How Digital Twin Applications Create Real Results for Small Manufacturers
The one thing that would change the way you manufacture product.
Heuristic Decisions

Production Plan
CapEx
Bottlenecks
Resource Allocation
Inventory Planning
The Leadership Cost of Less Than Optimal Decisions

We’re running under capacity.
We’re inefficient.
We’re working harder, and still missing deadlines.
We’re spending more, and still missing our goals.
Our cash is tied up in inventory.
Why is it difficult to predict the future of your system?

Time
Variability
System Interactions
Modeling the real world.

The Model → The modeled solution

Virtual World – Risk free space

The Real World

The System → The solution

Digital Twin

Production Plan
CapEx
Bottlenecks
Resource Allocation
Inventory Planning
Simulate The Entire Business Lifecycle

Strategic level: Market, competition, product portfolio

Large scale logistics: Supply chains, GIS-based models

On-site & smaller scale logistics: Trucks, trains, pipelines, tanks

Physical level: Material handling, factory floor, pedestrian
Simulation & Digital Twin
Moving a Simulation Model to a Digital Twin

Integrate models with your operations software

• ERP
• MRP
• BI
• In-House Applications
Case Studies
Typical Solution

Inputs
User Interface

Model

Output Dashboard
Responding to Manufacturing Demand Increase

Small manufacturing company with a large increase in demand
The process is inefficient
Overtime costs are growing
Unable to staff in difficult labor market
Responding to Manufacturing Demand Increase
Responding to Manufacturing Demand Increase

Man Power
Day Staff: x34
Evening Staff: x11

Workstations
- STOCK
- SEMI - FRAMING
- SEMI - ASSY
- CUSTOM
- INSPECTION
- REWORK

Variable demand
Daily and weekly demand variations

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Responding to Manufacturing Demand Increase

Order list
Labor availability
Control logic
Quality data
Automated decisions

ROCKY MOUNTAIN CABINETRY

MONDAY Order 10-29 14:00:35

Key performance indicators (KPI):
- Number of completed orders
- Overtime hours required
- Workers’ Utilization
- Dynamic recommendations

Widget Simulation Model

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Responding to Manufacturing Demand Increase

Order Sequencing
- Various possible heuristics
  - Sort by due date (Standard in this business)
  - Custom heuristic

Workers Assignments
- Rework by a dedicated worker Vs. On assembly lines
- Weekly or Daily optimal assignments

Assembling Strategy
- Custom line making other product types orders
- Balance semi-custom framing & assembly lines
- Application of a sampling plan
### Scenario Comparison

<table>
<thead>
<tr>
<th>Method</th>
<th>Reduction on weekly overtime needed (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use designed sequencing</td>
<td>57</td>
</tr>
<tr>
<td>Dedicated reworker</td>
<td>38</td>
</tr>
<tr>
<td>Daily assignment</td>
<td>15</td>
</tr>
<tr>
<td>Balance Semi-Custom operations</td>
<td>15</td>
</tr>
<tr>
<td>Balance stock assembling</td>
<td>14</td>
</tr>
<tr>
<td>Custom making other types</td>
<td>3</td>
</tr>
</tbody>
</table>

The **Experiment Plan** identified two solutions that had a **significative impact** on reducing Overtime Hours.

#### Experiment Plan Key Points:

- **Objective**: Minimize overtime needed
- **Automate and ease analysis of simulation results**
Responding to Manufacturing Demand Increase

Impact on production throughput (cabinets/week)

Gain of 105 units weekly

**KPI Results**

- Avg. human resource utilization: 84%
- Overtime Reduction Cost: ~40%

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**Graph**

- Base Case Scenario: 369 cabinets per week
- Optimized Scenario: 474 cabinets per week

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Warehouse and Robotics

Warehouse Simulation
Supply Chain

Build Larger Models With Ease
Simulate The Entire Business Lifecycle

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We help manufacturers make data driven decisions with simulation and digital twin.