

LEAN MANUFACTURING

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Introduction

Facing challenges is certainly not a new experience for the Army Materiel Command (AMC) workforce and its leaders. However, the current environment is one of unprecedented challenge. The requirements of a future workforce, the impact of high technology, the global war on international terrorism, Operation Iraqi Freedom, supporting Army transformation, and the evolving changes in our national culture all coalesce to present AMC with huge challenges. This new environment calls for new approaches and new ways of thinking about what we do and, in this, there is potential for great progress. Implementing "lean" practices should catapult AMC to the forefront of innovation and productivity in DOD and permanently establish the organic base as a vital and essential component in future industrial base strategies.

Tobyhanna Army Depot

Tobyhanna Army Depot (TYAD), PA, is DOD's largest facility for the repair, overhaul, test, design, and fabrication of communications-electronics systems and components. Throughout its 50-year history, TYAD has established a reputation for quality, productivity, and efficiency. Striving to ever improve that record of performance, TYAD is aggressively incorporating lean thinking into all aspects of depot operations. TYAD's initial efforts began in June 2002 with the establishment of a full-time Lean Core Team to lead implementation of lean concepts throughout the organization.

Value-stream analysis on the Sidewinder (AIM-9) guidance and control section overhaul line and the AN/TRC-170 communication system overhaul line marked the depot's first of many lean events. The Sidewinder is the primary air-to-air missile used by the Air Force, Navy, and many foreign military allies. The AN/TRC-170 is a critical piece of the tactical communications networks used by the Army, Air

Force, and Marine Corps. Both systems have shown improvements in materiel movement, flow days, and unit maintenance costs as a result of this analysis.

TYAD is also targeting industrial processes common to many of their value streams for lean improvement. These include large- and small-component refinishing operations that support most depot projects and numerous value streams. Lean efforts in these areas will improve every aspect of the depot's performance of its maintenance mission.

These activities are the prelude to TYAD's aggressive plan of action for the months ahead. TYAD will extend lean thinking to all operations to improve processes in every area of its communications-electronics mission. TYAD personnel are planning further lean events for a robust list of additional systems critical to warfighter readiness throughout the remainder of FY03.

TACOM's GSIE

The Army Tank-automotive and Armaments Command's (TACOM's) Ground Systems Industrial Enterprise (GSIE) is incorporating lean manufacturing in its daily operations. GSIE has five installations conducting lean activities: Red River Army Depot, TX; Anniston Army Depot, AL; Watervliet Arsenal, NY; Sierra Army Depot, CA; and Rock Island Arsenal, IL.

Red River Army Depot. The Red River Army Depot began implementing lean manufacturing in May 2002. In February 2003, the depot completed its first pass of lean implementation on the Heavy Expanded Mobility Tactical Truck (HEMTT) engine and the Small Emplacement Excavator (SEE) vehicle.

The HEMTT provides transport capabilities for resupply of combat vehicles and weapon systems. The SEE is an engineering vehicle designed to excavate below the ground surface on which the machine rests. The vehicle is fitted with a backhoe and a front-end loader.

Implementing lean concepts in both projects resulted in the reduction of travel time by placing parts, tools,

and technical data within reach of the individual (point of use) and a reduction in throughput time by implementing standard work and one-piece flow. In addition, SEE lean efforts reduced the parts inventory, which will allow future relocation of assembly-line support operations immediately adjacent to the assembly line and will lead to additional savings.

Lean implementation has begun on the Cummins 903 engine assembly operation used by both the Bradley Fighting Vehicle and the Multiple Launch Rocket System. The projected savings from lean implementation on the HEMTT and 903 engine lines is more than \$2 million. Personnel will accomplish these savings by converting batch engine assembly operations into assembly lines, resulting in fewer labor requirements to meet current demand.

Anniston Army Depot. Anniston Army Depot began in-house-supported lean manufacturing efforts in May 2002. These efforts were concentrated on the AVDS 1790 reciprocating engine process. Improvements to date include providing all parts necessary for engine assembly at point of use through kitting, instituting one-piece flow, eliminating non-value-added activities, and establishing several pull "supermarkets." Successes to date include reduced man-hour expenditures and improved on-time delivery.

In February 2003, the Anniston depot began initial efforts in the M1 Abrams main battle tank turbine engine process. After performing a value-stream analysis, the depot identified areas of opportunity for improvement and established aggressive goals to improve productivity and customer support.

