

Database-centric Production Control Systems

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GLOBAL PRODUCT DATA INTEROPERABILITY **S U M M I T** 2017



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Biography

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Matt Thorn is a Product Manager for Composites Manufacturing at Autodesk. He received his BS in mechanical engineering and mathematics from Rutgers University and Stockton University respectively after completing a 5-year dual degree program. Matt began his expertise in advanced manufacturing with Magestic Systems, a company that was then acquired by Autodesk in July 2014. With the Tru product portfolio, Matt continues to innovate in the composite hand layup and automated layup industries.

Overview

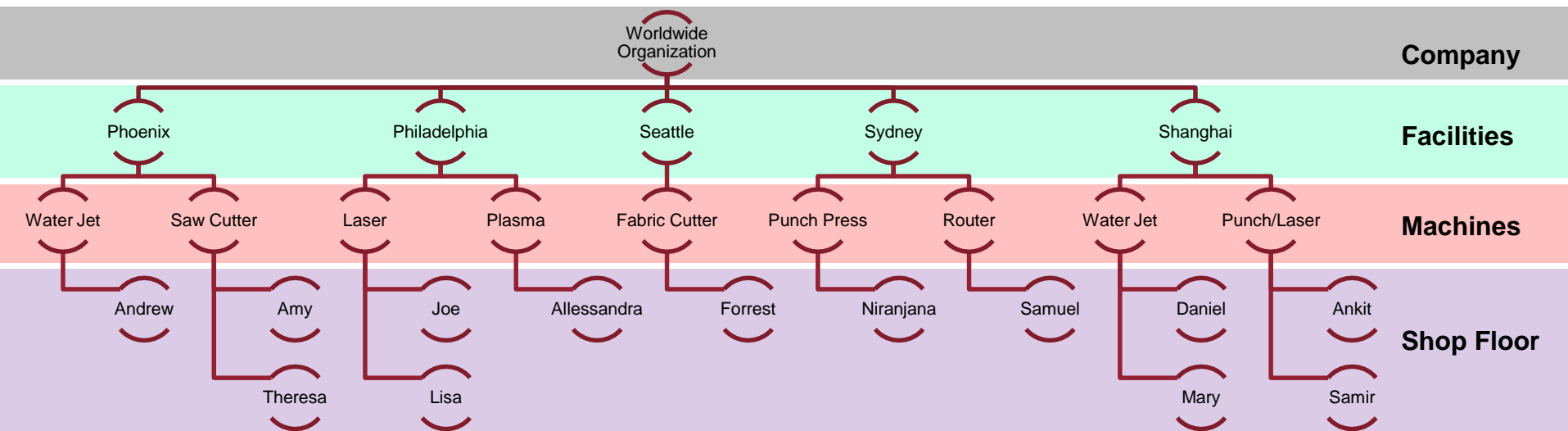
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- **Enterprise Production**
- **Material Asset Tracking**
- **“Lights Out” Automation**

