uponor Lean Green Project

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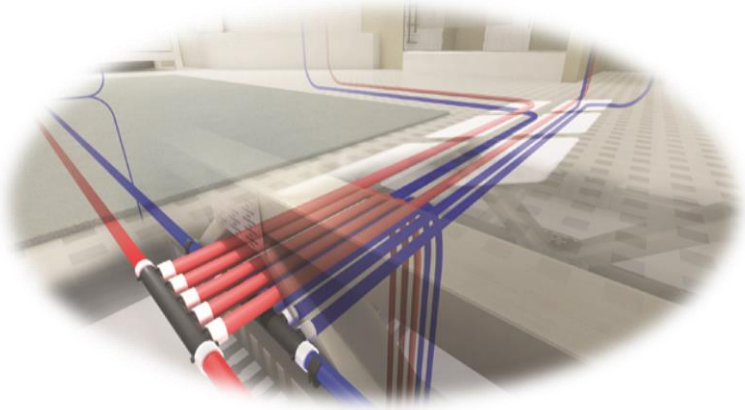
Overview

Overview: The Company, Uponor

- ụp-ʊ-nɔɹ
- Cross-linked Polyethylene pipe (PEX) extrusion
- Plumbing, radiant heating/cooling, fire safety
  - Residential
  - Commercial



Overview: The Project

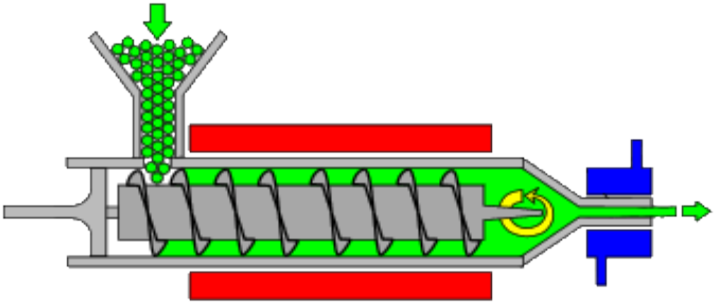
- New extruder system
  - Faster production
  - Higher operation cost
    - Same proportion as production gain
  - No net gain for Uponor
- Goal: Minimize operational costs through reduction of energy, water, and other inputs, using Lean tools and philosophies

Approach: Lean Manufacturing

- Philosophy based on continuous improvement
  - Minimize waste
    - Defective product
    - Overproduction
    - Waiting
    - Non-/Under-utilized talent
    - Transportation
    - Inventory
    - Motion
    - Excessive processing

