Proceedings of the General Donald R. Keith Memorial Conference
West Point, New York, USA
April 30, 2015
A Regional Conference of the Society for Industrial and Systems Engineering

Modeling and Analysis of the Rotor Blade Refurbishment Process at the Corpus Christi Army Depot

Nathaniel Green, David Jaye, and Stephen Kerns

Department of Systems Engineering
United States Military Academy
West Point, New York

Corresponding author's Email: Stephen.Kerns@usma.edu

The views expressed herein are those of the author and do not reflect the position of the United States Military Academy, the Department of the Army, or the Department of Defense.

Abstract: Much of the Army's equipment is coming to the end of its planned life cycle. At the same time, the Department of Defense and the Army are facing severe budget reductions for the foreseeable future. As a result, the planned modernization and acquisition of new equipment will be delayed. The Army is now forced to keep and maintain current equipment as opposed to retiring old systems and buying new ones. With the increased investment in the current systems, the organizations and depots that maintain and refurbish the Army's equipment are becoming increasingly valuable assets. Corpus Christi Army Depot (CCAD) is the Army's only facility for repair and overhaul of rotary wing aircraft. CCAD receives approximately 10 rotor blades per day for the Black Hawk helicopter. Each blade is routed through a detailed inspection and rework process consisting of approximately 67 sequential operations which take approximately 45 days per blade. Recently CCAD has expanded and reorganized the rotor blade refurbishment facility which provides an opportunity to re-examine processes, adjust positioning of work stations, and improve efficiency. In this research we develop a discrete-event simulation model of the CCAD rotor blade refurbishment process in order to identify inefficiencies and examine "what if" scenarios to improve key performance metrics. The key performance metrics used to analyze model input include throughput, work in progress, mean queue time, mean queue size, and workstation utilization. Model analysis reveals that there is a lot of room for improvement as far as the current process is concerned. The baseline model revealed that there were two crucial bottlenecks that severely limited the throughput and overall performance of the refurbishment process. Adjusting the capacities of these workstations was very effective in reducing the number of blades in WIP and reducing the impact of the queues in front of these stations, but failed to increase the throughput to the desired amount. Additionally, we found that the loss of one whirl tower's production would not be a significant factor for CCAD's performance in terms of throughput since operating with only one whirl tower did not cause a serious blockage for the process.

Keywords: Simulation, Depot Maintenance, Sequential Manufacturing, Work in Progress (WIP), Throughput, Bottleneck Analysis, Discrete-event Simulation