

DETAILED PRODUCTION SEQUENCING IN SIMIO

INTRODUCTION

There are many industries that demand complex sequencing, which takes into consideration multiple constraints at the start of the production run, to find the most feasible schedule that will not violate any hard or soft constraints. This is particularly true for this highly automated and complex foundry producing up to 80 different parts with various material types and production constraints.

BUSINESS PROBLEM

The production schedule for the line was generated using Microsoft Excel on a daily basis. Managing 80 parts with all the production constraints was very difficult and inefficient using just Excel. This schedule produced in Excel was not integrated with the Manufacturing Execution System (MES), but instead it was printed and distributed to the operators. Also, the operators were given the freedom to pick orders out of sequence based on the current state of the facility. Although the MES did provide a real-time listing of the work orders, the work orders were not listed in any sequence and therefore did not match the Excel schedule that was given to the operators. This made it very difficult to use the MES effectively. Additionally, feedback to the MES and SAP systems was slow, preventing timely action to deal with deviations from the planned production.

The goal was to have an integrated production scheduling system that will allow for real-time data exchange between the MES, the ERP and the production schedule providing the ability to create a schedule based on the actual status of the production line. The schedule must be fed back to the MES to provide the operators with an accurate production schedule on their operator screens. By following this optimized integrated schedule, the company is poised to improve production results for meeting on time delivery dates as well as reducing production time and cost.

WHY SIMIO?

Simio has a simulation based scheduling engine that allowed the team to create a detail simulation model of the facility to accurately represent the process flow, taking into account all the decision logic and resource constraints in the production facility. Simio also provided the ability, by utilizing its extensive built in logic, to evaluate all identified process constraints such as material requirements, equipment requirements, resource availability, due dates, etc. at the start of the campaign to generate a feasible production sequence.

This sequence that was created during the simulation respects all process constraints, ensuring plan stability throughout the production run. The scheduling system also provides detail output via Gantt charts, reports and interactive dashboards showing material consumption and resource utilization at every step in the process.



Industry

- Foundry for parts manufacturing

Challenges

- Ineffective planning in Excel
- Infeasible production schedules
- Schedules are disconnected from the MES and ERP
- Poor production performance and throughput

Solution

- Integrated scheduling and MES solution
- Sequences that respect all process constraints
- Quick and efficient re-planning and scheduling
- Schedule presented on the MES operator screens

Value

- Greater production stability
- Improved production throughput and efficiency
- Data integration and integrity
- Time feedback and re-planning

Customer Background

- Largest foundry under one roof
- Iconic agricultural equipment manufacturer



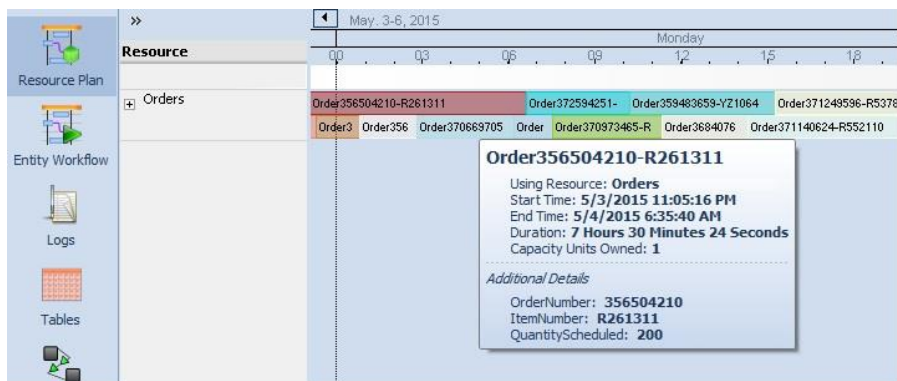
Simio has the flexibility for the model developer to create more than one heuristic for sequence creation. For example, the scheduler might want to create a sequence that prioritizes one of the scheduling rules over another, such as prioritizing the balance of raw materials throughout the shift or prioritizing the jobs that require the most manpower. With Simio, it is very simple for the scheduler to create different schedules that each use a different sequencing heuristic and then decide on the best schedule after analyzing the associated reports and outputs.

The scheduler can also use Simio to export the schedule directly to the MES via its standard API to make the schedule available to the operators on the production floor to better utilize their MES operator screens.

IMPLEMENTATION

The Simio production scheduling tool was deployed to create a feasible schedule for the production line at the foundry based on the orders, material requirements and production constraints. Simio was integrated with the MES. The work order status, resource downtimes, available material, WIP, routings, BOM, etc. are pulled from the MES into Simio. The work order status, WIP and resource downtimes are imported each time the production schedule is run while the routings, BOMs and other static data are imported when changes occur.

The sequence logic was configured to take 9 different scheduling rules and constraints into consideration, including gantry, manpower, mold, iron type, etc. The sequence logic was used for generating the production schedule for each shift for a week in advance.



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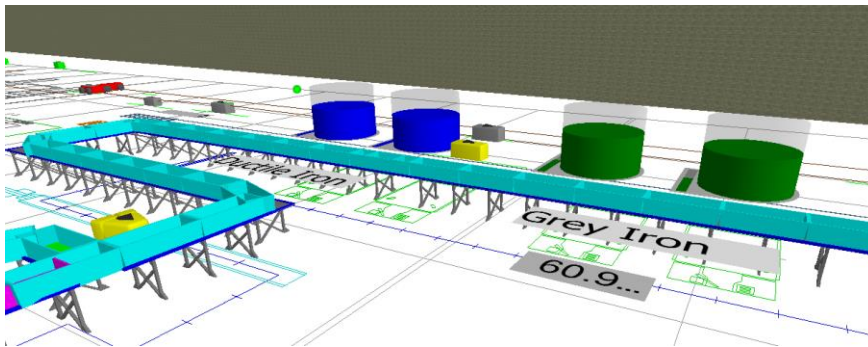
Once completed, the production scheduler saves the schedule and exports it back into the MES. The scheduled dates for the work orders are updated based on the schedule generated in Simio. Additional reports are also generated in Simio. The production scheduler can print and export the reports to be used by other departments within the production facility.

The operators on the shop floor are now able to view the production schedule using the MES Operator screens. The operators now run the work orders in the sequence from the Simio schedule, but will still have limited freedom to run orders out of sequence when deemed appropriate. If this occurs, an updated schedule that includes the changes made by the production line, can be produced within minutes so it is ready for the next shift.

VALUE

By implementing Simio as an integrated simulation based scheduling system, the production facility can realize the following benefits:

- Find the best sequencing rules for the current work orders given the current state of the system.
- Identify the biggest contributors causing a reduction in the effective line speed and associated throughput.
- Develop iron melt campaigns to support the line production schedule so the line has sufficient iron and production is uninterrupted
- Reduce the production time and running cost per shift by creating a more optimum schedule given the current order composition.
- Reduce production cost by reducing overtime and extra shifts due to a more effective production schedule.
- More effective use of the MES operator screens and real-time feedback from the operators and equipment, which opens the path to automatic re-scheduling.



CONCLUSION

Simio Risk Based Planning and Scheduling provided the facility with a unique capability to both represent the process flow in significant detail and to also create a feasible sequence, which considers their large number of scheduling constraints. Simio is used to create a stable and executable schedule to optimize production throughout the facility. Simio enabled a truly integrated planning workflow linking the data between SAP, MES and planning.



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