Improved Insight Into Composite Manufacturing Throughput with Simulation

Aerospace and Aircraft Mfg

A Leading Composite Mfg Company

Success Story

ProModel Optimization Suite

SITUATION

A composite manufacturing company was producing carbon fiber components for commercial and military aircraft. The process associated with this production has many time-based complexities (e.g. expiration times for stored or in-use material, variable cycle times with manual operations) that are inherent to the nature of the process. These complexities present difficulties in planning and scheduling at current program-required volumes. Future increases in demand make that challenge even greater.

A lack of a dynamic and accurate capacity planning tool made analyzing these issues very difficult and time consuming. There was no scheduling tool for long-range capacity analyses to determine what combination of labor, tooling, equipment, and other resources will be required to maximize system throughput and ensure on-time deliveries to customers. A need also existed for a short term method of predicting when specific jobs will likely be completed given current workload and work in queue. The company needed to see when they would run out of capacity, where they would see constraints and what measures were needed to eliminate these constraints.

OBJECTIVES

- Understand capacity issues of various services
- Achieve significant dollar savings by identifying and resolving processing constraints
- A better understanding of work flow
- Ability to predict the impact of increased production levels
- Ability to predict staffing and/or equipment changes required to optimize production levels
- Ability to analyze the impact of operations on product throughput
- Cost savings realized by more efficient resource utilization
- Understand the impact on overall throughput performance when introducing a new product

RESULTS

The composite manufacturing company was able to:

- Evaluate current production capacity and the effects of demand increase and volume mix
- Identify bottlenecks and evaluate improvements in a risk free environment
- Evaluate future line designs and enhancements
- Feed short term demand funnels into the tool and optimize tactical scheduling decisions
- Improve on-time delivery
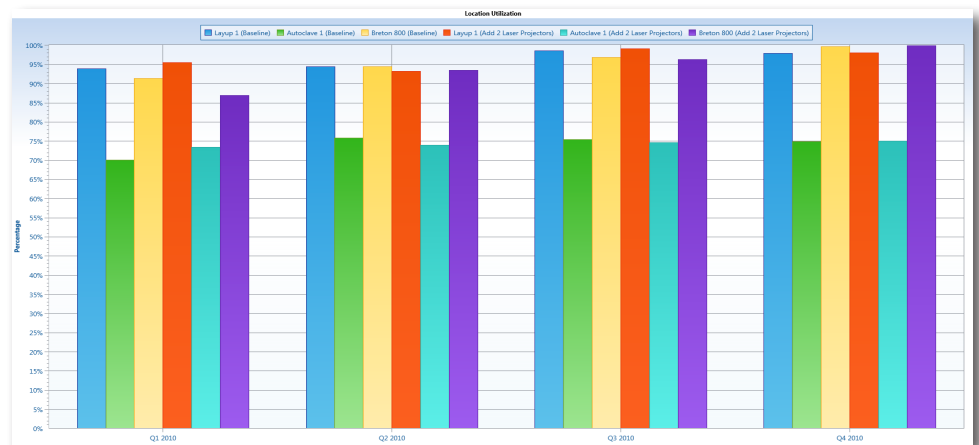
Comparative Scenarios: Equipment Utilization by Quarter