Enterprise Production

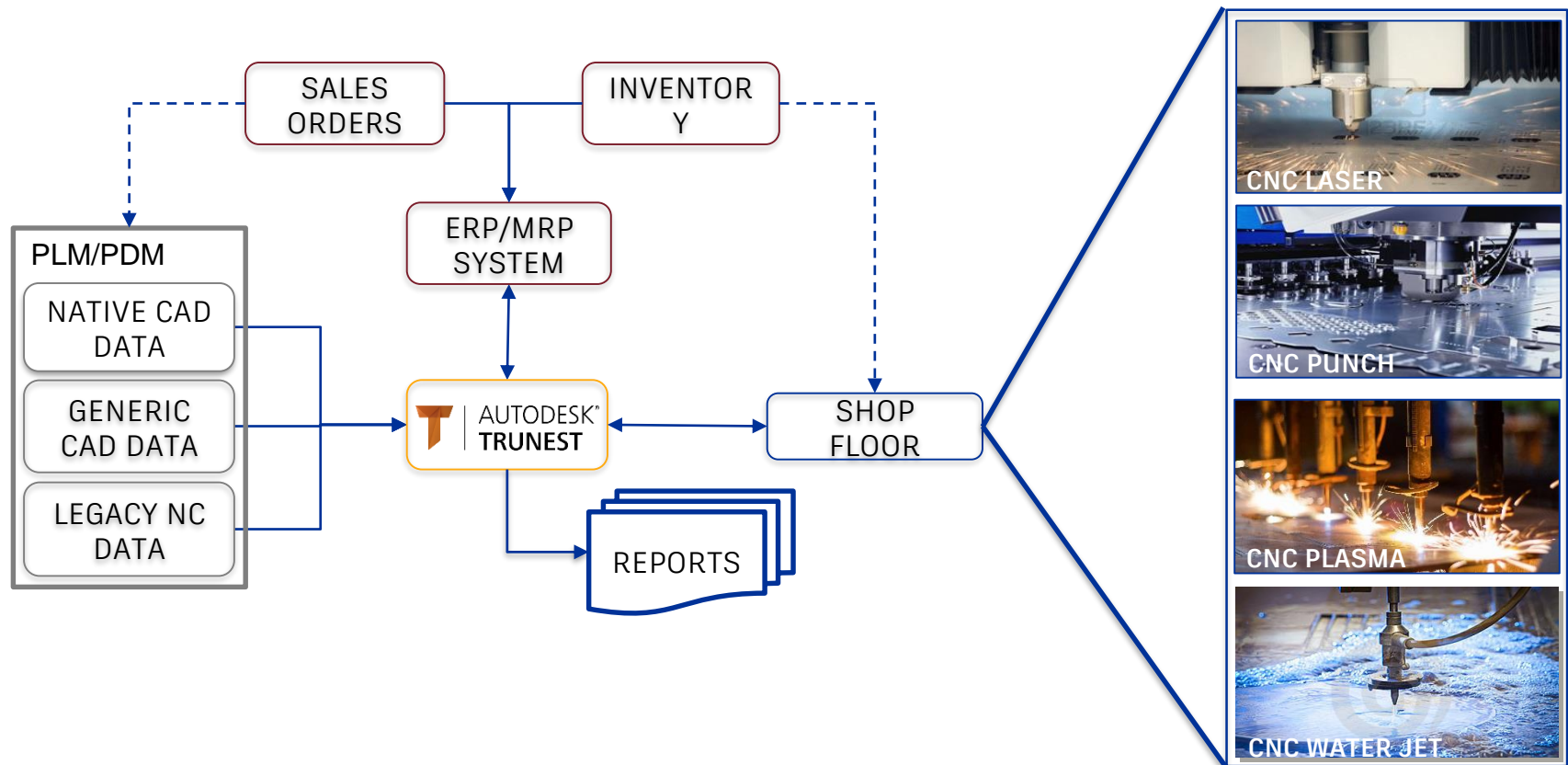
Enterprise Production Hierarchy

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Enterprise Production Workflow

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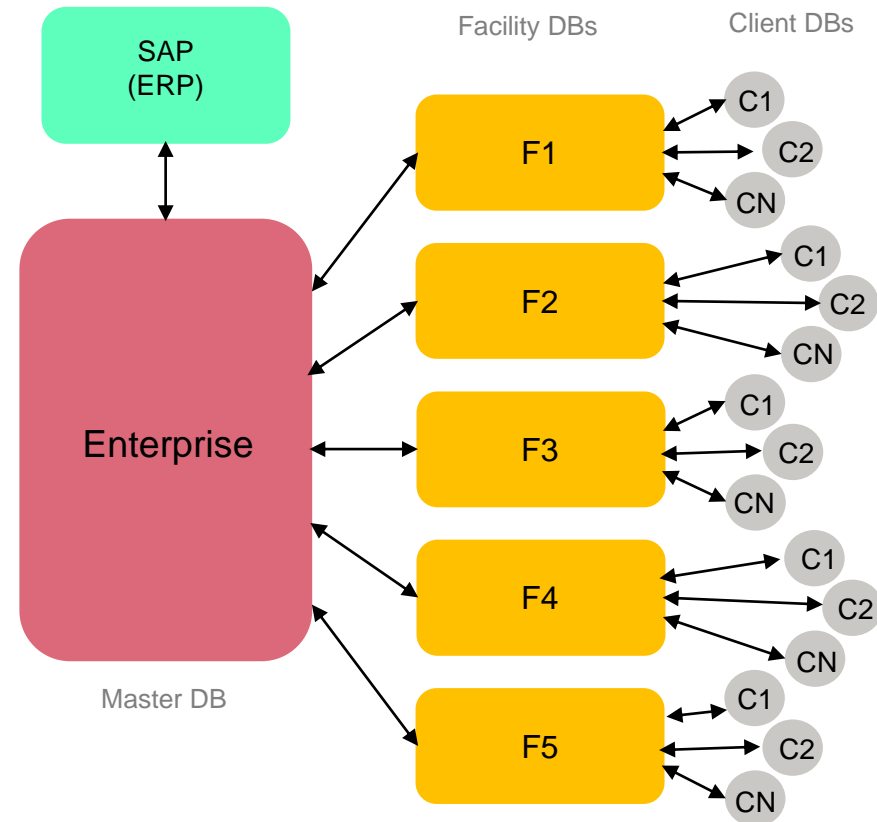




Database Architecture

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- SAP feeds Job Order and Inventory Info
- Master DB distributes information to each facility
- Client DBs filter out Role Specific data into unique client environments



Enterprise Role Representations

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Business



Engineering



Production



Enterprise Role Responsibilities

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Business



Setting up business rules

Foreign Keys

- Set up Facilities and Machine Groups

Machine Management

- Set up Machine List, Mach Groups, Facility, Mach Info, Mach Settings
- 20 machines at Auburn facility
- MGroups need to match SAP nomenclature
- Need to procure Mach Info data from Boeing

Facility Staging Tables

- Material, Inventory, Production Order, Pick Request, Pick Confirmation
- All read-only

Enterprise Role Responsibilities

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Engineering



- Setting up feeds, speeds, nesting defaults, importing NNS
- Foreign Keys
- Set up Facilities and Machine Groups

