



## CASE STUDY

# Lean Ops & Supply Chain

## Chemline

### ■ PROBLEM / CHALLENGE

This polyurethane manufacturer had grown quickly but had significant manufacturing and supply chain challenges that affected quality, inventory and on-time delivery. The company was good at quick-reaction fixes to problems but not sustainable improvements.

The CEO estimated the operations & supply chain problems were costing \$3 - \$4 million a year in lost profit.

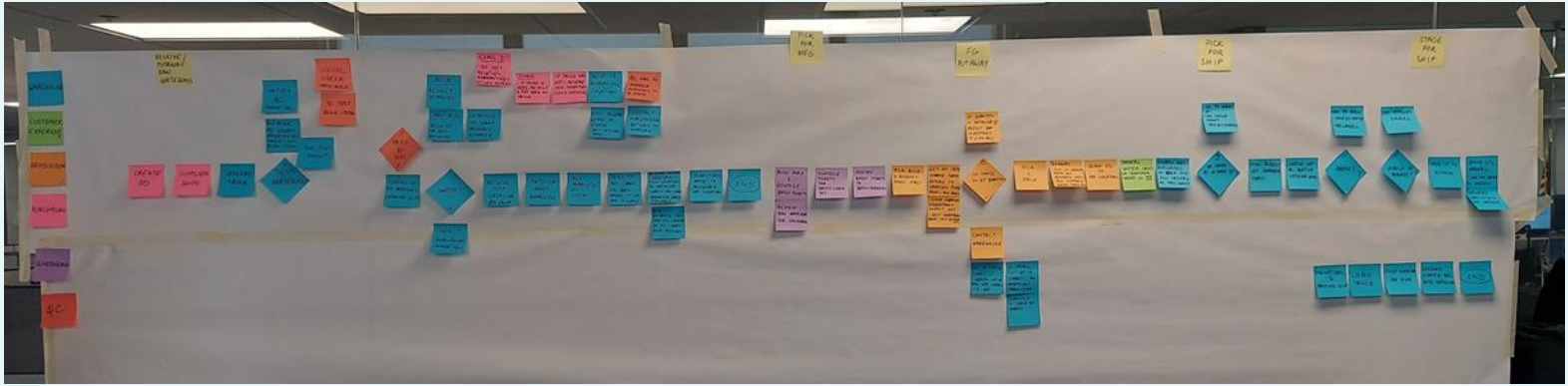
### ■ Lean Assessment - Value Stream Analysis

The first step of eliminating waste, increasing throughput and reducing costs in operations and the supply chain is to Value Stream Map across the “Plan – Source – Make – Store – Deliver – Return” processes. The analysis identifies the wastes and quantifies costs while highlighting redundancies and gaps.

### ■ VALUE STREAM MAP DETAILS

- **Lack of Aligned and Actionable Performance Metrics**
  - The company had many dashboards but did not have metrics owned by the key operating departments (Purchasing, Prodn, WH, Quality, Customer Service, R&D)
- **No Quantification or Root Cause Analysis of Cost-of-Poor-Quality**
  - Quality was a chemistry function that carefully checked chemical properties but there was no focus on root cause of defects in production or at customers operations
- **Lack of a Demand Forecasting or Inventory Strategy created ad-hoc stocking policies**
  - Scheduling was reacting to orders or to informal stocking agreements
  - Purchasing was ‘fighting’ numerous stockouts of raw materials
- **Communication between Sales and Ops / Supply Chain was informal**
  - There was no way to systematically communicate changes in future customer demand
  - New products with new raw materials were not communicated to Purchasing creating last-minute scrambling
- **Warehouse Layout was Unproductive**
  - Extra movement required to pick items
  - Poor utilization of space

## ■ PROCESS FLOW MAPPED PURCHASING-WAREHOUSE-SHIP PROCESS



## ■ SKU CLASSIFICATION ANALYSIS

SKU Class	Count	% of Total	Orders	% of Total	Pounds	% of Total	GM\$	% of Total
FG1	145	3%	5920	55%	18,095,936	70%	\$ 27,585,189	68%
FG2	192	4%	2135	20%	3,918,224	15%	\$ 6,488,929	16%
FG3	258	5%	1625	15%	2,001,852	8%	\$ 3,084,362	8%
FG4	552	10%	1073	10%	1,846,529	7%	\$ 3,435,614	8%
FG5	4151	78%	85	1%	61,036	0%	\$ 94,877	0%
	5298	100%	10838	100%	25,923,577	100%	\$ 40,688,971	100%

