Applying Lean Management to Aging Infrastructure – 15416

Rodney Blackmon, Bonnie Barnes
Savannah River Remediation, LLC

ABSTRACT

Currently the Savannah River Site liquid waste system consists of 51 waste tanks, two operating evaporators, a salt processing pilot plant, the DWPF vitrification facility, the Saltstone Processing Facility and an Effluent Treatment Plant. Six of the waste tanks have been grouted and closed and the full scale Salt Waste Processing Facility (SWPF) is under construction. Some of the waste tanks and associated infrastructure were placed into operation as early as 1954 and DWPF went into operation in 1996. Due to this long history of operation, the SRS liquid waste system is being challenged by aging infrastructure issues and the stored radioactive liquid waste has been identified by regulators as the highest environmental risk in the state.

Much of the DOE complex faces similar infrastructure issues. Remedies that can mitigate the impact of those issues are needed all across the complex. At SRS, Lean Management has been adopted as a business process to help address some of the impacts. Lean Management got its start decades ago in the manufacturing sector and has its roots in the work of W. Edwards Deming and his contemporaries. In more recent years the process has matured in the Toyota Production System and migrated into fields as diverse as services industries, healthcare, and now the DOE complex. Lean Management has a "secret sauce" that must be correct to avoid becoming the "flavor of the month". The easy part is the talking. The hard part is the doing. The payoff is in the doing.

Obviously as facilities and equipment age, more and more funds are needed to maintain, refurbish, and replace them. Funding of course is tight for all our sites. Lean management generates work efficiency so a given set of resources can produce more. It must be noted that this isn't by working harder but rather by focusing scarce resources on the few activities that truly add value. A positive aspect for companies that have been on this journey is employees feel less stress and higher motivation. The work they do matters and they have fewer outside impediments to distract and sap their energy.

SRR has used the Lean process to streamline both work planning and control and the supply chain to improve maintenance efficiency and reduce the Corrective Maintenance backlog. This paper explains how this was done, the challenges encountered, and how organizations can use this methodology for their own improvements.

INTRODUCTION

No doubt the term "Lean" means different things to different people and perhaps the most prevailing attitude is that lean is another one of those process improvement tools like Six Sigma,

TQM (Total Quality Management), and the like. For SRR, when we say lean, we are not limiting ourselves to the use of a given tool or even the toolbox of process improvement. We are fundamentally transforming the way we do business. We do that by respecting people and making improvements part of the job description. Our system builds on the partnering work done over the last four or five years with the Department of Energy and includes our state regulators.

We began our journey formally in the fall of 2013. Journey is a word commonly heard in business literature these days but it is not used lightly here. It has the connotation we've start but not arrived, which is very much the case. When you consider that Toyota has been working at this for over six decades, we have clearly just begun. The good news however is we have seen very positive results thus far and the promise of real breakthrough performance is being realized in localized applications. Like many companies in the waste business, we've use pieces and parts of lean tools for a long time. By creating a lean business system, we intend to integrate all the tools into a new way to work.

Our process has been built with the help of Simpler Consulting a firm dedicated to taking lean management from its manufacturing roots and applying the process in other industries. In particular Simpler provides our program with Sensei (Master Coaches) who have the experience and background to guide our transformation process. Both Savannah River and Hanford have significant efforts underway at this time. Other sites and laboratories are initiating efforts as well.

We call our version of the Simpler business process "Mission Excellence" noting the importance of both the job we've been called on to perform, as well as the concept that we must constantly strive for excellence in all we do. The process begins with an evaluation of the highest level mission. That evaluation is captured in the Transformation Plan of Care (TPOC). We carefully and with much thought and planning intend to transform how we work so we can create an environment where every employee enjoys their job, feels appreciated, and knows they are making a valuable contribution.

An output of the TPOC is a list of value streams where, as a company, we deliver the value the client has requested. These include the primary products (clean tanks, vitrified wasted) and supporting programs (safety basis, work planning, supply chain, etc). Value Stream Analyses (VSAs) are typically week long events where workers across a complete chain of activities come together and follow a disciplined process to evaluate how value is delivered. During the week, the team identifies areas where waste could be eliminated from the process, which leads to the next layer of our business systems, the rapid improvement events (RIEs).

RIEs focus on those parts of a process where VSA teams identified potential waste. The RIE teams come together to generate solutions that eliminate waste and streamline the process. The team is empowered to make immediate changes to the process. There are usually some follow-on tasks that can't be completed during the RIE week and these are tracked to closure with a rule of thumb to have all actions completed within 90 days.