Enterprise Role Responsibilities

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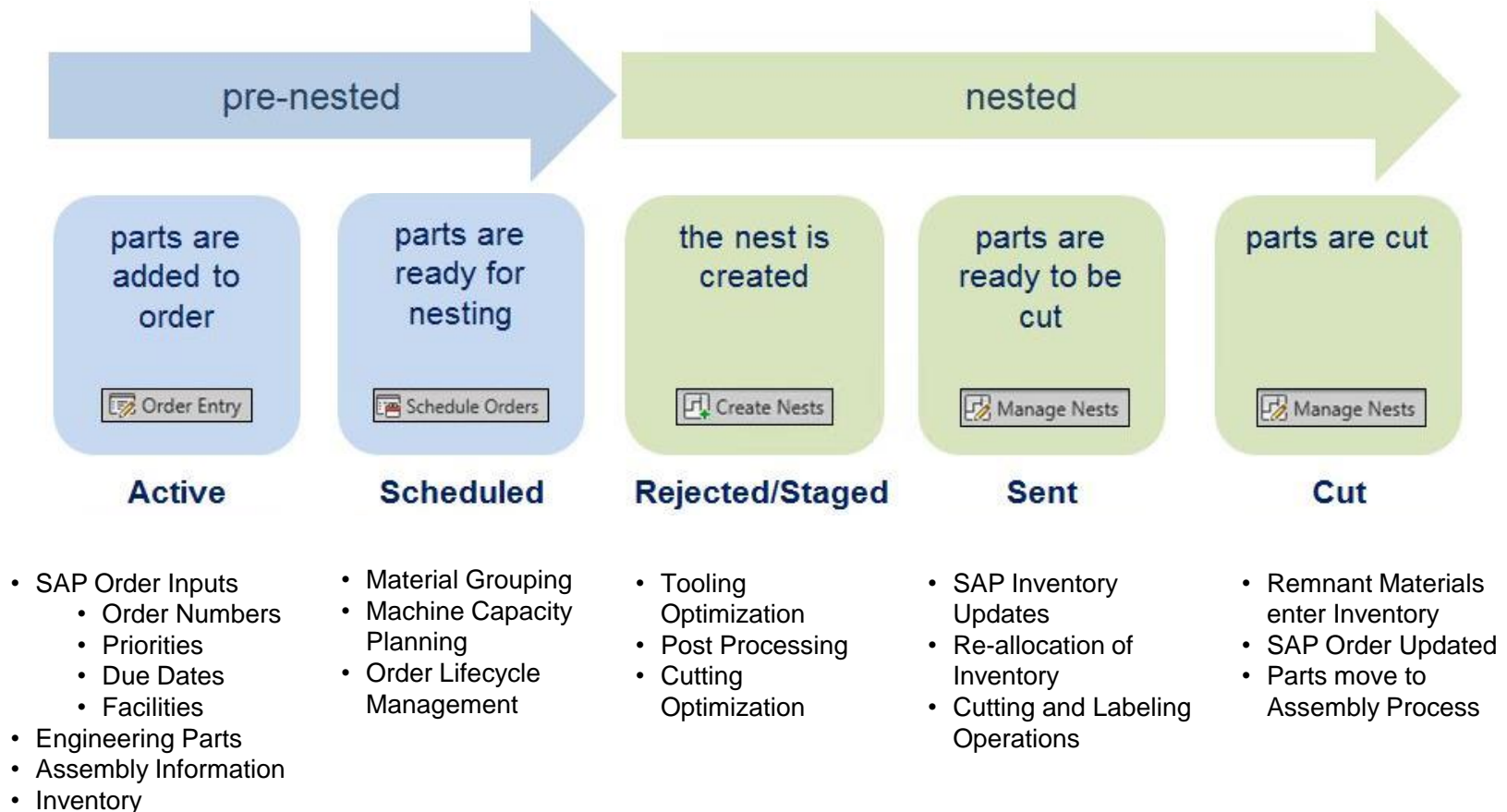
Production



- Visualize everything sent to machine (SENT status)
- Receives Nest Plot (with barcode) and plates from inventory
- Tracking and documenting cutting operation from start to finish
 - Partial or Complete cut
- Reviewing nests
- Editing machine selection for nests as required
- Reposting for new machine
- Sending new NC to machine

Nest Lifecycle

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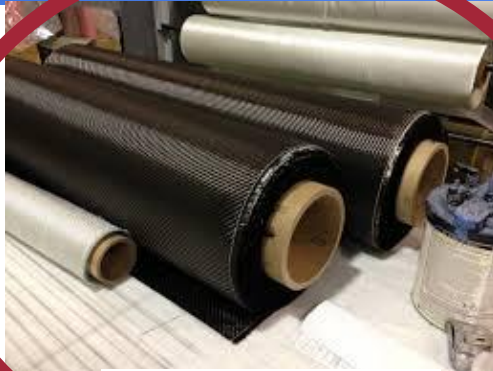
Material Asset Tracking

Materials

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Coils



Carbon Fiber



Concrete



Metal plates



Grating



Honeycomb/sandwich panels



Honeycomb



Fiber Glass



Foam



Bars – Extrusions - Rods



Material Asset Tracking

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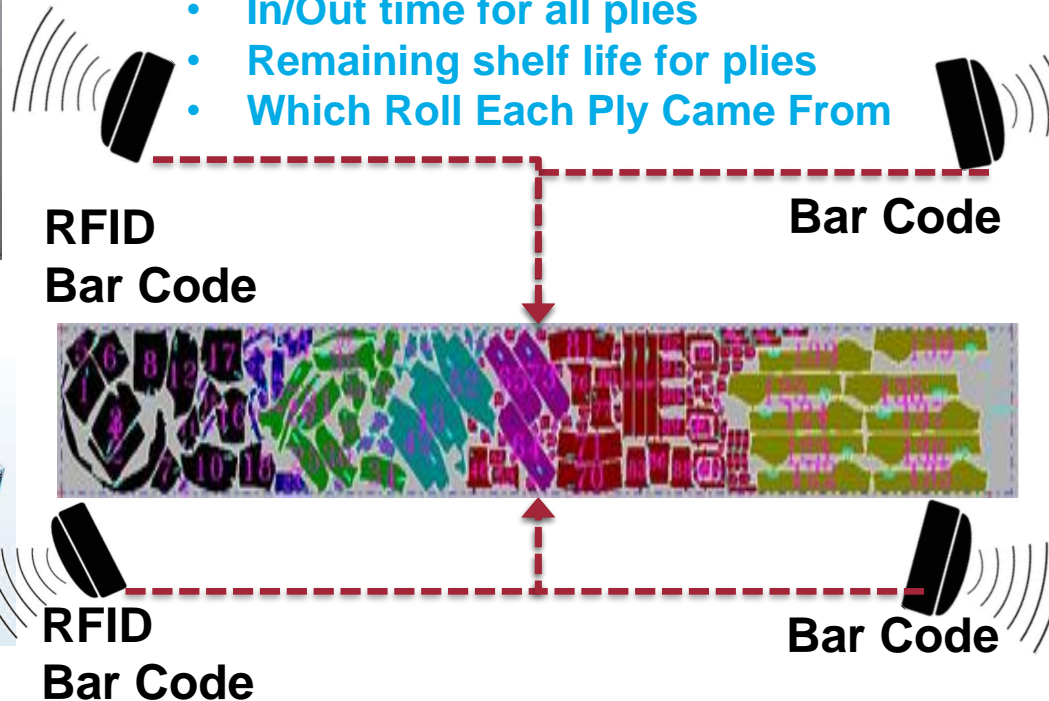
Freezer