Orders, Pounds and GM\$ data hidden for confidentiality

## ■ FOCAL IMPROVEMENT AREAS

- **Inventory**
  - Created machine learning demand forecasting model
  - Classified all finished goods (FG) and raw materials (RM) into SKU classes
  - Implemented MRP with calculated safety stock based on SKU class and produce-to-forecast
- **Integrated Business Planning (IBP/S&OP)**
  - Implemented 'IBP Lite' at this mid-size company to increase communication with minimum bureaucracy
  - Focal areas:
    - Sales Reps adjusting model-forecast based on insights from customer ordering
    - New customers and new products
    - Capacity constraints at suppliers
- **Quality / Cost-of-Poor Quality**
  - See details on last page

## ■ QUANTIFIED RESULTS

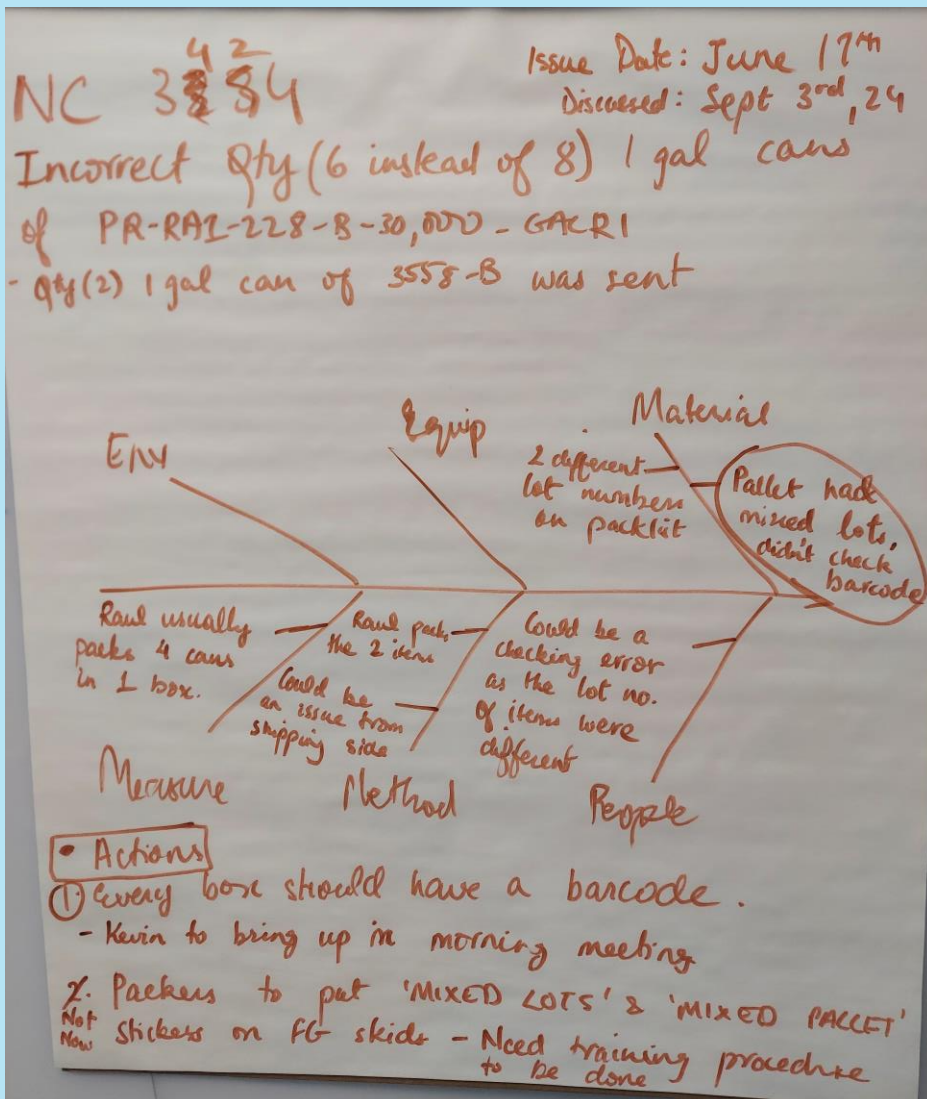
- **Implementing Quality Improvements increasing 1<sup>st</sup> Pass Yield from 81.3% to 94.3%**
- **Increased on time delivery from 67% in February 2024 to 97% February 2025**
- **Increased FG inventory turns from 9.7 in February to 13.5 in September**
- **Shipping errors reduced from average 2 per month to 0 for last 6 months**
- **Reduced Manufacturing overtime from 14.3% to 9.6%**