Extrusion Overview

Extrusion Overview



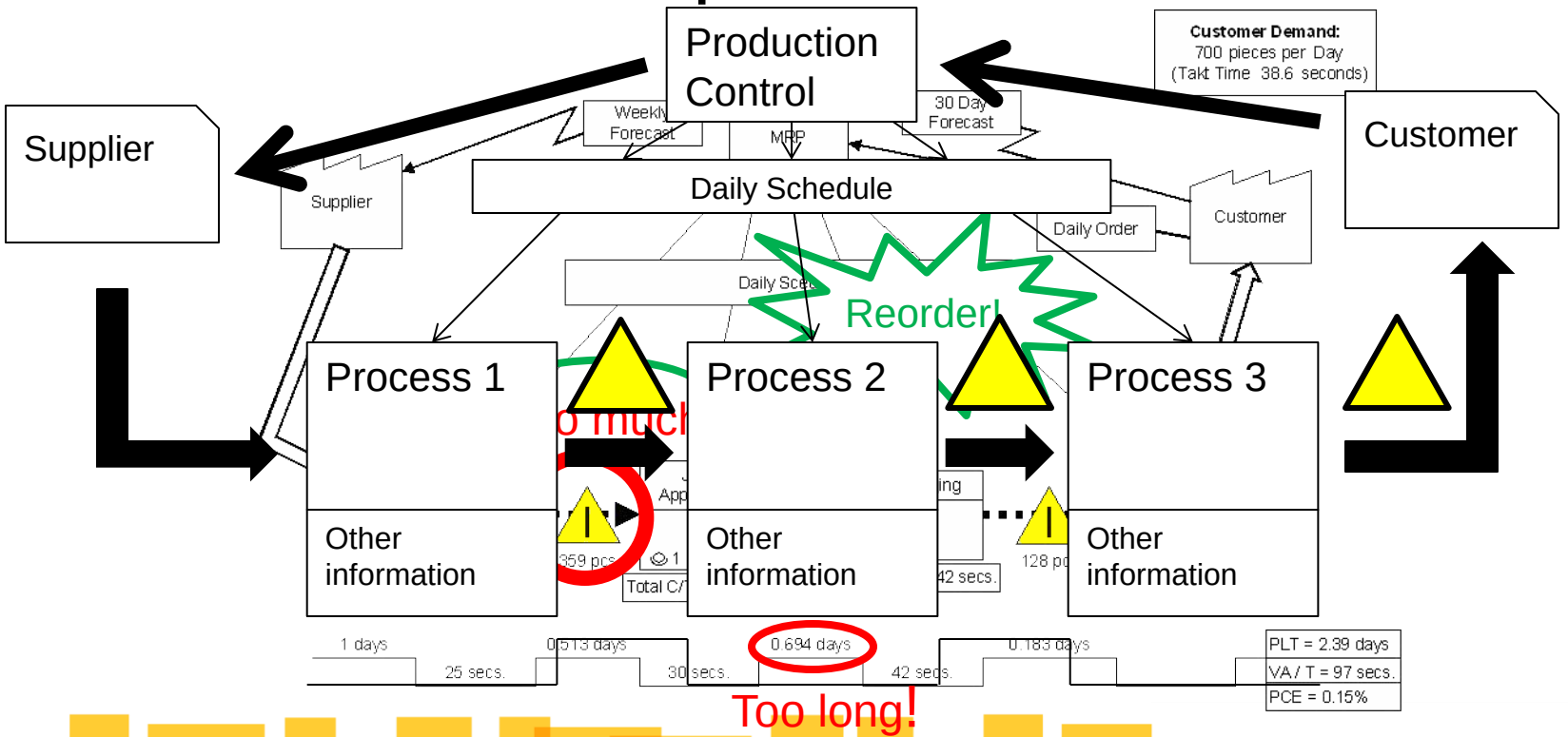
Feeder → Extruder → Die → Cross-Link → Cooling Tanks → Measurements → Coil

Prioritizing Efforts

Tools

Value Stream Maps

- Lean visual tool to help analyze a process' current state and plan a future state