Cutting



- Expiration dates for all plies
- In/Out time for all plies
- Remaining shelf life for plies
- Which Roll Each Ply Came From



Autoclave

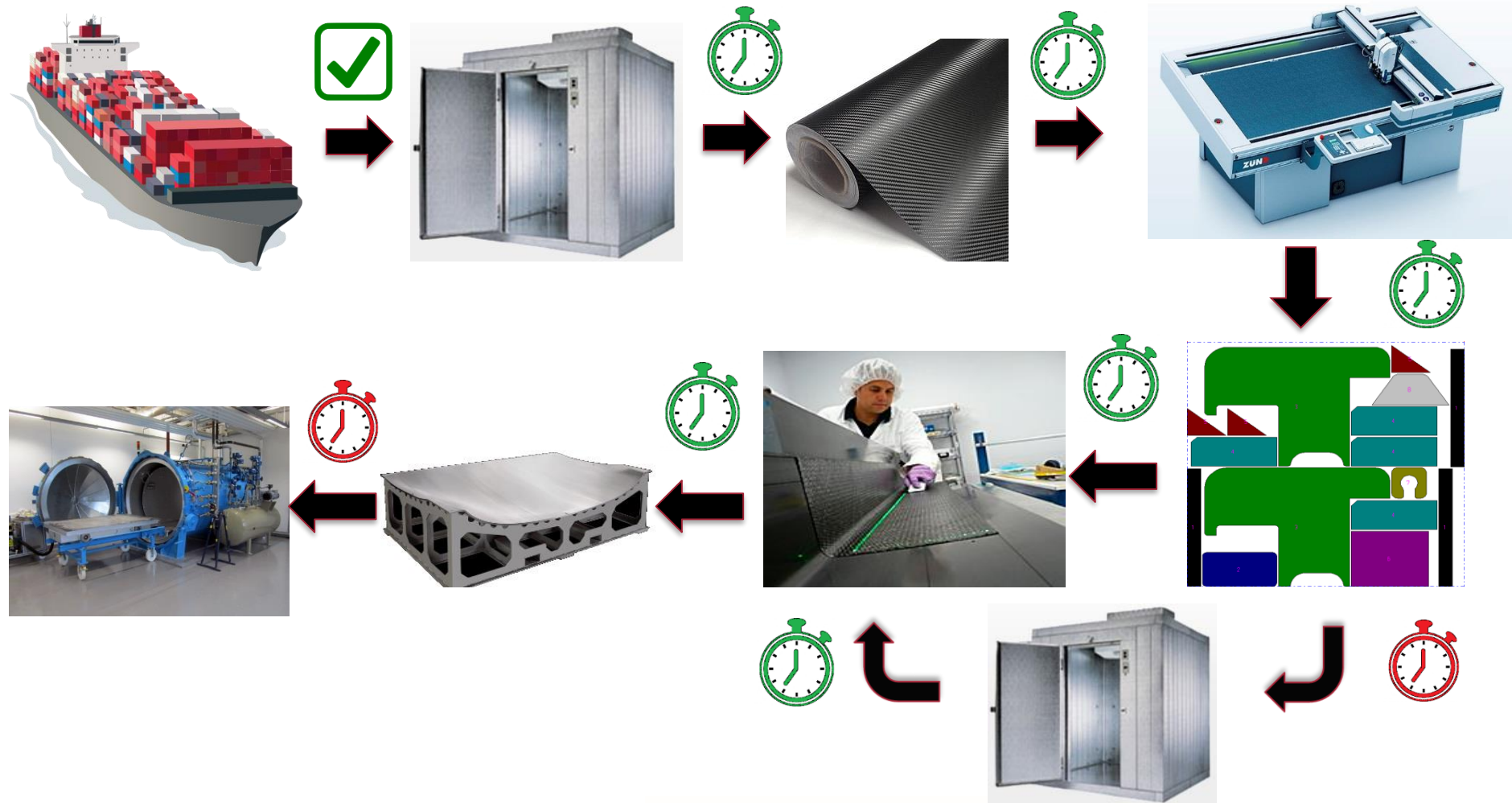


Layup



Workflow for Material Asset Tracking

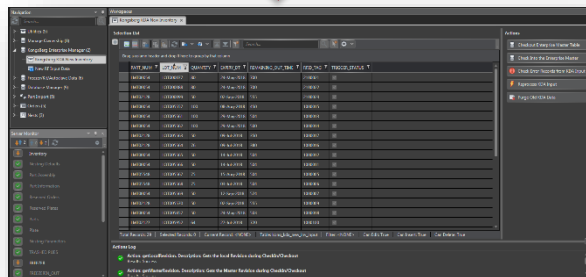
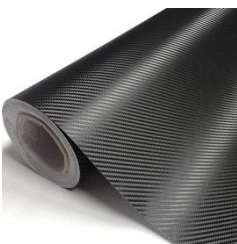
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Material Storage

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	A	B	C	D	E	F
1	Roll name	Material	Quantity	Width	Time remaining	Expiration date
2	ATP000001	2ZZZ8v96de	100	1270	222	12/31/2016
3	ATP000002	2ZZZ8v96de	60	1270	162	12/31/2016
4	ATP000003	2ZZZ8v96de	90	1080	992	12/31/2016
5	ATP000004	2ZZZ8v96d48	80	1270	264	4/30/2017
6	ATP000005	2ZZZ8v96d48	22	1270	926	4/30/2017
7	ATP000006	2ZZZ8v96d48	109	1080	453	4/30/2017



