

# Optimizing Production



Effective production planning and scheduling are core competencies of competitive supply chains. But the growing complexity of the process industry has made achieving this goal more challenging than ever. Increased competition from the Far East, tightening margins from higher raw material and energy costs on the supply side combined with unyielding consumer retailers and automotive giants on the demand side, and expanding product portfolios increase supply chain complexity.

ITEM	PLANT	DATE	QTY	STATUS	START DATE	END DATE	START TIME	END TIME	OPERATION
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reducing or increasing run lengths, interrupting a campaign to accept a last minute change in demand, responding to a production upset by rescheduling production around the outage, planning inventory builds around a projected turnaround, and slotting in planned preventative maintenance downtime around regular production runs. They must know how to reshape plans smoothly and responsively, without breaking the rhythm of the plant.

Accordingly, production planners and schedulers must balance several important trade-offs: satisfying customer demand while keeping inventories low; minimizing disruption to the plant floor while being responsive to shortening customer lead-times; and intelligently creating runs and sequences that minimize waste while maximizing uptime and operational efficiency. And these decisions must constantly be reevaluated on the fly in response to ever changing operating and business conditions.

**KEY BENEFITS**

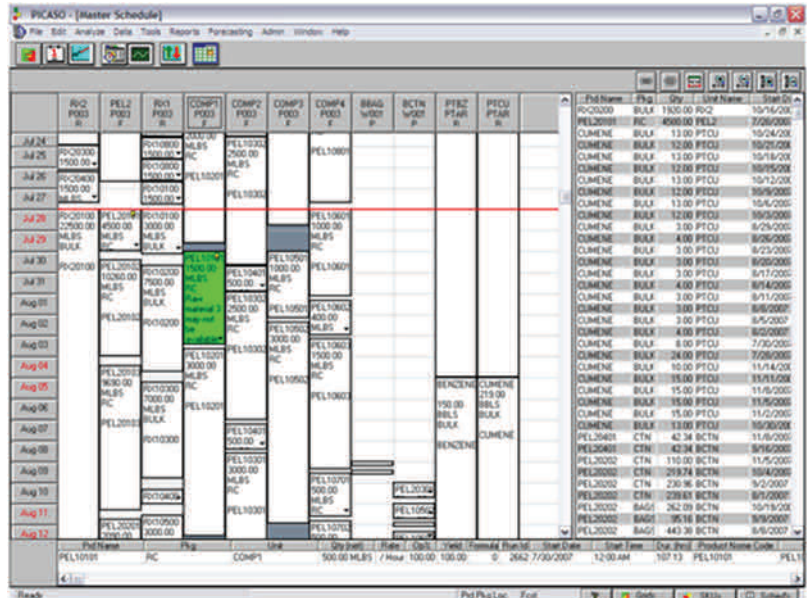
- Increased Profitability
- Better Customer Service
- Lower Capital Costs tied up in Inventory
- Higher Production Efficiency
- Lower Production Costs

A good human scheduler can use logic, experience, intuition, and pattern recognition skills to make great decisions occasionally. However, without good tools that assist with calculations and visualization, a human scheduler can occasionally miss something important that could cost the business substantially. Today, more than ever, Schedulers need the WAM Supply Chain Planning Solution to recommend scheduling solutions to problems that minimize cost and maximize profitability in response to dynamically changing constraints.

Schedulers must understand all the financial and operational implications of

# WAM Dynamic Scheduler

- Designed to create optimal production schedules that maximize profitability
- Uses proprietary optimization algorithms to balance supply and demand
- Instantly evaluates 1000's of possible schedules to find the best solution
- Works with multiple ERP Systems: SAP / APO, Microsoft, Oracle, JD Edwards, etc.
- Targets the best balance between transition costs and customer service

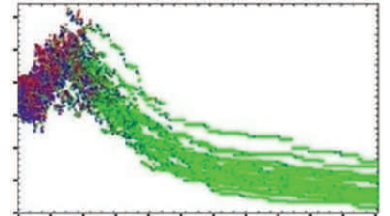


Creates a schedule which:

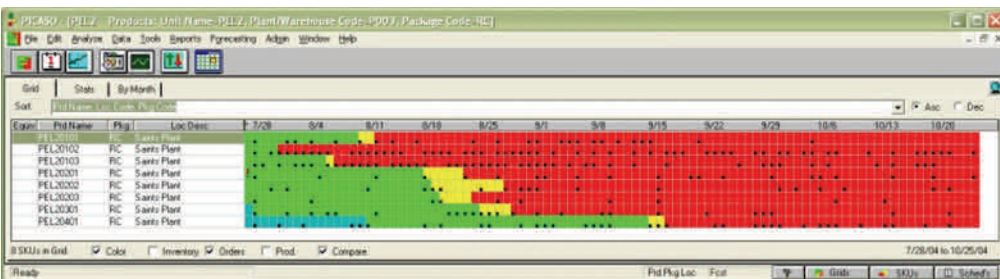
- Balances profitability, customer service, production costs
- Accounts for constraints: hardware, labor

Adapts the schedule to unplanned events:

- Internal: plant shutdowns, material shortages
- External: transportation strikes, hurricanes

