SOLVING THE CHALLENGE OF "TOO MUCH WORK" ONE "THIN VERTICAL SLICE AT A TIME"

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The commercial nuclear power industry, including CANDU designs, is challenged with ever increasing pressures to accomplish more work with fewer resources. Aging plants, shrinking budgets, experienced personnel leaving the industry and an ever increasing required level of performance are all adding to this challenge.

The bright side to this challenge is that industry performance has been outstanding. By most accounts performance of the commercial nuclear industry has never been better. According to the Nuclear Energy Institute (NEI), "Last year's performance was outstanding."

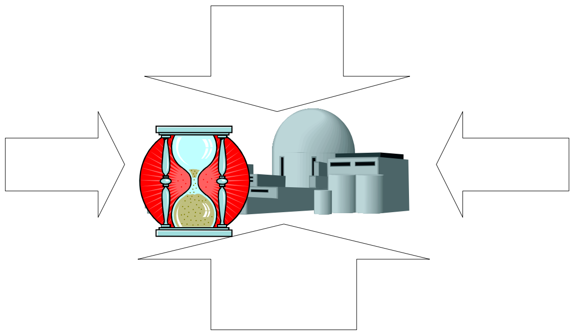
- The fleet operated at almost 92 percent, the highest capacity factor ever and a reflection of the effort utility personnel bring to plant management and operations.
- Output set an all-time record, over 800 billion kilowatt-hours – mostly the result of high capacity factors, but also due to more capacity available.
- High output obviously drives economic performance. NEI estimates production cost last year was $16.80 per megawatt-hour – cheaper than coal.
- New construction is proceeding. Nine applications filed with the Nuclear Regulatory Commission for construction/operating licenses, and between 7 and 11 more are expected before the end of the year. Two current designs have already certified by the NRC, and three are pending certification. Companies are ordering long long-lead components to support construction.

The dark side to this challenge is not just "too much work". The problem in ACA's view is that existing processes for identification and completion of work have become so complex that they are inefficient and ineffective. Experienced personnel that used to populate our industry could deal with these processes. The newer, less experienced personnel that did not grow up with these processes cannot.

Another significant contributor to this challenge of "too much work" at some plants is the under-investment in our assets. Efforts to cut costs have resulted in a long term under-investment in our assets, including people, plant, process, tools and data that have left us with a debt to be paid. Plant resources are being expended on operating and maintaining equipment that should have been replaced years ago. Critical equipment, that should never fail, is failing far too often. The emergent work caused by the failure of this critical equipment significantly impacts our plant organizations. Instead of working on preventing failures much of our time is spent reacting to what failed yesterday. The corrective action program is driving the use of our resources. We are challenged to "get ahead" of where we are today.

Pressures on Owners and Managers

The following graphic provides one view of the some of the pressures that tend to drive owners and managers of nuclear plants to do more with less, leading one to believe there is “too much work”:



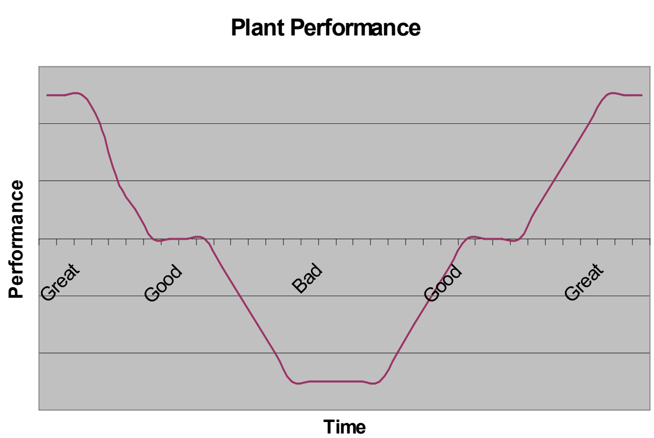
Impact of Complex Processes and Under-investment in our Assets

Complex processes and under-investment in assets could be contributing to the cyclic performance we see at many plants.

The best organizations are challenged with the inability to consistently maintain performance within the goals defined in their business plans.

Other organizations that are not performing as well are challenged with degraded performance that can result in reduced share holder value including reduced revenue, increased cost and increased regulatory oversight.

The following is a typical performance change graph that most plants have gone through, cycling from Great to Good to Bad and then back again.



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These complex processes and under-investment in assets have resulted in the following symptoms of a problem:

- Critical equipment is failing. By definition, critical equipment should never fail!
- Our primary customer (Operations) has lost confidence in our ability to complete work when we said we would.
- Some plants have developed multiple, complex work prioritization schemes because the simple "one priority" schemes did not result in work being completed on time. Instead of correcting the root cause they provided a band-aid.
- Plant personnel work hard to perform preventive maintenance within the assigned grace period, maintain backlogs of corrective, elective, modification and other types of work within goals set in their business plan. Some call it "Whack a Mole", establishing a special effort to improve one area while backlogs in other areas increase.
- The work control processes that plan, schedule and perform work are challenged to keep up with the corrective action program processes that identify and prioritize work. Work control and the corrective action program are two of the most important process at the plant. They are the "sharp end" of the equipment reliability and plant performance "stick". Evaluations to define the right work to be performed are of little value if that work cannot be properly performed.
- The work identification and performance processes result in "churn" or work that was scheduled and planned to be performed, but then taken out of the schedule.
- Standard project management processes of defined scope, schedule, budget and levels of quality are not rigorously applied to work performed during plant operations.