Freezer station

1. Automated freezer
2. Software driven
3. Feeds data to TruNest

Material Processing

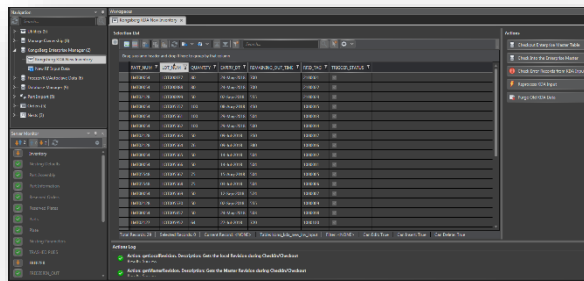
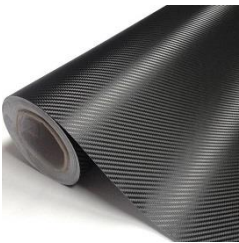
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Cutter station

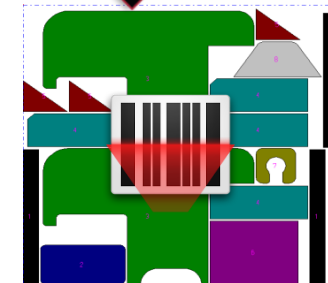
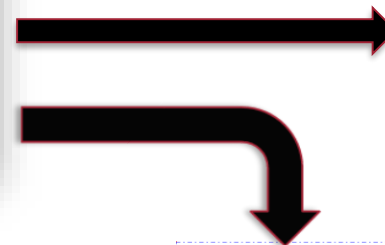
1. Orders from ERP
2. RFID shows roll
3. Post for cutter
4. Bar code label
5. Bag label to printer