Watervliet Arsenal. Watervliet Arsenal recently completed a lean project on the T-53 helicopter rotor component. The component is an aircraft engine turbo prop carrier-reduction piece that is used on various helicopters. Watervliet Arsenal has developed the process for reclaiming the five bores by chrome plating and grinding bore diameters to specified tolerances and locations. Depot personnel studied this process using lean principles. This led to the identification of manufacturing and tooling problems, which were subsequently resolved and resulted in a reduction in manufacturing time. Watervliet Arsenal's future lean projects include the 60mm barrel process re-engineering project. In addition, Watervliet Arsenal is anticipating benefits of

reductions in material handling and unit standard time.

Sierra Army Depot. Sierra Army Depot personnel began implementing lean efforts in January 2003. The depot's first lean project involves Class VIII medical supplies, storage, issues, and receipts. Presently, Class VIII medical is located approximately 9 miles from the main operations area, which is not conducive to normal workflow of operations. Sierra personnel plan to use lean efforts to relocate the program to a more efficient work area. Sierra's future lean efforts include long-term storage (medical hospitals) and central-receiving projects.

Rock Island Arsenal. Personnel at Rock Island recently completed their first lean manufacturing value-stream analysis on the Forward Repair System (FRS). Personnel use this system to repair battle-damaged heavy combat systems onsite. Rock Island Arsenal will implement lean tools to reduce direct and indirect labor resources, decrease floor space and tool load area, and improve the production process. The goal is to reduce delivery time from 10 months to 6 months by February 2004. Rock Island Arsenal has set an additional stretch goal of a further reduction in FRS delivery time to 3 months in 2005. The arsenal will start applying lean thinking to improve processes in acquisition, the Contact Maintenance Truck (Heavy) manufacturing and assembly lines, and the assembly of the Explosive Ordnance Disposal System. The arsenal is also integrating its current quality initiatives, such as six sigma and ISO 9000, into its lean program.

AMCOM

U.S. Army Aviation and Missile Command (AMCOM), AL, personnel implemented lean thinking in the Black Hawk recapitalization at Corpus Christi Army Depot (CCAD), TX, and in the Patriot recapitalization line at Letterkenny Army Depot (LEAD), PA.

CCAD. At CCAD, the initial value-stream analysis on the Black Hawk recapitalization line revealed a number of opportunities for substantial improvements. The main items found were lack of flow in the dock stage process (e.g., aircraft was stationary within major processes, aircraft status was difficult to determine, and wasted space was found) and parts storage and retrieval problems (e.g., parts stacking and clutter, parts damaged or lost, and no smooth flow to or from

back shops). The conversion from the initial dock stage to the flow process was completed in June 2003. Once lean processes are fully implemented, turn-around time will be reduced by more than 50 percent. Other significant metric improvements include approximately 50-percent reduction of work in process, 75-percent reduction in aircraft moves, and an 80-percent reduction in the total distance traveled by the aircraft. CCAD personnel will implement these improvements as part of a 5-year plan to ingrain lean philosophies throughout the organization. Additional projects include tri-service lines, back shops, and CH-47 recapitalization.

LEAD. At LEAD, the initial value-stream analysis of the Patriot launcher revealed similar issues as those at CCAD. However, the Letterkenny approach has differed somewhat in that Patriot is truly a system-of-systems. This led Letterkenny personnel to attack each individual system as its own value stream. LEAD personnel are currently focusing on the Patriot launcher. The results to date indicate that an overall 30-percent productivity improvement and 40-percent floor-space reduction are achievable. LEAD personnel expect to achieve the same improvements on the antenna mast group as on the launcher. Other LEAD projects where work is being accomplished using lean tools could result in a 70-percent improvement in turn-around time and 36-percent reduction in floor space. Additional projects include other major components of the Patriot System (i.e., the Engagement Control Station, Information Coordination Center, and radar).

Conclusion

At AMC, lean thinking is not another do-more-with-less slogan. Lean tools, techniques, and activities have been successful in both industry and government in improving manufacturing processes and expediting the flow of ideas and development of new technology. Lean thinking involves the entire AMC workforce focusing on efforts to increase the value of its products and services to the end users—our soldiers. Lean thinking is not about reducing the workforce; it is about enabling the workforce to accomplish more. Lean AMC organizations will have world-class manufacturing processes and capabilities that will compete with the best services pro-

vided by private industry. Successful lean implementation will ensure viability of organic capabilities for the long term and will position AMC to meet the enormous challenges of the 21st century. For more information on AMC lean initiatives, go to:
<http://www.amc.army.mil>.

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