

APICS2017



Using Simulation and Optimization in Complex Manufacturing Operations

Jim Curry, OpStat

Alvaro Brisolla, Prod. Planning & Logistics Manager – Fortune 500 Medical Device company

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Disclaims

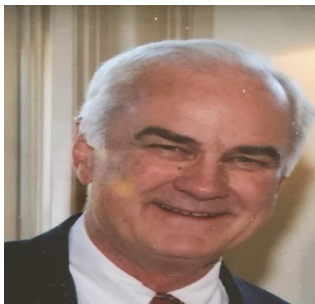
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The information shared on this presentation are not meant to be "Best Practices" or definitive statements of how an issue should or will be treated, as every organization is unique and the circumstances at two organizations may yield differing but equally valid responses to the same issue

Nothing shared on this presentation should be interpreted as an advice or counsel, nor legal or consulting advice, and attendees should consult with their own attorneys, tax advisors, etc. before adopting or changing a practice or policy

This presentation should not be interpreted as an endorsement to any vendor, agency, supplier, consultant or third-party partners in any shape or form.

Presenters



Jim Curry is founder of the OpStat Group. He has been a management consultant for large multi-national companies in operations and supply chain improvement for over 20 years, and has implemented supply chain simulation models for pharma, bio, consumer, medical devices, and chemical operations



Alvaro Brisolla is a Senior Manager, Production Planning & Logistics for Ethicon, a Johnson & Johnson subsidiary, responsible for the supply chain of raw materials that support billions of dollars in revenues annually

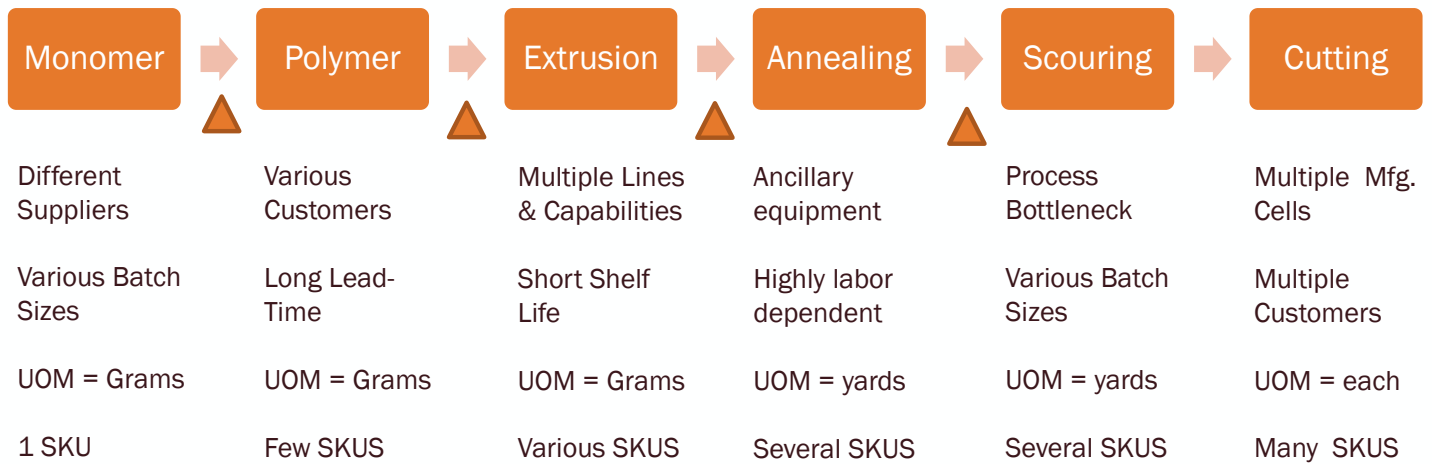
Agenda

- **Case for Action – What was the problem to be solved?**
 - High level overview of the operation, its complexities and challenges
- **Solution Overview – Simulation & Optimization through ExtendSim**
 - Opstat Modeling overview
- **Lessons Learned – The Journey through multi-level advanced planning**
 - Resolved Roadblocks and collateral benefits