1



2



Layup/Assembly

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Layup station

1. Come from cutter or freezer
2. Bar code kit bag
3. Bar code tool
4. Trash / Transfer plies

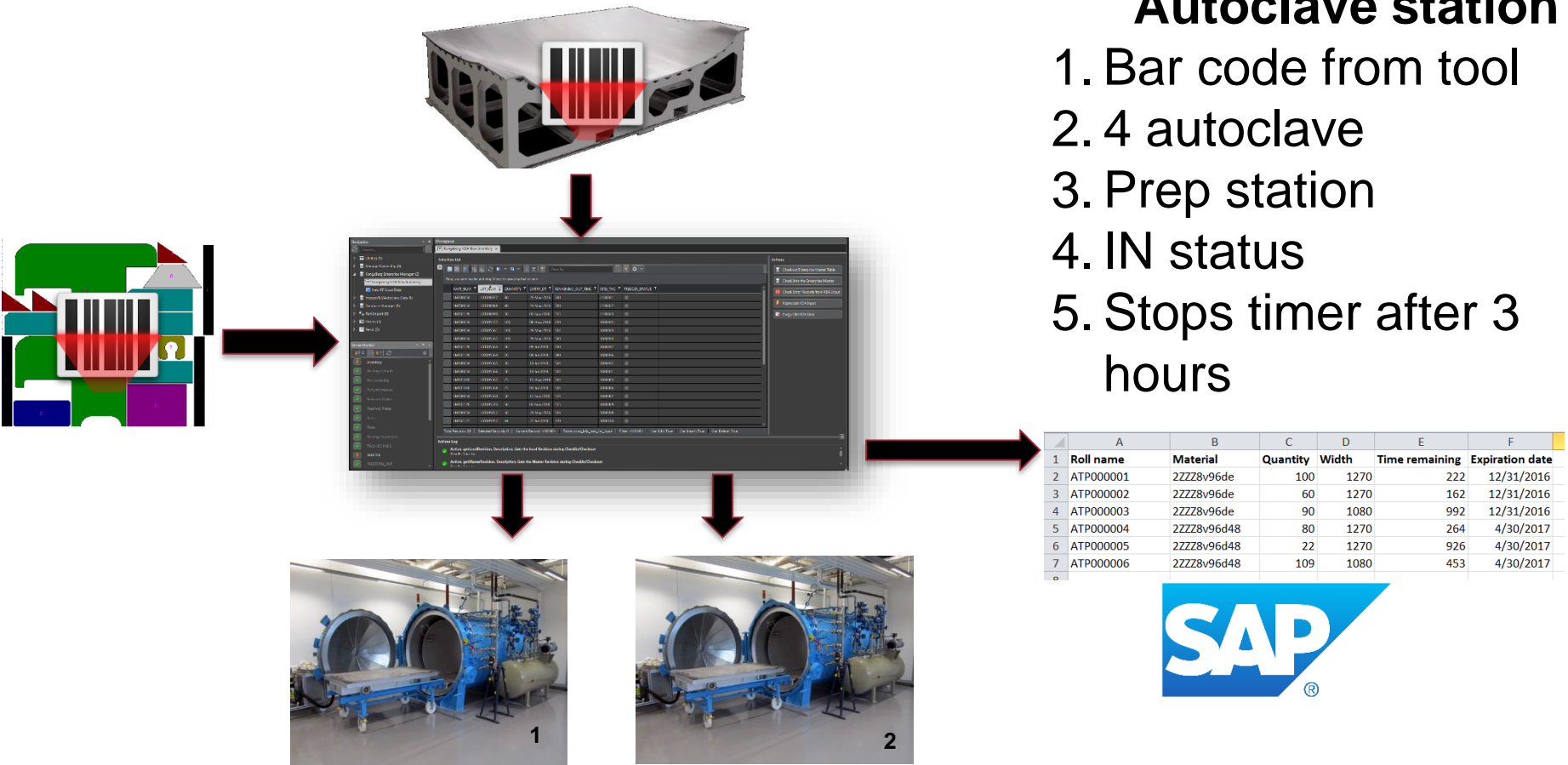


Additional Processing

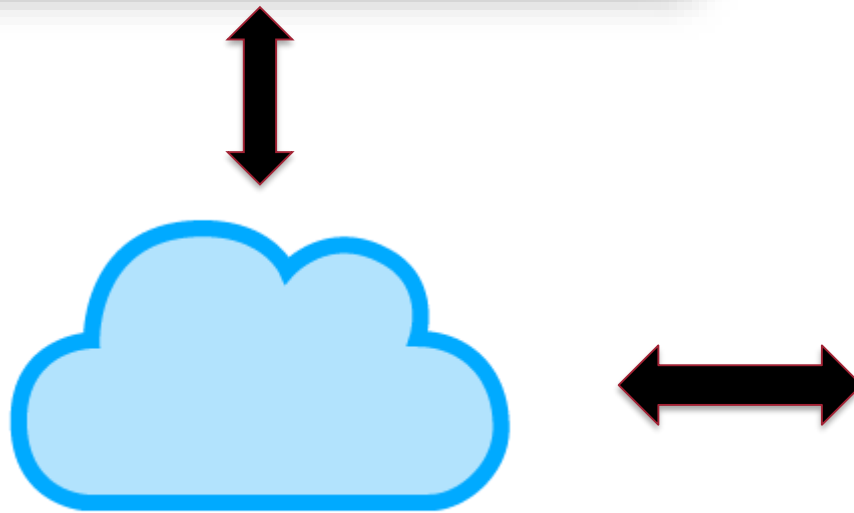
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Autoclave station

1. Bar code from tool
2. 4 autoclave
3. Prep station
4. IN status
5. Stops timer after 3 hours





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[illegible]

Work Instructions in the cloud

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SHOP FLOOR ▾
REPORTS ▾
CREATE ▾
MANAGE ▾

mug-test


EDIT

CLONE

+ CREATE JOB SHEETS









Job instruction: Customer order IMT1638

JI #	End Product	Quantity	WIP Jobsheets	All Jobsheets	Created By	Creation Date
#7008	LMAM23009	1	0	0	Anthony Muzzillo	Nov 10, 2016

Details

One customer order containing all the kits required to create a complete part

TASKS

Task#	Task Name	Workstation	Task Details	Estimated Time
TASK 10	 Remove roll from fre...	Material Freezer	remove roll from freezer. this must be done at le	00:00 hh:mm
TASK 20	 Load roll at cutting t...	GFM Ply Cutter	roll will be loaded on machine holder. this will t	00:05 hh:mm
TASK 30	 Cut nest on material ...	GFM Ply Cutter	Load NC file for order that corresponds to roll on	01:00 hh:mm
TASK 40	 Create ply kit bag	GFM Ply Cutter	Operator retrieves plastic bag with label on it fr	00:05 hh:mm
TASK 50	 Unload cut plies to ki...	GFM Ply Cutter	each ply is scanned with bar code reader as it is	00:10 hh:mm
TASK 60	 Trash / Transfer plies	GFM Ply Cutter	Any plies that were not cut correctly are scanned	00:10 hh:mm

Shop Floor Management in the cloud





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 SHOP FLOOR ▾ REPORTS ▾ CREATE ▾ **MANAGE ▾**

mug-test 

Manage > Workstations



	Workstation Name	Description	Modification Date	Creation Date
	Material Freezer	Robot controlled for original material roll (lot), or ply kits	Nov 7, 2016	Nov 7, 2016
	Autoclave station	Autoclave 1	Nov 7, 2016	Nov 7, 2016
	Hand Layup Station	Station in clean room with laser projection assist. Data fed by TruPlan	Nov 7, 2016	Nov 7, 2016
	GFM Ply Cutter	Static bed AGFM-30	Nov 7, 2016	Nov 7, 2016

“Lights Out” Automation

Automation Frameworks

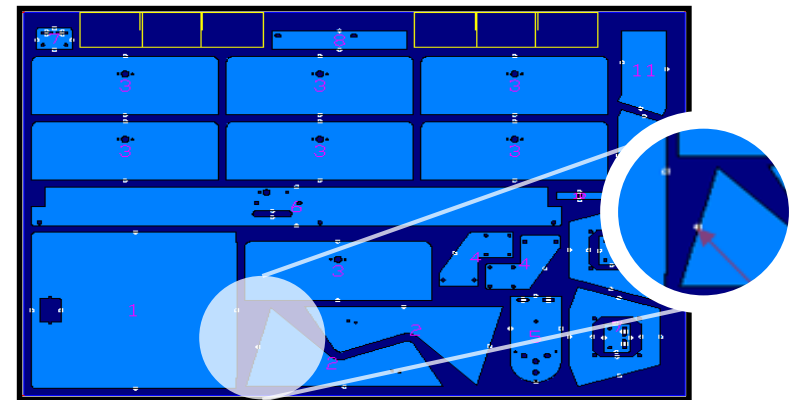
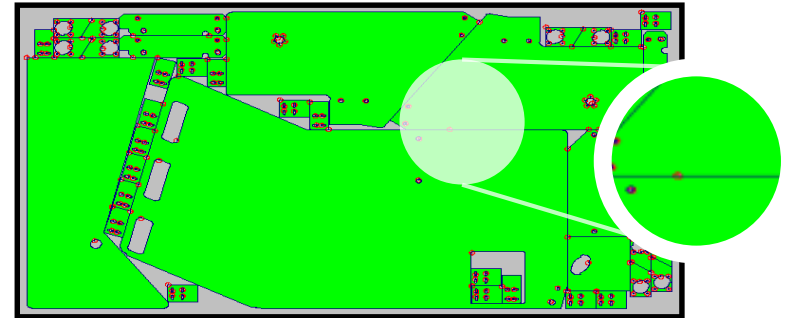
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- **Nesting and Cutting Optimization**
- **Tooling Automation**
- **Software Automation Utilities**

