:

- Make administrative procedures user friendly
- Implement electronic control of technical and administrative procedures
- Implement a new computerized maintenance management system
- Develop and implement working level performance indicators
- Cross-trained engineers to accommodate shifts in workload
- Close the gap on 100% CAD drawing utilization
- Development of electronic standardized work instructions
- Centralized scheduling
- Reviewing preventative maintenance procedures for effectiveness
- Improved work-in-progress statusing

The management team came away from the off-site meeting with a new understanding of what the integration program was all about and what its part would be in the continued growth of the program. The vision statement was something that this team developed and embraced and could take to their people with renewed pride and understanding. They themselves became the beacons of the Integration Program.

The management team improved its span-of-control from 8:1 to more than 11:1, with a goal this year of 12:1. Organizational change within Maintenance Operations means taking a deeper look inside each organization in FY2000 and making decisions, even tough decisions, that are for the benefit of the overall work-group, not just a few. Today, the line managers have their own weekly meeting where they discuss not what took place last week but what needs to take place in six weeks or six months to continually improve the work place and to continually strive to achieve the Maintenance Operations Vision. Management Leadership training is enhancing the ability of these maintenance managers take this organization to performance levels not previously possible.

CONCLUSION

The positive results of the pilot program led to the expansion of the integration program to all maintenance operations. This expansion occurred in phases between May 1998 and February 1999. By February 1999 (only 19 months since the inception of the Integration Pilot Program) all maintenance zones were incorporated and productivity, reduction in maintenance costs, and personnel safety were an integral part of the new maintenance vision. The new maintenance vision is, “(to) increase our value to the customer by SAFELY reducing the cost of maintenance.” Accomplishments attributed to the Integration Program (July 1997 through July 1999) include:

- Increased schedule performance to ~85% across maintenance
- 29% reduction in Corrective Maintenance backlog (total for all zones)
- Reduced staffing level by 12 full-time-equivalents

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- Reduced budget \$800,000.00 annually

The workforce continues to demonstrate an increasing sense of autonomy and ownership for their respective areas of maintenance responsibility and is actively contributing to continuous process improvement initiatives.

Personnel safety has been maintained and is in the forefront of every employee's mind. It is reinforced every day through truly integrated safety in the field. Weekly team 'tail-gate' safety meetings are opportunities to review lessons learned and to explore new areas of safety awareness with team members. Since the expansion of the Maintenance Integration Program, the 'tail gate' safety meeting is a common thread among the maintenance teams.

An excerpt from the DOE Voluntary Protection Program (DOE-VPP) re-evaluation team's report, dated September 1998, reads, "... (The) Re-evaluation team unanimously voted to recommend the Westinghouse WID at WIPP for continuation of (VPP) Star status." The report went on to say, "Westinghouse WIPP has continuously improved its hazard prevention and control by integrating the involved functions into (maintenance) teams. They have... successfully pilot tested implementing Integrated Safety Management practices, including Enhanced Work Planning techniques, into their Zone 3 (Electrical Maintenance), and have recently expanded these practices..."

With no adverse effects on safety, much progress in productivity, cost of facility maintenance, and quality of work life has been made in Maintenance Operations since the inception of the Integration Program. The goals for the current phase of integration implementation include the following:

- Increase productivity
- Standardize work practices
- Evolve autonomy (self-sufficient maintenance zones)
- Improve communication
- Foster team building
- Assure safety, development, and well being of all personnel

A great deal of organizational change has occurred in WID's Maintenance Operations as well as all of Operations since the chartering of the Integration Program. This change will continue to evolve to insure organizational emphasis on safety of the personnel, public and the environment, cost effective operations and operational responsiveness and will be driven by the workers and the management team over the next several years.

Today, several initiatives are underway that will contribute to WID's Maintenance Operations' continued progress towards its vision. The WID Maintenance Integration Program is a significant step in assuring site-wide standardization of work processes in the continued pursuit of optimizing organizational performance, the pursuit of cost-effective operation of the WIPP site, and assuring worker safety.