

# Performance/Production-based Management

Reduces Production Time and Lowers Costs at  
Maintenance Depots



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## 1. Introduction

**The Department of Defense (DOD) maintenance depots are critical to the readiness and sustainability of our combat forces. According to the DoD Maintenance Fact Book, 17 major maintenance depots support equipment valued at more than \$400 billion and employ 600,000 people, with an annual cost that is 12 percent of DoD's budget.<sup>1</sup>**

The maintenance depots comprise a highly complex enterprise demanding insightful performance measures. The work itself is becoming more complex while the volume is increasing. One of the standard metrics has been direct labor hours. Direct labor hours represent a lagging performance indicator and are of limited use to make proactive adjustments to operations. This paper contends that a new type of performance measure based on the integration of effort (labor hours) and results will enable better productivity management. This kind of leading performance indicator can inform significantly improved operating efficiencies—reducing production time and lowering costs—by directing management attention to areas where intervention is needed. We call this the performance/production-based management measure, or P2BM.

## 2. How Depot Budgets are made

Most defense maintenance depot operations are financed by defense working capital funds (DWCF). The working capital funds support business operations with a focus on efficiency and customer satisfaction similar to commercial businesses. Working capital funds use a revolving fund concept of operations, in which the fund delivers goods or services at its expense in return for reimbursement from its customers. The depots build a projected estimate and schedule of asset availability for repair, repair cycle time, labor

<sup>1</sup> Office of the Assistant Secretary of Defense (Logistics and Materiel Readiness). 2010. DoD Maintenance Fact Book. Washington, D.C.: The Pentagon.

hours, and material dollars (direct cost), and project indirect and general administrative labor hours and material dollars (indirect cost) based on the services' and defense agencies' projected asset repair requirements and schedules. This annual estimate is broken down by month for direct and indirect hours and dollars with a projected net operating result (NOR).

Productivity for the maintenance depots is measured by the amount of direct labor hours (DLH) expended against the budgeted direct labor hours. The goal is to have these hours zeroed out by the end of the year. NOR does not take into account production output. It assumes that the depot is producing assets for the number of hours originally estimated in the plan. Because the estimate is determined 18 months or more before work is performed (as part of the planning, programming, budget, and execution process), a "zero profit" NOR is atypical. Factors such as condition of asset, scope creep, and experience of workmanship on asset can come into play, making the number of hours spent on an asset is different from the amount budgeted. A depot can execute direct hours close to the estimate and still be significantly behind or ahead of scheduled asset production. Using a NOR-based metric of DLH provides a false management understanding of performance and limits the ability to investigate production anomalies and improve year-on-year execution. This not only has serious impacts on asset funding, but it also impacts asset availability to the services. Both of these issues—asset funding and availability—are crucial for optimizing warfighter support.

## 3. OSD Responds

In 2010, former Secretary of Defense Robert Gates directed a four-track approach<sup>2</sup> to move the defense enterprise toward a more efficient, effective, and cost-conscious way of doing business. The four tracks were:

<sup>2</sup> Gates, Robert M. August 16, 2010. Memorandum: Department of Defense (DOD) Efficiency Initiatives. Washington, D.C.: The Pentagon, [www.cpms.osd.mil/sespm/docs/EfficiencyMemo.pdf](http://www.cpms.osd.mil/sespm/docs/EfficiencyMemo.pdf)

1. Shifting overhead cost to force structure and future modernization accounts.
2. Inviting outside experts to suggest ways that the DoD could be more efficient.
3. Conducting front-end assessments to inform the fiscal year 2012 budget request.
4. Reducing excess and duplication across the defense enterprise. These initiatives were in addition to long-standing objectives to get equipment to the warfighter quicker and reduce program cost.

At the same time, the operations tempo has increased and the work has become more complex with the introduction of new weapon systems technologies. This environment has further challenged the maintenance depots to determine how to increase efficiencies and production while decreasing costs.

In September 2011, current Secretary of Defense Leon Panetta said the department has initiated a strategy-driven focus on the defense budget as it looks to implement \$450 billion in savings over the next 10 years<sup>3</sup>.

#### 4. What Can the Depots Do?

Across the globe, organizations are examining their performance and developing new measures to drive improvement. Rather than simply managing to a zero NOR, the depots could improve operational performance with a new measure based on Performance/Production Based Management (P2BM) concepts and techniques. This approach combines quality, throughput, and cost (DLH) to provide a leading performance indicator. P2BM also provides a starting point to investigate potential performance issues. For example, P2BM findings might direct Lean Six

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<sup>3</sup> Garamone, Jim. September 22, 2011. Panetta: Defense Cuts Will Be Made Strategically. American Forces Press Service, <http://www.defense.gov/news/newsarticle.aspx?id=65423>

Sigma teams to areas of improvement (figure 1). P2BM would:

- Significantly improve operating efficiencies
- Align with OSD guidance to reduce production time and lower cost
- Provide a more integrated view of productivity
- Focus management attention on areas where intervention is needed
- Establish a measure that is a leading indicator of performance.

If the depots adhere to the current metric, which uses NOR to measure labor schedules without tying them to output, they will have a difficult time increasing efficiencies and lowering costs in a systematic way. P2BM goes beyond simply comparing budgeted costs to actual costs. It measures the value of work by comparing the planned value of work scheduled for a given period with the actual cost of work accomplished. By using the metrics derived from these values to understand performance status and estimate cost and time to complete, performance management can alert program managers to potential problems sooner than expenditures alone can<sup>4</sup>.