Nesting and Cutting Optimizations

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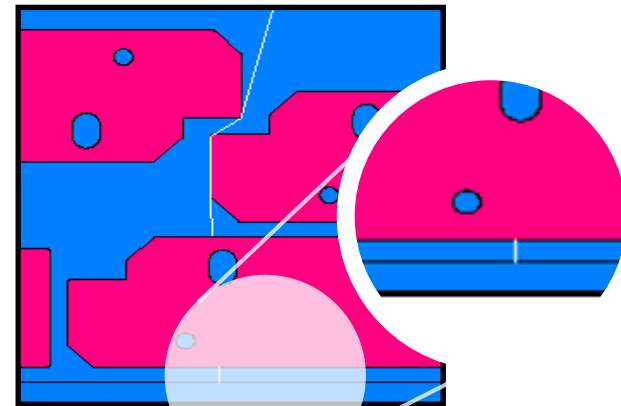
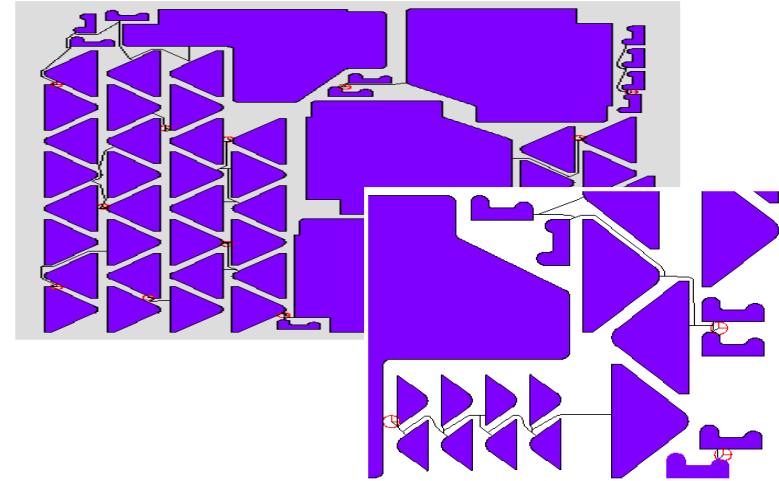
- Common Line Punching
- Automatic Part Tabbing
- Nest Around, Above, or In Clamp Zones
- Automatic Clamp Repositioning
- Skeleton Cutting
- Detect & Destruct Floating Scrap
- Leverage Special Tooling
- Embossing & Labeling
- Reduce Number of Tool Changes
- Remnant Tracking



Nesting and Cutting Optimizations

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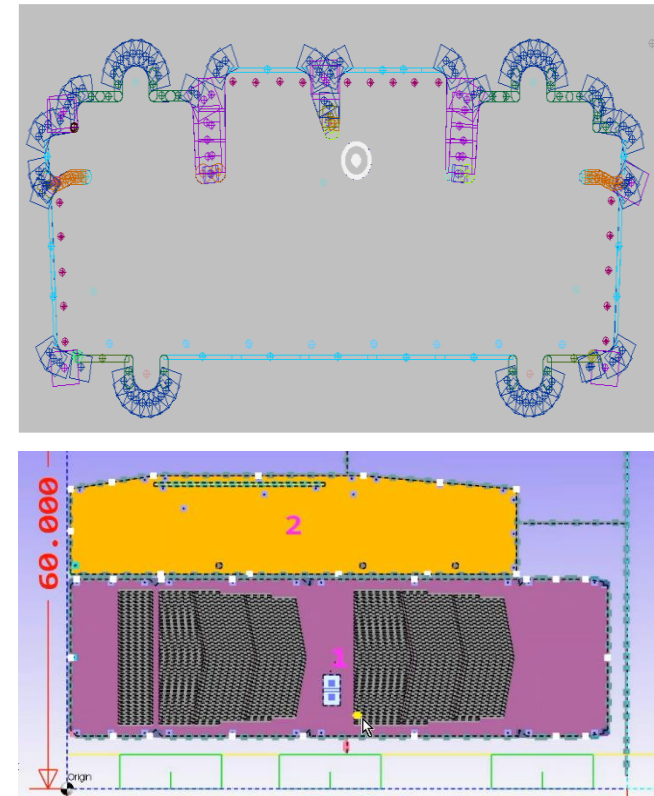
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On The Fly Programming