Reference: Tim Donohoe, COO  
TDonohoe@chemline.net

# ROOT CAUSE ANALYSIS OF DEFECTS AND CUSTOMER RETURNS

Bad Batch Date	Batch Maker	Formula	Busin... Area	Quanti... (#s)	Issue with Batch	Notes	Status	Action Item Status	Root Cause Category	Corrective Action(s)
08/12/24		CC-41400-B-30000-P5PB	CC	1,316	Batch Packer Err	• The batch was calling for 28 pa	Closed	Complete	Operator Error / Procedure	Mitch • Ask Matt to place a n knows the exact amou
08/26/24		IP-I-GC800-A2-30000	IP		Formulation Issu	• For the A side color/haze of the	Closed	Complete	Formulation Issue	Jon • Meet with R&D and r production runs. • Set up a meeting w/J steps for this bad batc
08/26/24 Monday, August 26, 2024		IP-I-GC800-B2-30000	IP		Formulation Issu	• For the B, material would not ci	Closed	Complete	Formulation Issue	Jon • Meet with R&D and r production runs. • Set up a meeting w/J steps for this bad batc
07/17/24		PR-RA1-228-B-30000-GALRI	Intermei		Shipping Error	Highland Tank-NC ordered qty (€	Open		Operator Error / Procedure	Kevin • Notify all packers to j morning meeting.
09/11/24		HC-I-503PM850-A-30000	HC		Equipment Error	Issue: The heating requirements	Open		Production Equipment	Doug • Measure the temp at lost. • Add a local heater to
09/17/24		IP-I-850.8-A-20000	IP		Incorrect Proces	Issue: Pre-blend showed an unu	Open		Operator Error / Procedure	Alan/Davis • Add batch instruction reduce the mix time or Harry • Add in the remarks to Carl • Run a draw down an anything is reacting wi
09/23/24	A.I Talkinton	CC-I-8569-B-10037-M18	CC		Equipment Error	Previous batch had flake glass tr	Open		Production Equipment	This bad batch will be

## CAUSE & EFFECT – ROOT CAUSE ANALYSIS



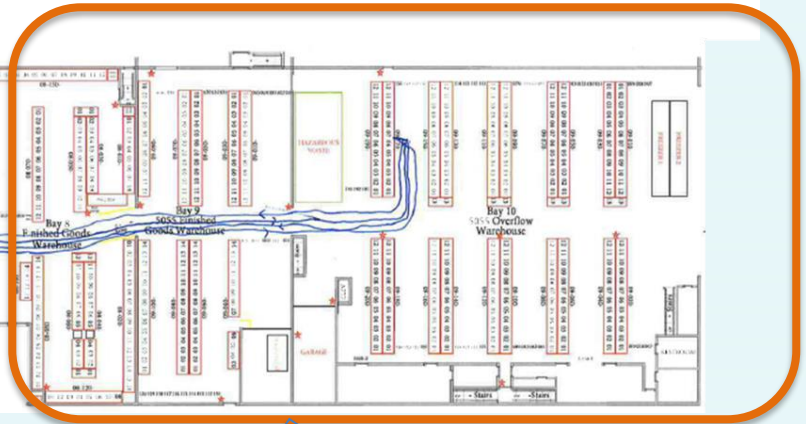
## REDUCING COST OF POOR QUALITY

- Starting in June, developed quick-turnaround root cause analysis meeting for every internal quality defect, customer return or shipping error
  - Included the different stakeholders in the meeting including the person who caused the defect/return/error
  - Categorized the error as either:
    - Operator/ procedure error
    - Formulation
    - Production equipment
    - Supplier / raw material
- Created Cause & Effect Diagram for every defect/return/error
  - Using this tool took the focus off 'blame and shame' but still created accountability
  - Developed correction actions that are tracked in quality update meetings until they are completed