This method is regarded as a best practice throughout the industry. In an interview, Gary Delallo, Sikorsky's manager of program planning and control for military and commercial programs, noted, "Every project, from program planning to capital procurement to IT projects, must now be executed under our EV [earned value] program. It's a cultural shift that is guiding our transformation."<sup>5</sup>

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<sup>4</sup>U.S. Government Accountability Office. March 2009. GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs. GAO Applied Research and Methods GAO-09-3SP. Washington, D.C.

<sup>5</sup>Primavera. Sikorsky Aircraft and Primavera: Transforming Processes with Earned Value Management. 2006. Primavera Technologies: Bala Cynwyd, PA,

## 5. P2BM Solution Explained

The concepts for P2BM have been around since the early 1900s when industrial engineers used it to assess factory performance. They compared physical work output or something gained through some effort to the planned physical work and subsequent actual costs. In the 1920s, General Motors used a form of performance management called flexible budgets; by the early 1960s, performance management had graduated to the program evaluation and review technique or PERT, which relied on resource-loaded networked schedules (i.e., routes and bills of material) and budgets to plan and manage work.

Today's P2BM is a set of project management procedures, guidelines, and disciplines that must be implemented to ensure proper management of a project. It gives managers the capability to integrate the work scope with the schedule and cost elements for effective program planning and control through:

- Planning all work scope for the program to completion
- Defining the work scope in finite pieces for which responsibility for technical, schedule, and cost objectives and risks can be assigned
- Integrating work scope, schedule, and cost objectives into a performance measurement baseline plan from which accomplishments may be measured and baseline changes controlled
- Recording of actual (or estimated) costs incurred in accomplishing the work performed
- Objectively assessing the accomplished work at the work performance level
- Analyzing variances from the performance measurement baseline,

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<http://www.crownsys.com.sg/successstory/Aerospace-Defence/Sikorsky-Aircraft.pdf>

forecast of impacts, and estimates at completion for schedule and cost.

This additional scrutiny throughout all levels of management over the life of the project results in increased productivity.

Performance management has long been known for its accuracy of projecting estimates-at-complete or final cost on projects once they have become greater than 15 to 20 percent complete. It is also known for improving cost performance and schedule adherence, although a quantitative metric has not been established for this benefit because different project sizes and levels of performance management implementation. One of P2BM's unsung benefits, however, is the establishment of built-in metrics as the system is applied. A properly implemented P2BM system will have both detailed and summary metrics on cost (e.g., over- and under-runs) and schedule (e.g., accurate projected completion or deliverable dates). Additionally, the system requires causes, impacts, and corrective actions for project items deviating from the original plan. These P2BM metrics are calculated continuously throughout the life of the project, enabling management to be proactive when addressing variances or changes to the baseline because of unknown events.

P2BM provides a true picture of productivity because it concentrates on the resources expended and at the same time identifies the amount of work those resources accomplished. In other words, P2BM measures what is produced, how much it cost, and how fast it was done—exactly the insights depots need to make crucial decisions such as scope of repair, asset supportability for services, and supportability to troop deployment dates.

## 6. Sample PPBM Output

The following is an example of the type of performance metrics available with minimum implementation of P2BM concepts. In figure 2, the "electric truck" maintenance is forecast to exceed the estimated "cost" by 1,106 hours. Meanwhile, 55 fewer repaired trucks have been produced than planned (or promised) for that extra expense. The

cost performance index (CPI) or “efficiency” rating of 93 percent and schedule efficiency of 79 percent means that 7 percent more was spent and 21 percent more time was required than planned. And while the average truck has a variance of 7.43, there is wide variability in the individual units—which should flag management attention to determine the root causes of the variations. It could be that the vehicles are more damaged than anticipated, in which the customer should be immediately notified that delivery will be delayed because there is more work to do than originally known. Or there may be inefficiencies in the repair process requiring a change to a business process, additional worker training, or closer supervision.

Information such as projected cost at completion, quantity that can be completed with current budget, average variance, etc., are just a few metrics and performance information available using basic P2BM. With this type of information, depots can determine which areas to investigate, where to concentrate process improvements, when current funding is projected to run out, whether to adjust future estimates to perform work, and whether realistic replacement factors are being used, just to name a few areas.

In addition to a productivity and financial view, the data can also be plotted onto a statistical control chart, leveraging the investment DoD has made in techniques like Lean Six Sigma. Using the control

chart, the P2BM data can direct depot management to ask critical questions about quality and quality management, for example:

- Are the data points outside the thresholds the result of “common cause”—meaning that the system is creating the problems and should be reviewed?
- Or is a “special cause” the culprit, meaning that some event (a machine was out of alignment, or the depot received a run of particularly damaged equipment, for example) triggered the spike or dip in productivity?

## 7. Conclusion

P2BM is a system that helps accurately measure the productivity at the maintenance depots while at the same time providing drill-down reporting for root-cause analysis, enabling quality improvement initiatives such as Lean Six Sigma. A P2BM dashboard highlights schedule status, cost impacts, and problems encountered and provides a leading indicator of productivity. By identifying variance issues early, problems can be addressed to correct the production output. If implemented correctly, P2BM has the potential to reduce cost and increase production. P2BM works regardless of the software in place because it is not software reliant—procedures, guidelines, and disciplines drive the P2BM system.

Effective application of P2BM provides customer and supplier program managers timely, accurate, and integrated cost, schedule, and technical performance information for the total capital investment program and the individuals supporting projects or contracts.