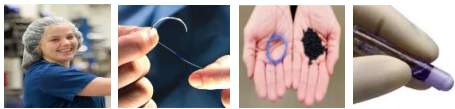
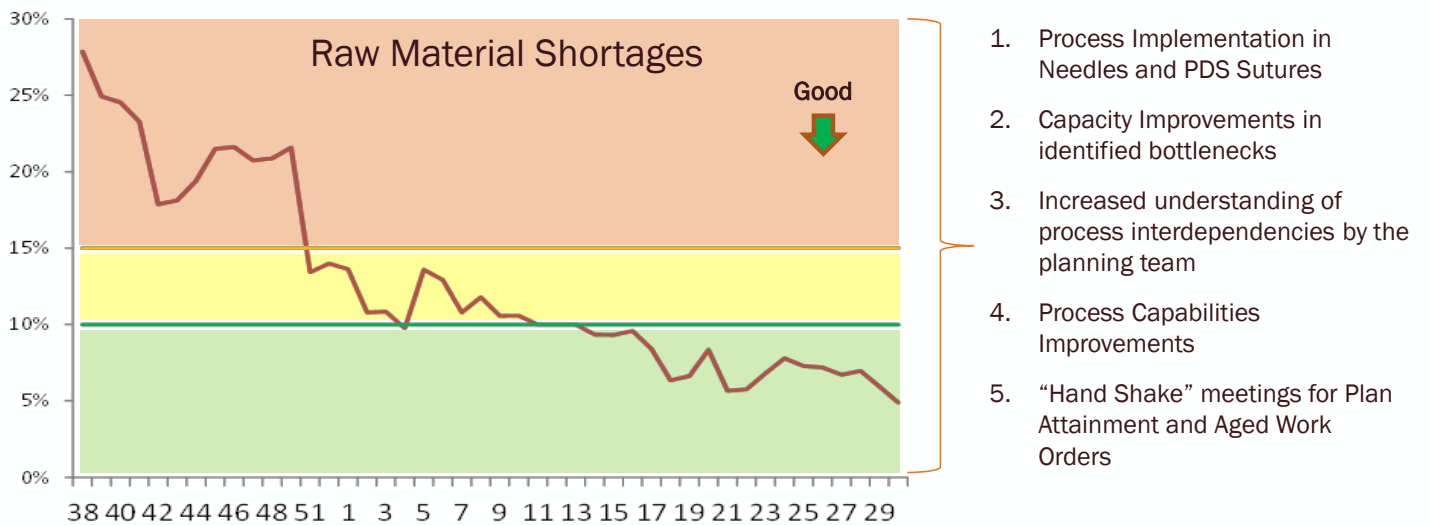
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High Level Manufacturing Processing Overview



Customer Service challenges and observed results



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What decision can we drive with simulation?

1. How the bottleneck moves?

Direct throughput impact by adding pockets of capacity in different steps of the manufacturing process

2. The importance of planning parameters

Direct impact (Time/Throughput or Customer Service) by changing planning parameters such as Yields, OEE, Shift Availability, Batch Sizes, etc.

3. How to best fulfill the demand

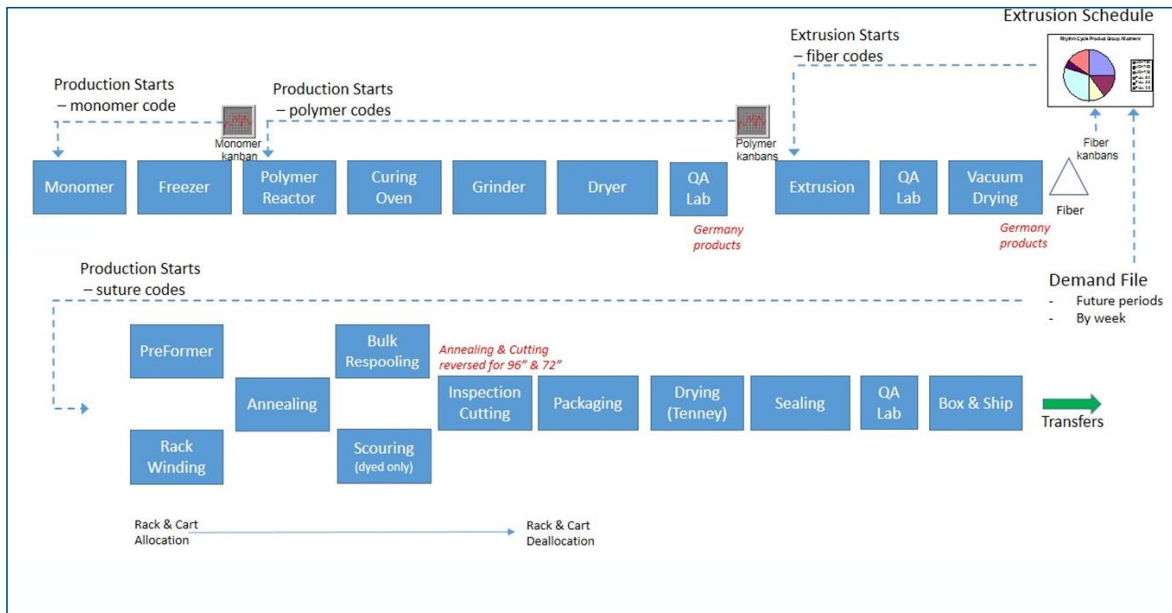
Through an iterative process, modeling of different demand fulfillment scenarios by varying demand timing or target inventory