ProModel®
Better Decisions—Faster

SOLUTION

This project addressed the development of a simulation-based operations planning tool to provide accurate and timely information regarding expected system performance against current plant capacity and under various future product demand and mix scenarios. The final solution will help the company operations staff to understand where current and future capacity constraints exist, and was provide the ability to experiment with available options for maximizing production throughput while minimizing cycle times, inventory levels, labor expenses and capital outlays.
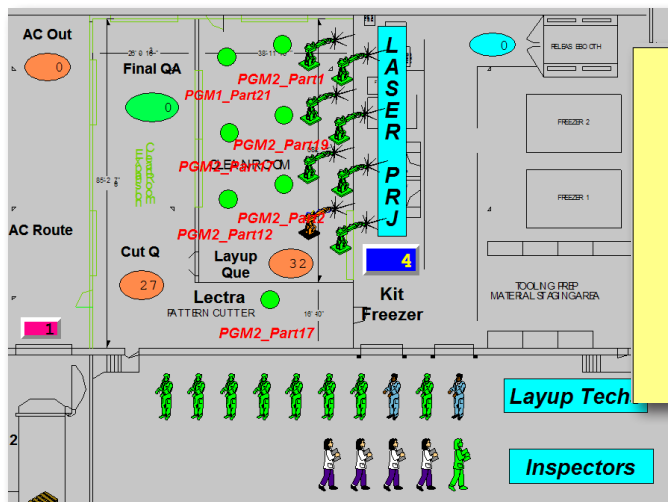
Composites present a complicated manufacturing process with multiple constraints to be managed at each phase of the process. Understanding the systems true capacity with deterministic (Spreadsheet) methods is near impossible. Our technology and solutions create enhanced ability to identify capacity constraints and run future scenarios to evaluate how to address those constraints. Simulation provides the ability to predict system performance given multiple system constraints as listed below.

- Mixed Model Production
- Personnel (types & quantity)
- Layup and Trim Tool Availability
- Autoclave (number, size & process conditions)
- Product Attributes (size & cure times)
- Hot parts (AOG) given priority through system
- Time limitations on stored and in use materials
- Quantity of Laser Projectors
- Tombstones & riser availability
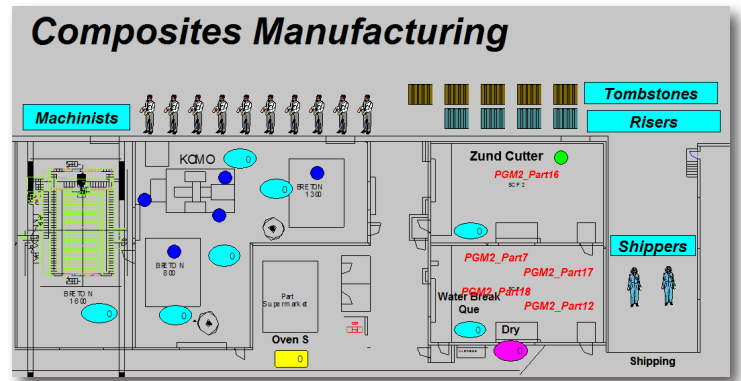
ProModel Simulation supports both the long term strategic planning process as well as the short term tactical optimization of schedules and deliveries.

Scenario Manager

#	Parameters	Baseline	Baseline + PGM4	Add 2 Layup Techs	Add 2 Laser Projectors	Add 2 Risers	50% Mach SU Reduce	Add 2 Risers + 50% SUR	Add PGM4 + Risers & SUR
	Simulate Scenario?	☑	☑	☑	☑	☐	☐	☐	☐
	Last Simulation Run								
1	Number of Layup Techs	10	10	12	10	10	10	10	10
2	Number of Laser Projectors	20	20	20	22	20	20	20	20
3	Number of Risers	4	4	4	4	6	4	6	6
4	Machining Setup Reduction Factor	0	0	0	0	0	.50	.50	.5
5	PGM4 On/Off Switch	0	1	1	1	1	1	1	1

	Complete	WIP	Cycle (hr)	VA (hr)
PGM2_Part1	22	6	191.63	44.92
PGM2_Part2	22	6	212.99	45.70
PGM2_Part3	24	4	223.02	40.96
PGM2_Part4	17	4	179.47	40.38
PGM2_Part5	23	5	142.87	49.20
PGM2_Part6	24	4	212.18	42.31
PGM2_Part7	17	4	230.44	40.84
PGM2_Part8	22	6	161.92	41.23
PGM2_Part9	24	4	175.18	45.11
PGM2_Part10	17	4	153.07	45.58