In addition to the three levels of analysis listed above, a key element of our program is known as 6S

(sometimes called 5S in lean literature). This program builds work cells with the idea of work flow and efficiency in mind. All the tools, parts, and instructions needed to do a job are placed so the work flows one task at a time from start to finish. Good labeling and visual cues are used to ensure the task is completed the same efficient way every time. All extraneous material is removed from the work area.

DISCUSSION

The SRR TPOC identified two value streams that had broad impacts on our aging infrastructure and its maintenance. These value streams were Work Planning and Control (WP/C) and Supply Chain and they were the first events we scheduled for analysis and improvement. WP/C kicked off in January of 2014. Key roles were identified for the team and these included the Executive Sponsor who was the DWPF Project Director (a direct report to the SRR COO), the Process Owner (Manager of Work Planning), and a team leader (Work Planning Manager for our Tank Farms). Supply Chain had similar roles and levels of authority on its team as well.

The WP&C VSA process was broken down into small sections to keep scopes manageable. Those sections created Rapid Improvement Events (RIEs) for Prioritization, Scheduling, Planning, Execution and Visual Management (to enable us, at a glance, to determine if we were on track as we moved forward).

Issues:
SRR facilities and equipment are aging. Numerous key operating systems have far exceeded their functional life expectancy. With the acceleration of legacy waste clean-up across the DOE complex, modeling for High Level waste tank closure projected rapid closure of tanks as part of a risk mitigation strategy with the South Carolina Department of Health and Environmental Control (DHEC). This resulted in several years of a “run to failure” mindset at the site anticipating rapid tank closure. Several years of funding below previous projections, forced a change in execution strategy as infrastructure continued to age. Maintenance programs were rebaselined to maintain facility equipment to appropriate durations through maintenance optimization and adjusted preventive and predictive maintenance frequencies. Equipment reliability was on the decline. Corrective Maintenance backlog climbed to a high of 28 man-weeks. With funding levels challenged to maintain the facilities and maintenance attrition levels at an all-time high due to an aging workforce, senior management selected the Lean process as the way SRR would eliminate non-valued-added activities to improve project efficiency, leading to improved employee morale, and savings that can be redirected to fund capital improvements.

The primary objectives for transformation of the Work Planning and Control program at SRR is to improve WP&C efficiency with savings re-invested in additional projects to refurbish aging infrastructure. Savings were harvested through:

a. Elimination of non-value added actions from WP&C processes

b. Reengaging the workforce with a positive attitude by doing work that matters
c. Introduction of Standard Work to WP&C processes
d. Conversion of the planning process to a "Pull" system
e. Introduction of a Visual Management tool
f. Reduced WCD (Work Control Document) cycle time (trigger to done)

Results:

Each RIE led to the following improvements:

Prioritization RIE:

- Fix-It-Now (FIN) Team concept revamped, more work being performed as FIN with little to no planning required

  SRR FIN work was limited to very simple, routine tasks that could be completed as "skill of the craft" work with no planning required. The Lean event pointed out that since FIN work did not require planning resources and thereby could be completed quickly and with less involvement with other support groups, it made good business sense to perform as much work as FIN type work as was allowable. The FIN teams were then expanded to include the best and brightest mechanics and electricians with the goal to perform as much work as FIN as is allowable, thereby reducing the cost of work and working off the backlog at an accelerated rate. Since implementation, we have seen a consistent and steady work off of our CM/PM (Corrective maintenance/Preventive maintenance) backlog (20% reduction).

- Data collection procedure developed to expand potential FIN scope

  All work that required any inspection or signature was previously excluded from being performed as FIN. The data collection procedure provides a data sheet to expand the pool of work that can be performed without a planned work package.

- Thorough Corrective Maintenance and Planning backlog scrub to validate work order priority

  All facilities performed a comprehensive scrub of their backlogs to eliminate work orders for work scopes no longer needed, ensured priorities assigned were still valid, and scheduled activities that had gotten "lost" in the sea of backlog.