Where to invest company resources
to maximize a given objective



Simulation & Optimization Modeling



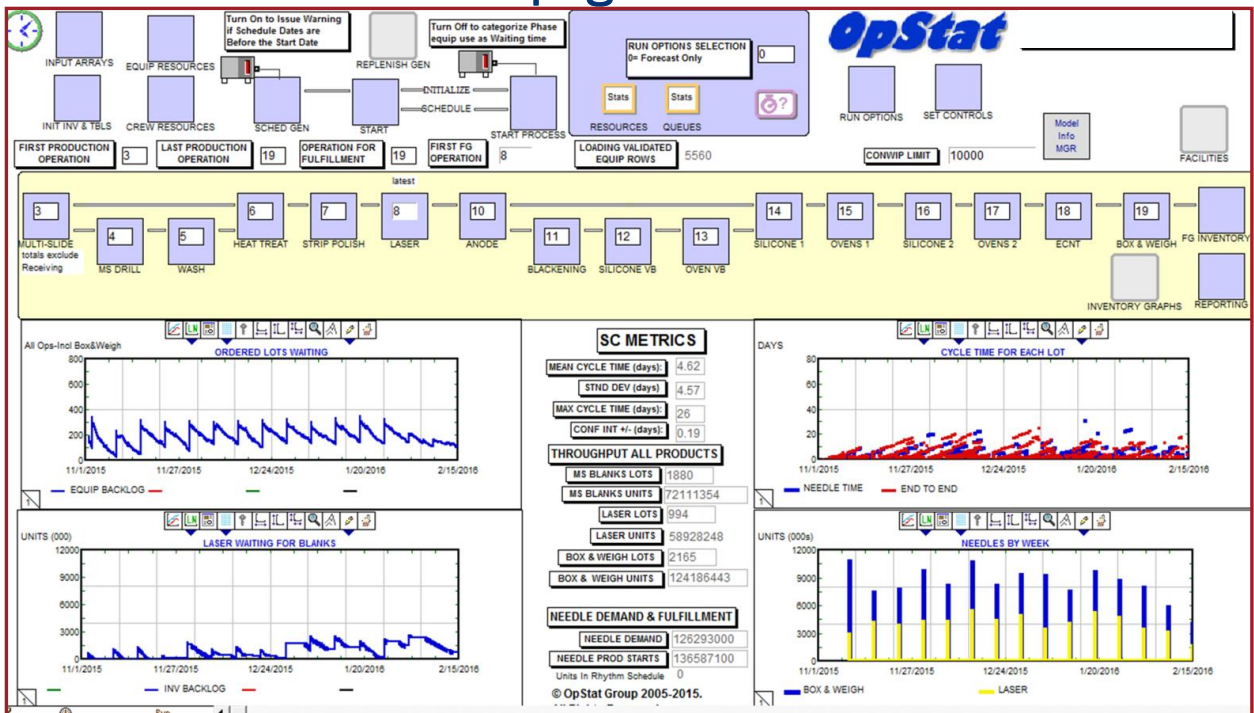
Inputs:

- Demand
- BOM
- Routes
- Processing Times
- Change Over Matrix
- Yields
- Working Schedule
- Product Attributes
- Mfg. Rules
- Rhythm Wheels

Output:

- Synchronized Schedule on a Calendar format
- Machine Utilization
- Bottleneck views
- Projected Pipeline Inventory
- "All you can think" in terms of reports...

Snapshot of the model front page



One level down from the front page

The screenshot displays the OpStat software interface for a production line. The top section includes summary statistics for throughput, lots completed, and lots waiting. A central table shows equipment utilization for 10 different machines, categorized by 'IN USE', 'CLEAN', 'RECOM', and 'DOWN'. To the right, a detailed table lists arrival dates, product codes, and lot sizes for various production runs. Below these are sections for 'WAITING FOR MATERIALS AT END OF RUN' and 'TOTAL WAITING FOR MATERIALS DURING RUN', which includes a line graph showing inventory backlog over time. At the bottom, a process flow diagram illustrates the material flow from input to output, including stages like 'HOLD MATERIALS', 'INITIALIZE', and 'SUMMARY', with various control points and switches.