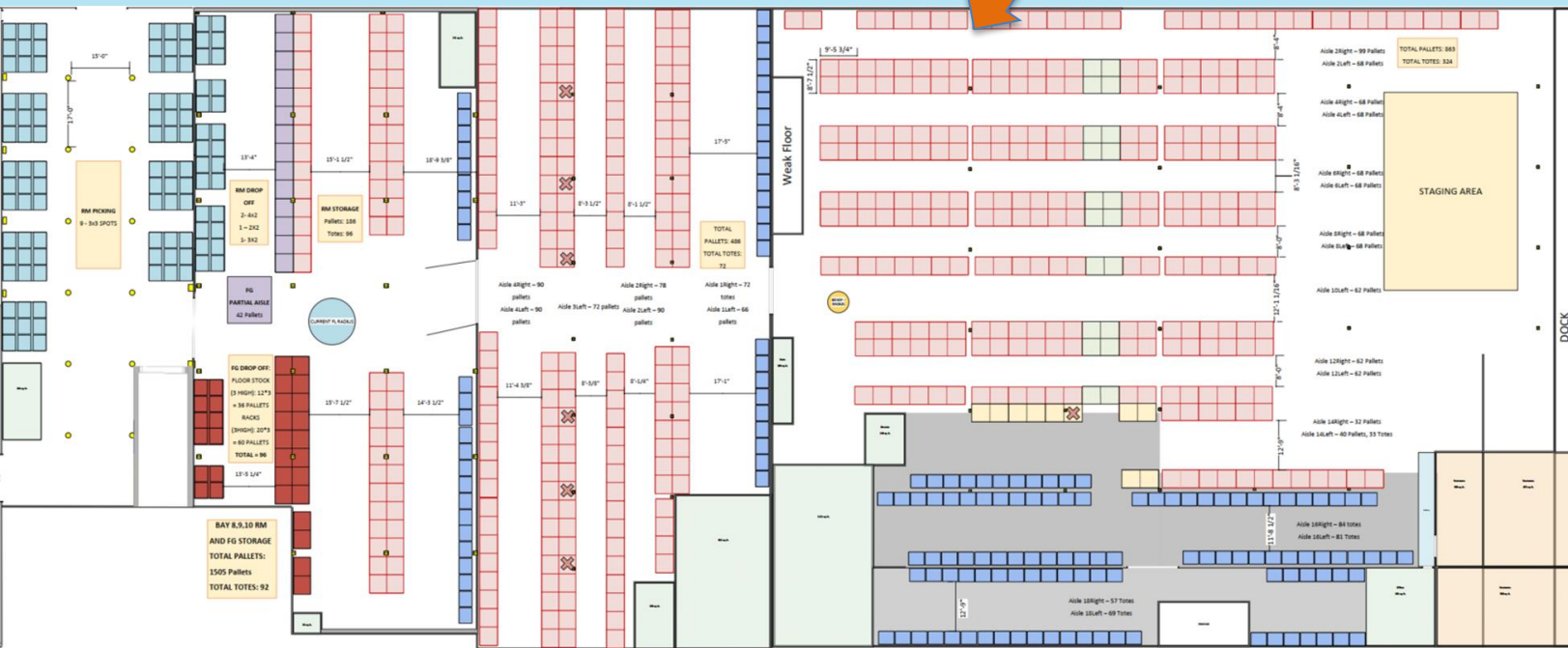
## LEAN WAREHOUSE PROJECT: REDUCE MATERIAL HANDLING & INCREASE SPACE UTILIZATION



This spaghetti map of the old layout requires the batch maker to travel to every part of the building to retrieve raw materials for their batch taking away from productive time, reducing equipment utilization and impacting on time delivery



## NEW LEAN WAREHOUSE LAYOUT



BAY	PALLETS	TOTES
8	186	96

BAY	PALLETS	TOTES
9	486	72

BAY	PALLETS	TOTES
10	833	324

TOTAL PALLETS	TOTAL TOTES
1505	492

## LEAN WAREHOUSE LAYOUT

- Used narrow aisle forklifts to increase space utilization
  - New warehouse can fit an additional 524 pallets and 233 totes
  - This allows all materials to fit in the warehouse
- Lean Warehouse layout created natural flow to dock doors (on right side of the drawing)
- New Raw Material Handler role will stage all raw materials for batch-makers, keeping them focused on manufacturing and equipment utilization

## BALANCED PERFORMANCE SCORECARDS

- Every department reporting to the COO now has a scorecard aligned to the company's goals and the metrics the CEO tracks
- Each department leader meets with the COO and CFO monthly to review their scorecard and provide status on initiatives and action items to improve performance

CES Scorecard	Actuals	
	Prior Period	R12 Months
On-Time Delivery →	96.4% Last 30 Day %	84.3% Last 12 Mo %
CES Non Conformances →	0 Last 30 Days Errors	3.42 Average / Mo
CES Caused Returns →	0 Last 30 Days Errors	1.08 Average / Mo
Freight Variance →	\$9.4K Last 30 Day Variance	\$11.2K Average / Mo

Purchasing Scorecard	Actuals	
	Prior Period	R12 Months
Stockout →	0 Last 30 Day Stockouts	11.1 Avg # / Mo.
Supplier On-Time Delivery →	89.5% Last 30 Day %	90.0% R12 Mo %
Supplier Quality →	0 Last 30 Day SCARs	0.6 R12 Avg / Mo

Production Scorecard	Actuals	
	Prior Period	R12 Months
First Time Prime →	94.3% Last 30 Day %	92.9% Last 12 Mo %
Internal Quality →	94.3% Last 30 Day %	95.0% Last 12 Mo %
Bad Batch LBs	(Blank) Last 30 Day LBs	10.90K Avg 12 Mo LBs
Overtime Percent	9.6% OT % Last Month	10.3% Last 6 Months
On - Time Production →	92.9% Last 30 Day %	91.6% Last 12 Mo %