- Work Control Document Scoring (criteria/weighting) to provide additional granularity to the site prioritization process

  The prioritization process at SRR pre-RIE involved a cross-functional team screening new work and assigning priority with a program that includes 11 priority codes. With a backlog in excess of 2000 work orders, the project needed a method to provide additional granularity to the prioritization process to ensure work was being planned and executed in the right order at the right time to support project missions. The recommendations that came out of the prioritization Lean event resulted in a weighted scoring system where each new work request is scored against weighted criteria looking at factors including personal safety, Safety Basis implications, contract deliverables, process impacts, environmental compliance, radiological safety, conduct of operations impacts, Non-Conformance Report

and temporary modification impacts, process improvement/enhancements and system impacts. This scoring combined with assigned priority and need date for work performance allow the right work to be planned and executed at the right time.

Planning RIE:

- Reduction in non-value added paperwork in work packages
  The work package checklist was evaluated and only documents that are required to be included in the work package are included. Optional documents are referenced.
- Efficiency improvements to planning template
  The planning template was evaluated and pull down menus were reorganized for easier and more efficient access for planners.
- Validated "Approver" list
  The "Approver" list was validated against requirement documents to ensure no unnecessary approvals were being obtained during work package approval routing.
- Amended planner feedback requirements
  The mandate for 100% feedback for all work packages was removed. Feedback will continue to be monitored.
- Desktop Planning Guide
  A facility specific desktop planning guide was being used in one facility and is now being developed for the other project to ensure consistent implementation and reduce work package returns during the planning process.

Scheduling RIE:

- Formalized Change Control (Form)
  A new formal change control has been developed requiring justification and identification of impacts to the locked-in schedule with a facility management signature required to reduce schedule churn
- Rolling T-8/Optimum Performance Window Scheduling Process
  A revitalization of the T-8 scheduling process to load schedules and begin planning work 8 weeks out to facilitate task readiness and reduce locking in "at risk"
- Commitment to Task Readiness two weeks prior to lock-in
- Formal turnover of uncompleted Work Week activities
  Rigor applied to turnover between off-going and on-coming Work Window Manager to make sure the locked-in schedule is protected.

Execution RIE:

- Morning Meeting consolidation

Meeting consolidation will allow supervisors to get their crews more quickly in the mornings.

- Modified work prerequisite scheduling

  Formal identification of pre-requisites will allow work groups to start work with a clear understanding of what is required prior to the start of work.

- Increased rigor on pre-job briefing start times

  Delays in pre-job briefings waiting for all participant results in work delays

- Verification of task readiness before the start of work

  As part of the revitalization of the T-8 Week Rolling Scheduling process, earlier planning and scheduling will facilitate task readiness.

General Lean enhancement to the WP&C process:

- Standardized Work:

  Standardized work is a vital component of lean thinking. The concept is similar to the pre-flight checklist an airline pilot uses. The list is used every time no matter how experienced the pilot may be. In short standard work is the best know way to do a task. A group of experienced team members develop the standard work and that template is used every time by everyone doing a particular task. The job description of team members and leader becomes the same: a) do standard work (according to the standard work template) and b) improve standard work (taking improvements back through the team of implementation). SRR has developed the following standard work templates:

  - Enhanced Planner template
  - WCD Feedback
  - Planning checklist
  - WCD Approval checklists
  - Template for T-Week Scheduling Meetings

- Visual Management Tool

  This tool will enable everyone, at a glance, to evaluate scheduling effectiveness for the facilities and project. This tool is critical for the roll-out of the Lean process improvements to validate successful implementation.

Evaluation of Recommendations

As with any process change, the way to monitor the change and evaluate for success is through the development of performance indicators that tie back the element of the process being modified. To support the initiatives identified by applying the Lean process to work control, SRR WP&C developed and are monitoring the following indicators:

- FIN to New Work
- Work Package Returns

- Add-on Tasks
- Work Package Cycle Time
- Schedule Effectiveness (Including Add-ons and Emergent)
- Total Tasks Planned
- Schedule Consistency (T-4 and T-1 to T-0)
- Fast Track Tasks Planned

With few exceptions, indicators show that our efforts and continued diligence in maintaining the changed states are working. Trends are positive and have identified areas where enhanced focus is required. Action status and metrics are reviewed weekly by the WP&C Lean Steering committee and the Process Owner presents Actions, Status, and Countermeasures (where appropriate) to the Executive Steering Committee monthly.

CONCLUSIONS

While execution of our objectives is on-going, our trends indicate we are making progress. Based on estimated savings from applying the Lean process to our WP&C program as well as the other Lean efforts, SRR is driving to re-invest $20M per year into aging infrastructure and work acceleration.