OpStat

WAITING FOR MATERIALS AT END OF RUN

Arrival (days)	Prod Code	Product	TimeSchdStart	ProdOutCode	ProductComp	CombinLotID	LotSize	Input
0	42	991100464	294	7	991100735	535	85	91685
1	42	991100029	31	7	991100837	637	90	292357
2	42	991100034	35	7	991100000	400	92	897799
3	42	991100049	289	7	991100033	433	90	143374
4	42	991100052	332	7	991100072	372	103	190223
5	42	991100044	344	7	991100856	456	132	20000
6	42	991100051	351	7	991100787	567	134	20000
7	42	991100053	353	7	991100771	571	143	109306
8	42	991100002	302	7	991100044	444	118	32348
9	42	991100018	318	7	991100072	472	154	96671
10	42	991100018	318	7	991100073	473	155	24476
11	42	991100046	296	14	991100786	596	191	140798
12	42	991100015	17	14	991100788	588	192	65336
13	42	991100032	34	14	991100001	401	193	29683
14	42	991100018	318	14	991100074	474	203	79263

TOTAL WAITING FOR MATERIALS DURING RUN

LOTS

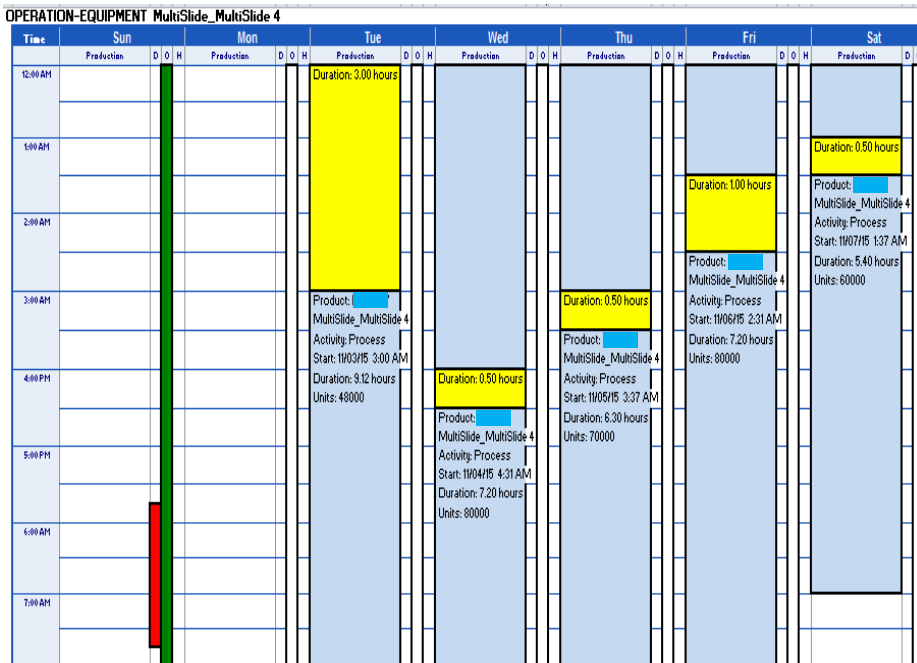
3/15/2015 3/25/2015 4/5/2015 4/15/2015 4/25/2015

— INV BACKLOG —

— LASER / ANODE WAITING FOR BLANKS —

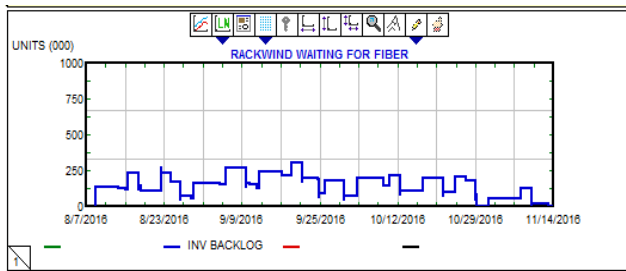
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Schedule view output



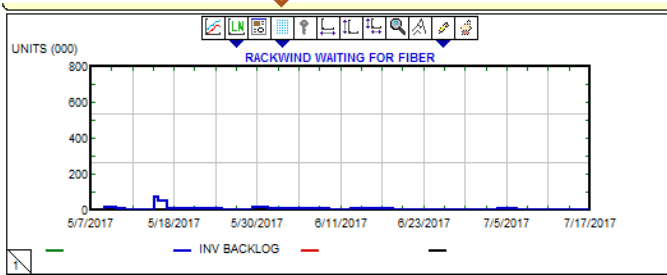
1. Schedule takes into account the best sequencing following a pre-defined rhythm wheel
2. Respect manufacturing best practices, such as MOQ's, Max number of change-Overs, etc.
3. Takes into account a change-over matrix to properly account for the timing of each operations
4. Generate a "by-the-hour" schedule in a calendar format
5. Enables the planning for preventive maintenance