Solving this Problem of "Too Much Work" – Causes

To solve the problem of too much work one must first define the causes of the problem. There are many causes behind this challenge of inability to consistently and properly perform work. In ACA's view the primary causes are:

- There is no clear alignment of goals and priorities from the executive to the worker.
- Expectations of performance are not clearly defined.
- Personnel are not consistently held accountable.
- Feedback on performance is not provided. In many cases management and supervision are "too busy" to monitor performance and provide feedback. Feedback is always provided though after failures, when it is too late.
- There is little positive incentive or motivation to meet expectations of performance. There are always negative incentives, but few positive incentives.
- Skills and knowledge required to do the "job" are not assured before work is assigned. This includes physical work, such as overhaul of a pump and "desk work", such as analysis of a failure or developing or revising an equipment reliability strategy.
- Priorities change "overnight", faster than the organization has the capacity to keep up.

- There are too many lists of disparate things to do. These lists may have been prioritized, however they have not been resource loaded and compared against available resources.
- There are too many ways to prioritize work.
- Team personnel are left to their own devices to set priorities for assigned work. Management does not play an active role in this prioritization.
- Team personnel do not push back when available resources have been exceeded. They begin to miss commitments.
- New work, including new programs is "accepted" without consideration of the work that has already been defined.
- Work management, scope control and project management processes are not effective at defining and managing work. Work churns in and out of the schedule preventing any organization from knowing what work is really going to be performed wasting energy in the work control processes.
- Organizations are not "change ready". The ability to change is not treated as a core value requiring the infrastructure necessary to support that change.
- Previous under-investment in the assets (people, equipment, processes, tools and data) and less than excellent decisions are driving performance down. This keeps organizations in a firefighting mode, taking away energy that could be spent in long term planning.
- Work priorities are improperly elevated to meet individual or emotional agendas.
- Performance indicators are not in place to identify symptoms of degradation in processes before failure occurs.

A significant cause is that in many cases we "correct" problems without taking the time to understand the root cause of the problem. We do not take the time to understand the failure mechanisms and causes of the problem when we apply the fix. This cause results in having to "re-fix" the same problem over and over again. Some call it repeat maintenance and apply it to equipment; however, this term repeat maintenance also applies to correcting problems in "desk work" and decision making processes as well as failures of equipment.

Solving this Problem of "Too Much Work" – Solution Options

The challenge for many plants is how to make it happen. Correcting these kinds of problems seems like solving world hunger. Being that everyone knows that one cannot easily solve world hunger, some do not start.

There are several solution options that could be applied.

One option could be a top down approach where executive management declares on time and proper performance of work as "the priority". Causes would be defined and a change management plan developed and implemented across the fleet or station. This would seem to be the best option. This option could be the shortest path to eliminating this problem of too much work.

Unfortunately, this option is not selected very often. Instead, other top down initiatives might be taken on, such as improve equipment reliability, improve the corrective action program, improve operations, reduce human performance errors, improve work control or improve maintenance.

Because they are often "siloed", meaning not integrated with other initiatives, these top down initiatives do not result in sustainable performance improvements and do not solve this problem of too much work.

Another challenge to this success of this top down approach is the organization's capacity for change. Many organizations are not "change ready" making any performance improvement difficult and having the potential for that change to not be sustainable.

Another option is the "Thin Vertical Slice". Within this approach a recognized problem is identified, the right team is developed and they solve the problem in a very short period of time. Then they go on to the next problem. When this team solves this problem they are careful to ensure they fully understand the problem and the root cause. Solution options are considered. The best option is selected and implemented. This team is responsible from problem statement to verification that the expectations of performance improvement have been met.

Thin Vertical Slice

The Thin Vertical Slice is not a new concept. Thin Vertical Slice includes elements of several other improvement approaches, such as GE Work-outs, Six-Sigma, Lean Manufacturing and Kaizen.

Thin Vertical Slice may be different in that it focuses specifically on a relatively small area of performance improvement and ensures that everything touched as part of that performance improvement is correct. The goal of Thin Vertical Slice is to ensure that areas improved do not have to be revisited again.

The real motivation behind the development of the Thin Vertical Slice approach is to improve an organizations capacity for change, one Thin Vertical Slice at a time. Each Thin Vertical Slice becomes easier to complete as the organizations capacity for change improves.

