1 SCHEDULING & PLANNING IN OM EXECUTIVE SUMMARY

The following report on scheduling methods for manufacturing was motivated by a desire to understand what methods are currently used and how they apply to various production environments. Specifically, research was conducted to define the characteristics of the following manufacturing approaches: mass production, mass customization, cell manufacturing, and assembly lines. Scheduling methods were then explored for each to determine how manufacturing layouts, production priorities, workforce competencies, and the current state of technological integration affect the complexity and level of planning detail required for running efficient operations. By analyzing each production environment, conclusions were drawn.

Almost all scheduling approaches used in manufacturing facilities are centered on primary objectives of reducing costs, minimizing the maximum completion time of a set of jobs or reducing lateness of steps in a production process. As part of the findings in this report, the research has concluded that there are no “out of the box” or “one size fits all” methods that specifically address these potential issues. There is scheduling software on the market that can address specified objectives but often scheduling methods must be modified to be coherent with an individual facility. Furthermore, if methods such as mixed integer programming (MIP) or constraint programming (CP) are integrated into software, the optimization model must be able to accurately portray the operations that are occurring on the production floor. For example, MIP or CP models that are built into software should include an appropriate level of detail (in the form of constraints and parameters) that allow for the solver to produce a solution that provides relevant information to the production floor. Otherwise, the optimization method will be trying to find a solution to the wrong problem.

As noted above, each type of manufacturing environment exhibits characteristics that are more cohesive to certain scheduling approaches. Mass production often looks scheduling problems from a broad perspective to determine production requirements. Furthermore, due its nature of autonomous systems, planning is often done from a strategic approach. Scheduling tools can provide facilities with decisions on what product must be produced and in what quantity. In contrast, mass customization often uses a more local and detailed approach making decisions on the sequence of operations within a facility. Methods in this environment are often implemented using a distributed approach, whereby scheduling decisions are made in each functional area of a process and information is then sent back to a master system. This approach is very important especially when the complexity of a manufacturing facility increases. Overall objectives can then be achieved by relaying information back and forth from each individual area of the production process. In addition to high volume and high customization processes, research also found that cell manufacturing and assembly line environments use their own appropriate scheduling methods. Assembly lines deal with line balancing procedures to improve production flow and cell manufacturing focuses on improving the throughput of materials within cellular aligned work stations. **To conclude** research done in this report, it is important to highlight some of the key takeaways. First, there are no scheduling methods that can be broadly applied to any facility. Therefore, once initiatives have been laid out by higher management, the facility should be analyzed to determine if there are any layout changes that need to be made to either improve on the current operations or allow for a scheduling system to be properly implemented. Next, priorities should be identified to determine what system to implement. For example, there are scheduling programs that can be built into existing ERP software. Resources and workforce competencies must be addressed to allow for scheduling decisions to be successful.