Bottlenecks can move – Equipment and Inventory

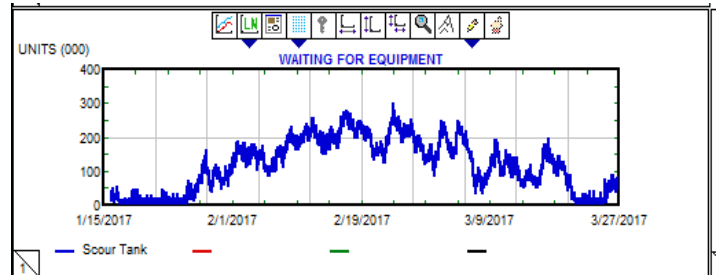


1. Original key issue was availability of Fiber from Extrusion operation constraining the flow.

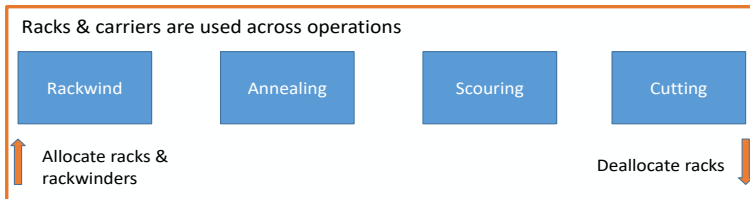
2. Solved the Extrusion problem with scheduling



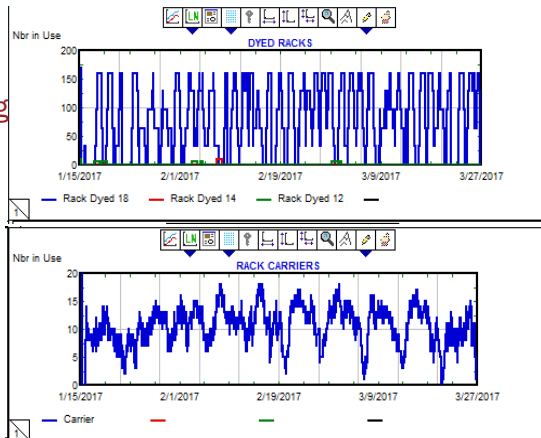
3. The Scouring constraint became clear.



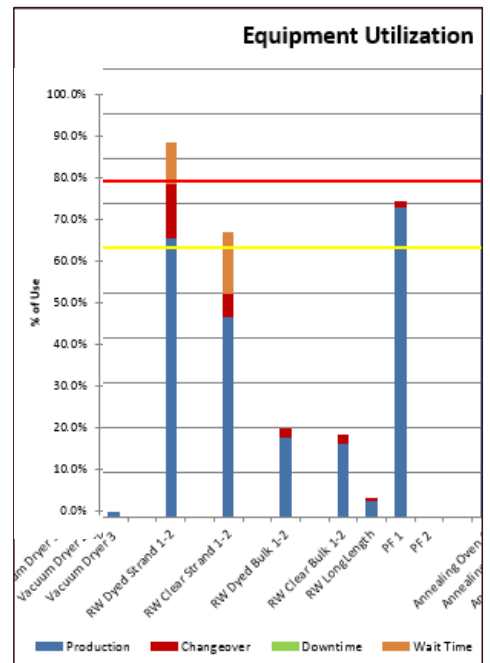
Equipment backlog and utilization tracked



Each piece of equipment is tracked during run



Utilization projections include:
 -Production,
 -Changes,
 -Waiting,
 -Downtimes



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Lessons Learned

1. The model is as good as the quality of the master data loaded into it

For certain areas, time studies were necessary, while for other, a good estimate was enough

2. Planners significantly increase their understanding of manufacturing complexities

Manufacturing interdependencies and the trade-off of parameters become extremely clear for planners

3. Don't underestimate the importance of change management

The models enables clear exposure of operational gaps by comparing actuals vs. plans.

Manufacturing must see the value of such initiative and partner during the solution implementation to minimize resistance



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Questions?

The logo for APICS 2017, featuring the text "APICS2017" in white on a red background. The number "0" is replaced by a stylized white star or compass rose icon.

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APICS 2017 Session Evaluation

A large, abstract geometric graphic on the left side of the page. It consists of several overlapping, angular shapes in shades of white and light gray, creating a 3D effect. The shapes are set against a solid red background.

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THANK YOU