Thin Vertical Slice is based on tipping point change theory. The tipping point is the level at which the momentum for change becomes unstoppable. As more and more small changes are successfully completed the organization strengthens it's "change muscles" and can take on and successfully complete much larger change initiatives.

Thin Vertical Slice utilizes what worked in the last change and continues to use those successes to grow stronger. Those steps that did not work well are not used in the next Thin Vertical Slice. Thin Vertical Slice is based on measureable, return on investment, type results of performance improvement.

An Example

Resources at a petrochemical refinery were "fully employed" however critical instruments were a vulnerability because some had no preventive maintenance.

Thin Vertical Slice was applied to develop risk mitigation strategies for 5 critical process instruments. A small team was established. This team performed the steps of the Thin Vertical Slice to quickly identify performance improvement changes. The following are examples of changes identified:

- One low value routine duty, performed by Operations was eliminated.
- The frequency for five routine duties, performed by Operations was extended.
- The change process for preventive maintenance was documented. This process was used to implement new preventive maintenance activities.
- Five new preventive maintenance activities were established for critical instruments with no preventive maintenance.
- A revision to the work control process was developed to conduct monthly feedback meetings to review performance of instrumentation and control components.

Because Thin Vertical Slice is driven by measurable performance results the process did not stop at this point. The 5 preventive maintenance activities were performed with work site support of the engineering and planning personnel that participated in the development. A critique of the preventive maintenance was performed with the technicians that performed the preventive maintenance and supervisory, engineering and planning personnel. Improvements in the preventive maintenance and work plans were incorporated.

The critique identified the following types of benefits:

- The technicians were impressed with the number of examples of degradation found in the instruments that could have lead to failure. This degradation was resolved as part of the preventive maintenance.
- The technicians were very happy with the detailed work plans provided. They were accustomed to very generic work plans that did not exactly fit the equipment they were working on. They would have to "fill in the blanks" to know what work should be performed to complete the preventive maintenance.
- The preventive maintenance was performed in accordance with the agreed upon work plan instead of the technicians perception of what should be performed.

The Thin Vertical Slice approach was applied to the Preventive Maintenance Change Request (PMCR) process at a nuclear power plant. Autonamation, the ability to automatically detect a defect and stop the process to fix the defect before passing it on to the next process step, was applied to eliminate rework and low value activities. The following performance issues were quickly identified:

- A significant amount of rework was being caused by missing data on change requests.
- Little Maintenance feedback was being provided when preventive maintenance was performed. Feedback is required to modify preventive maintenance scope and frequency.
- There was little ownership. There were no clearly defined roles and responsibilities.
- There was no comment resolution process. Most issued were left to the Planner to resolve.
- There are many non-value added steps. Rework was taking days or weeks.
- PMCR's were sitting in the Planners queue waiting on data or comment resolution. Some PMCRs have been in the backlog for more than one year.
- A large backlog of PMCRs had developed due to the issues above.

This Thin Vertical Slice identified the following changes that will reduce from 30 to 17 the average number of days required to process a PMCR:

- Defined Roles & Responsibilities.
- Included additional detail and clarity in the PMCR procedure.
- Incorporated autonamation into the process.
- Modified the software application used for PMCRs to facilitate process steps.
- Recommend creation of a PMCR Task team within the PM program

These are simple to implement changes that will improve communications and make more time available for plant staff to pursue proactive performance improvements.

Steps

Each application of Thin Vertical Slice will be modified as necessary to fit the problem to be solved. Thin Vertical Slice introduces a flexibility that allows the user to apply those steps and actions that make sense to the problem to be solved and not use those that do not make sense.

The following is a summary of the normal steps of the Thin Vertical Slice process:

1. Define the problem to be solved. Generate a brief problem statement. Ensure this problem is of narrow enough scope that the problem can be solved in a very short period of time. Two weeks is a good guide.

2. Develop the team to solve the problem. This team should be small enough to act quickly and should include each stakeholder organization that contributes to or is a customer of the problem.

3. Conduct training for the team. The Thin Vertical Slice process is relatively simple, however this step ensures the team is aligned around the process and approach to be used for this problem.

4. Determine the root and contributing cause(s) for the problem.

5. Develop a set of actions that could be taken to eliminate the cause(s) for this problem.

6. Select the best actions to be taken.
7. Present the actions to management for approval.
8. Implement the approved actions.
9. Follow the actions to ensure expectations of performance improvements are met.
10. Celebrate successes. Improve the Thin Vertical Slice process to make it better for the next performance.

Conclusion

A reality is that there will always be more work to be performed than there are resources to complete that work.

Another reality is that many organizations are not as good at change (change ready) as they need to be.

Imagine the places your organization could go if you could "turn-on-a-dime" to implement performance improvements.

Thin Vertical Slice is one approach that has the potential to help your organization learn to become change ready while making significant performance improvements as you learn.

Someone once said that real change begins with a ripple, not a wave. Thin Vertical Slice starts those ripples.