EFFECTIVE UTILIZATION OF MAINTENANCE STAFF IN DESIGN AND IMPLEMENTATION OF MAJOR PROJECT WORK

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OVERVIEW

The reorganization of Pickering Nuclear Division some 2 years ago resulted in the formation of the Projects and Modifications department. This department takes an integrated approach to manage all aspects of large projects at Pickering. The integration of Design, Drafting, Procurement, Construction and Operations functions into project teams represents a fundamental change to project management at Pickering.

The development of integrated teams has great potential for reducing both the time and cost associated with project implementation, while at the same time improving the quality, and maintainability of the commissioned in service project.

The Pickering Rehab organization 1989-1993, established to perform the rehab / retube of Units 3 and 4 had proven that a team environment will produce effective results. The outcome was astounding, critical categories such as Safety, Quality of Work, and Timeliness, had proven the team's effectiveness.

The integration of operations maintenance staff into the project work activities is still evolving, and has probably required the most adaptation to change for both the former Construction and Operations organizations. Maximizing the utilization of the maintenance staff in the design and implementation of major project work will prove to be a key to a long term operating success of these projects.

This paper will focus in on the effective usage of Maintenance staff in the design and implementation phases of major project work at Pickering, and on the benefits realized using this approach. It will be divided into 5 sections as indicated.

1. Past Project Shortfalls.
2. Benefits of the inclusion of Maintenance staff in the Calandria Vault Rehab Project.
3. Maintenance involvement in the Pickering 'A' Shutdown System Enhancement (SDSE) Project.
4. Challenges resulting from the inclusion of Maintenance staff project teams.
5. Summary

PAST PROJECT SHORTFALLS

In the past, installation and commissioning activities had notable delays. This some what due to the minimal maintenance involvement associated with the design, and implementation of the project work. With the majority of Commissioning activities occurring during scheduled Maintenance outages, the focus often was on getting it to work on time.

Design

Design rework was well beyond what would be deemed as 'acceptable'. In 1991, a review of the Instrumentation and Control wiring and drawings indicated that it was not unusual to have 20% of the wiring and drawings requiring rework, translating into

30% delay time to the preparation of the installation wiring packages. Though this affected the timing of receiving the wiring packages, the long term affects were that upon placing the project in service, maintenance staff were required to rely on a `flag' based drawing system.

Installation and Commissioning

Within a large functional maintenance organization there is ever changing assigned priorities, often specific project staffing would be dictated by the happenings of other non related work activities. Due to the size of the major projects at Pickering, this would translate into potential outage delays and cost over runs.

Installation and commissioning Workplans were often prepared without maintenance input. This resulted in the receipt of improperly reviewed work activities, and major delays during the critical outage window. Problems would arise during the execution of the work, and maintenance staff often in frustration would be placing jobs on hold, or according to their discretion would make interpretations and decisions in order to progress the work. In an environment where Procedural Compliance is a must, following the procedure would lend itself to workplan revisions, massive delays, or inappropriate maintenance non compliance.

Post Installation and Station Documentation Issues

Though the project was installed, commissioned, and placed in service, there was still a tremendous post installation work process. Due to pressing new assignments, and the lack of staff solely dedicated to the project, post installation work would often be lower on the priority scale. Budgets for design rework would be closed, maintenance procedures backlogged, design and operating manuals not updated. Ultimately a shift maintenance organization would be required to operate the system with inadequate training and documentation support.

BENEFITS OF THE INCLUSION OF MAINTENANCE STAFF IN THE CALANDRIA VAULT REHAB PROJECT

During the 1994 Unit 1 maintenance outage it became apparent that inspections and repairs on the Bio Shield Cooling and Ring Thermal Shield systems were required. Two Teams were setup. One team was assigned to the inspection project, A second team was established to perform the repairs. At the beginning of the outage it wasn't clear as to the extent of the repairs, however as inspections were completed it became quickly known that major repair was necessary.

As with all projects, a Work Assignment review was completed. The Construction Trades were assigned the fabrication of the tooling, and the station maintenance work groups were assigned the field execution. To be successful it required dedicated Mechanical Maintenance staff working within the former Construction project organization. This support began in the initial design stage and followed through to the completion of the work activities.

Tooling Development

Due to outage related time constraints, the tooling design, fabrication, tool proving and mock-up training processes were required to proceed within a very tight time schedule. To the credit of the Project and Design Engineers, Trades and Maintenance staff, a solid team approach was put forth. Maintenance input into changes resulting from the tool proving and mock-ups were incorporated by design and fabricated by the trades. This sequence of activities carried on until it was clear the tooling that had been developed would perform the tasks required.

Outage Execution

The execution of the field work activities had been assigned to the station maintenance groups. However due to staffing constraints, the Purchase Services Agreement was utilized and, Construction Trades staff made up the staff shortfall. The team work approach that was established in the tool design and fabrication, carried right on into the execution of the work.