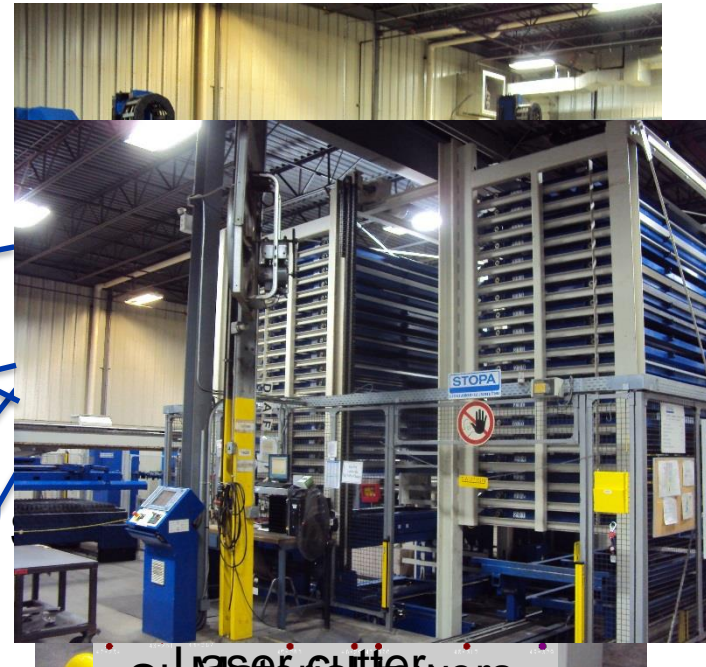
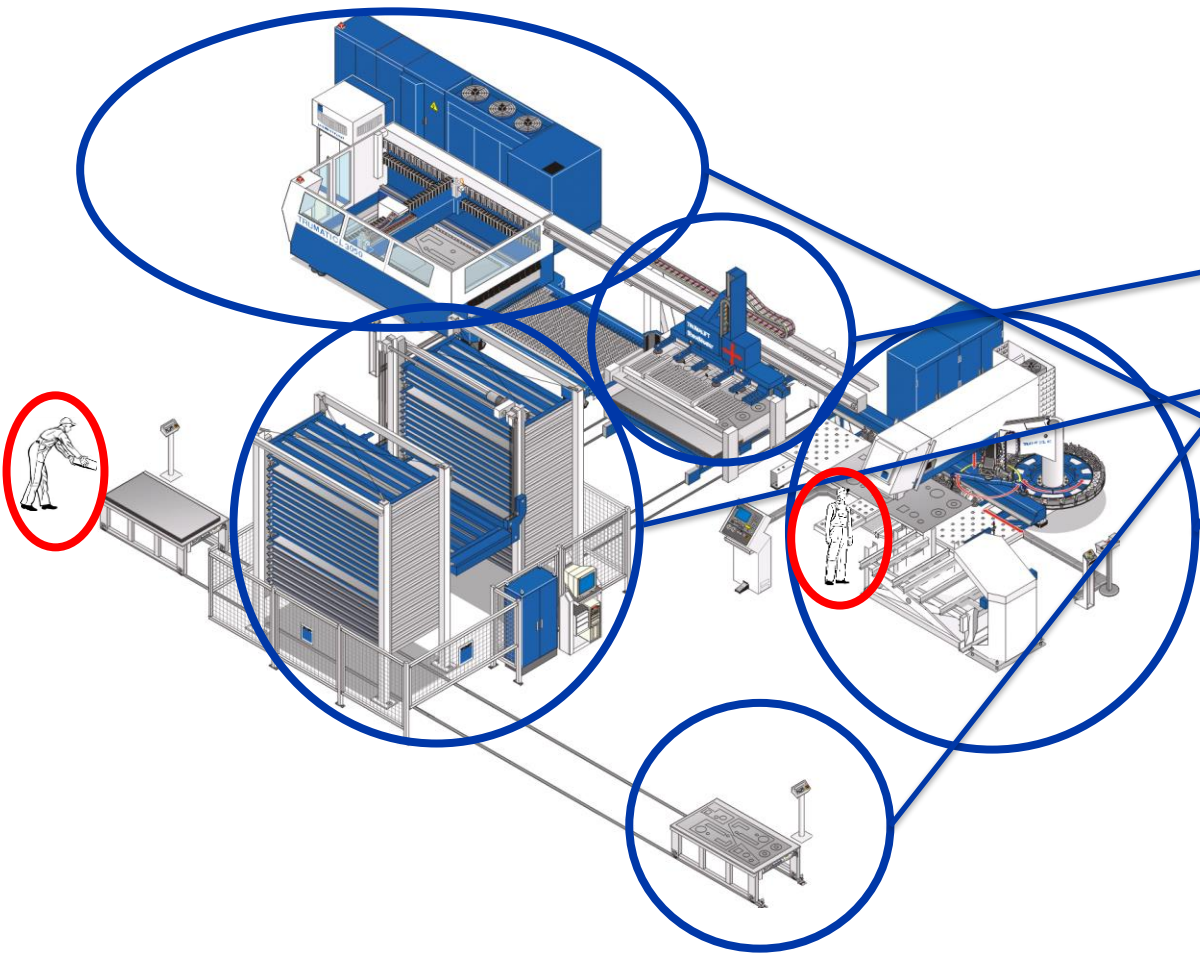
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Cutting machines: self contained factory

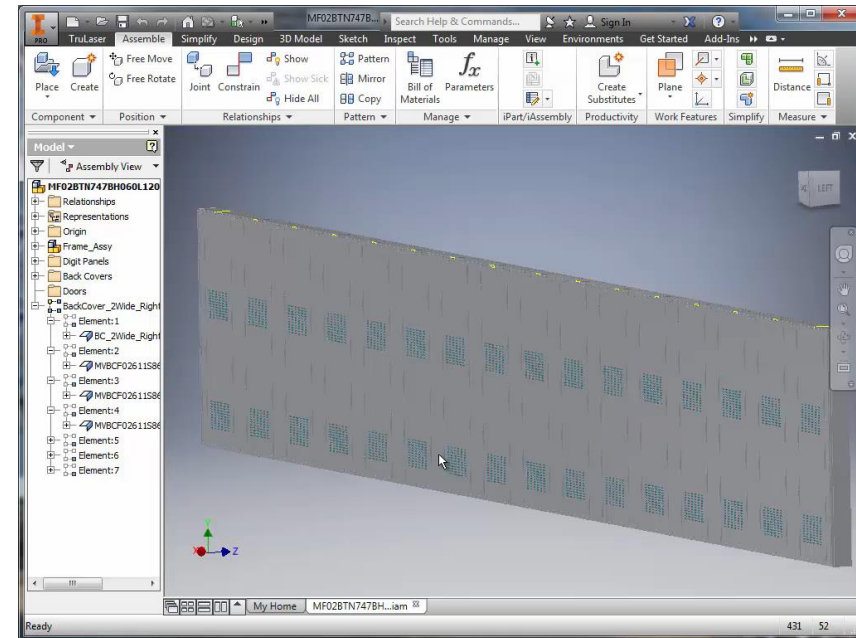
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Laser cutter
Sheet metal removal
Punch machine

Software Automation Utilities

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Questions?

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