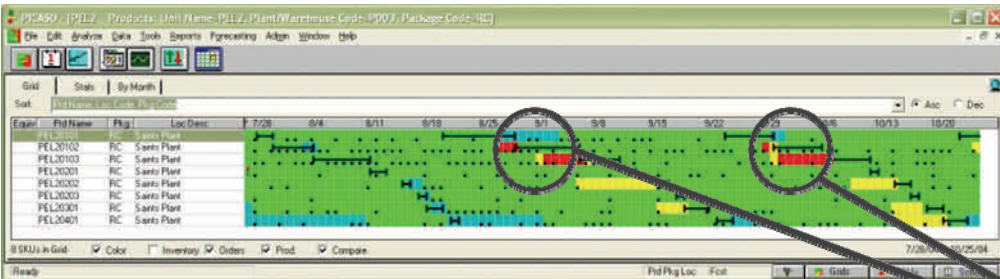


Inventory projection before implementing a production schedule

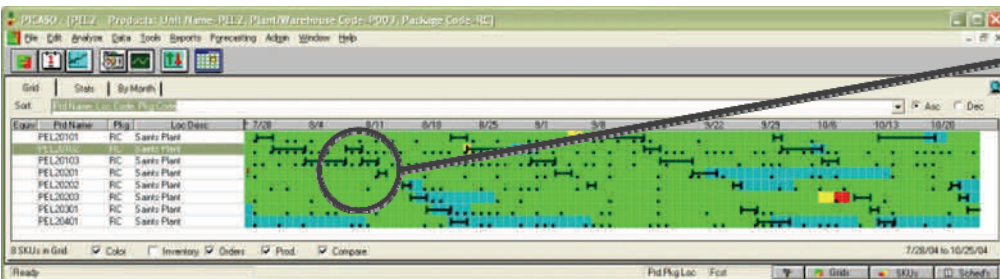


In the span of a few seconds, WAM's Dynamic Scheduler analyzes thousands of possible production schedules and creates a best-fit solution.

Inventory projection incorporating a manually-built schedule



Inventory projection with WAM's optimized production schedule



Dynamic Scheduler is able to optimize the production schedule with subtle changes that collectively represent considerable cost savings.

Optimizing production schedules in a process operation often requires consideration of some combination of the following types of constraints:

1. **The detailed timing of events down to the minute** including start time, end time, duration, setup, and cleanup.
2. **Modeling of transition downtime, yield, and resource requirements** to understand the impact to operational uptime and capacity as well as the economics of transition material that is saleable versus waste.
3. **Finite capacity feasibility** on equipment
4. **Campaign run length** including minimum and maximum lot-size, batch-wise production & shipments.
5. **Varying throughput rates** based on different recipes, yield, and equipment capabilities
6. **Production calendars** typically process facilities operate 24x7, but some areas only run 24x5 or 16x5
7. **Downtimes that may be fixed or flexible** modeling this flexibility is important because sometimes being able to get a PM or turnaround done a little earlier or a little later can make or break the economics of a good campaign.
8. **Group/family limits** some business rules require that at least a certain amount be produced against a budget or plan for a group of SKU's that belong to a product family. Alternatively, an upper limit can be placed against a group to cap production against that group in a given month.
9. **Product variants/ equivalents** there can be more than one way to produce a given SKU with each alternative having slightly different run rates, material requirements, yields, and resource requirements.
10. **Labor availability** As staffing levels have been cut, the timing of a transition can be affected by the availability of specialized labor resources required to perform the transition
11. **Precedence constraints** we cannot run A before B or A must follow B by a lag-time. If you have ever tried to run the load-lever or capacity-smoother in project management software you know how hard it is to generate capacity feasible plans that respect start-start, start-end, or end-end types of constraints.
12. **Shared resources** with limited raw material availability, sometimes a common feed shared by multiple reactors can become a gating factor on the schedule. Another example is some specialized movable equipment that may be needed to run certain operations.
13. **Financial trade-offs and controls** such as tolerance for building inventory or for running below safety stock; tolerance around transitions and total downtime; or tolerance for lateness or missing shipment windows.

## Coping vs. Optimizing

To cope with the complexity, a human Scheduler will often devise rules of thumb and heuristics to simplify the problem in order to come up with a good schedule. To create a schedule that truly minimizes the cost to the business it is important to consider and evaluate all of the options – all the degrees of freedom available to the business – and find the combination of decisions that results in the best financial and operational outcomes.

To properly consider all of these options requires many calculations. The WAM Dynamic Scheduler is a high performance calculation engine designed specifically to meet the numerically intense challenges of today's process industry supply chains. It quickly generates recommendations to problems for the Scheduler to consider before publishing for execution.

The combination of the WAM Dynamic Scheduler and your experienced schedulers provides the capabilities and information you need to successfully optimize production in a complex and competitive marketplace.



[www.wamsystems.com](http://www.wamsystems.com)

### North America

*Corporate Headquarters*  
600 West Germantown Pike  
Suite 230  
Plymouth Meeting, PA 19462  
+1.800.358.8305 tel  
+1 484.530.4854 fax  
[info@wamsystems.com](mailto:info@wamsystems.com)

### South America

Av Nações Unidas, 12551  
9th and 17th floors  
CEP 04578-903 - São Paulo  
SP - Brazil  
+55.11.3443.7732 tel

### Asia

80 Raffles Place  
Level 35 UOB Plaza 1  
Singapore 048624  
+65.6248.4772 tel

### Europe

Gustav-Stresemann-Ring 1  
65189 Wiesbaden  
Germany  
+49 (0)611.97774.410 tel  
[eu@wamsystems.com](mailto:eu@wamsystems.com)