Now with 2 units repaired, all projected completion dates for the inspections and repairs were met, with most targets completed earlier, and on budget. The early assignment of dedicated maintenance staff, and development of an integrated team was one of the major contributing factors to this project's success.

It is clear that this project set a new standard by which integrated engineering, maintenance, and trades groups, should follow. It proved to be one of the major success stories at Pickering in 1994 and 95.

MAINTENANCE INVOLVEMENT IN THE PICKERING `A' SHUTDOWN SYSTEM ENHANCEMENT (SDSE) PROJECT

The Shutdown System Enhancement (SDSE) project, is a 107 M$ Project, that will improve the shutdown system reliability of Pickering NGS A. The project organization is made up of 7 project teams, the effectiveness of the SDSE teams will dramatically impact on the 1995 through 1998 Maintenance outage schedules, and ultimate licensing of the units.

A Maintenance Supervisor has been assigned to the project to ensure that maximum input is received at each of the design, installation, commissioning, operational stages. Below is a list of some initiatives that have been put in place, that will clearly improve the product to which will be maintained.

1. Each project team conducts both a design and constructability review meeting prior to the issuance of the initial ECN drawing package release. Through these meetings design issues are being discussed which leads to a reduction of design rework.
2. There will be direct involvement by the functional maintenance organization on the writing / review of procedures and manuals, and the training of station staff. This will be occurring in advance of the start up of the first commissioned unit. The intent being that once commissioned, station operating staff will have the training, procedures, and parts available to maintain the systems.
3. All maintenance related installation / commissioning workplans will be reviewed by the work group prior. The work will not commence unless prior review and assessment has been completed.
4. A tracking system has been established to ensure that all associated documents and procedures required to complete the work are available and returned upon completion for processing. This tracking process also will cover maintenance procedure production, release of drawings and wiring to the maintenance staff.
5. The maintenance work activities will be listed on a separate work program schedule than that of the functional group, work will be performed by a dedicated trained crew of maintenance staff assigned to the SDSE project. This will provide for control over the execution of the work. All Safety, Quality Assurance, and Work Quality issues will be followed to the standards set by the project.
6. Though the tie-ins and commissioning will be completed by a specialty crew, it is imperative that the crew include persons from the shift maintenance organization. The commissioning experience will aid them when they return to their respective shift crews, and are required to perform maintenance functions on the in service equipment.

CHALLENGES RESULTING FROM THE ADDITION OF MAINTENANCE STAFF IN PROJECT TEAMS

As with each new initiative, some aspects of implementation can easily and directly be accomplished, while yet others have difficulties that require extensive longer term efforts to implement.

Maintenance Staffing

Determining and obtaining maintenance project staffing requirements has been a laborious process. It is much easier with construction trades staff based on the hiring of external persons. With maintenance staff however, rapid deployment / redeployment is very difficult. Tremendous efforts by the functional organization has been required to accommodate pre approved vacation and training schedules, and in obtaining staff from other business units. Through this process it is difficult to develop a dedicated and motivated team environment.

To Address this issue, the projects are required to set forth clear quarterly and yearly staffing requirements. The functional maintenance organization in turn will be committed to having the persons assigned. Similar to a contract basis. Reactor projects has taken it a step further by identifying a base of full time assigned persons and peak short term requirements.

Functional Versus Project Supervision

There are clear safety and performance targets built into each project, however there is still a 'grey' area over whom from a supervision area is ultimately responsible. The Team leader or the functional supervisor. There has be frustration felt by both groups on this issue. The project team has noted that it has not had the specific empowerment needed to execute the work, while the functional supervision's concern is on loosing control of the happenings of their staff. Presently a clear definition of project versus functional roles and responsibilities is being mutually drawn up. Some responsibilities are undoubtedly specific, while others are shared. The specific roles and responsibilities in all aspects must be clearly defined and agreed to by both sections.

Inclusion of Maintenance staff into a Construction Project Environment

There has been growing pains with both the Construction trades and Maintenance sections, with the physical integration on teams. For the trades, it is very different having maintenance staff set up and utilizing their shop areas. For the maintenance staff much concern is expressed on being removed from the main station maintenance organization.

Strides in developing the team environment have proven to be successful. Management being sensitive to this issue, has involved and utilized the stewards to address membership concerns.

SUMMARY

"World industrial and Hydro experience has demonstrated that motivated teams committed to a common objective deliver the highest quality products in the safest, most cost effective and efficient fashion. Projects and Mods will foster and utilize the team concept where appropriate to the greatest extent possible." [1]

Projects and Mods responsibility cannot be limited to just the design, installation and commissioning of projects. To provide an effective 'Turnkey' environment to the persons who will be operating the systems, it is crucial to have operating maintenance involvement right from the design stage through to the operating mode. One of the project indicators of success will be the:

Customer Confidence on Maintainability of Equipment and Systems.

Providing quality of design, workmanship, procedures, and training will build the necessary confidence in our customer, the operating station. Effectively utilizing maintenance staff will be a major step in achieving this.

[1] Operating Policy of Projects and Mods Department Organization *P-SRP 3.27.*