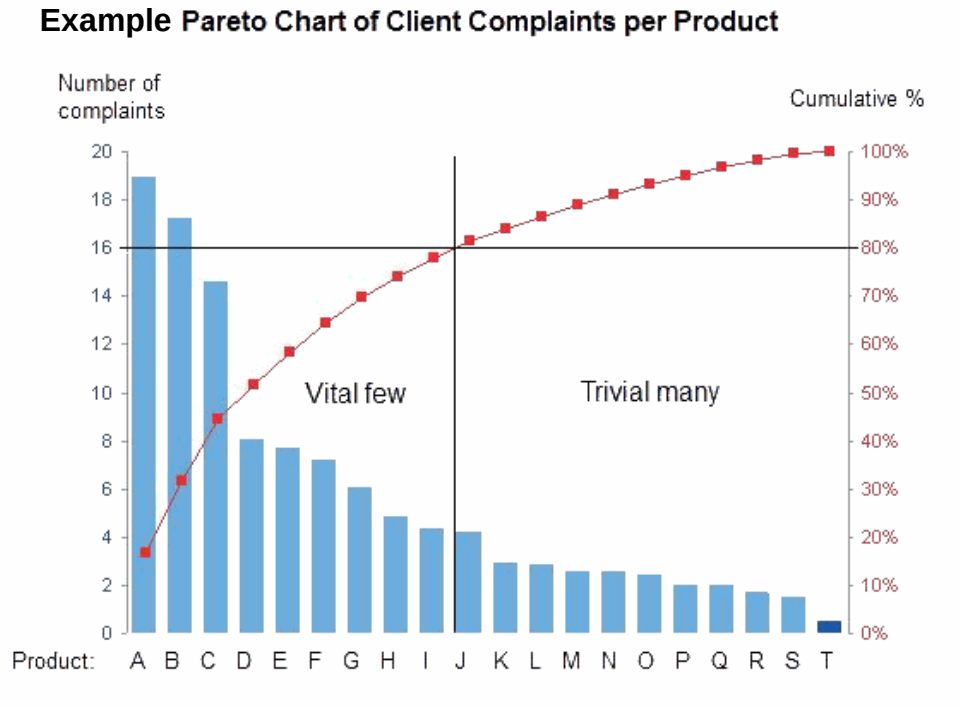


Value Stream Maps

- Enterprise MN
- Energy (Electricity)
- Water
- Compressed Air
- Nitrogen Gas

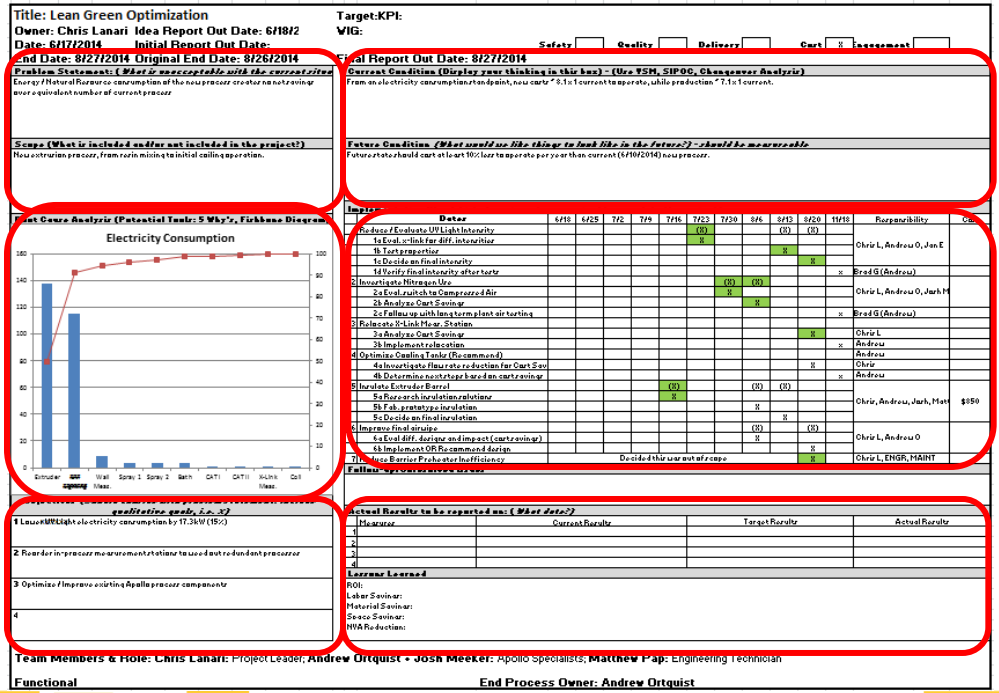
Pareto Charts

- Highlights high-impact factors
  - Histogram + Cumulative Percentages



A3 Project Management

- Story of a project
  - Background/Problem
  - Root Cause Analysis
  - Goals
  - Action Items
  - Follow Up/Verification



Action Item: Optimize Curing

- Initial State
  - All settings at 100%
  - Product within specifications
- Final State
  - All settings at 70%
  - Product still within specifications
  - $55,300 annual savings

Action Item: Insulate Extruder

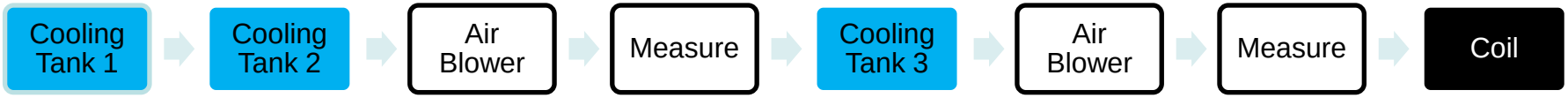
- Reduce heat loss to reduce consumed electricity
  - Heating elements
- 200 – 250 ^{o}C
  - Reduce to 43 ^{o}C
- Energy reduction
  - $2,600 annual savings
- More safe workplace

Action Item: Switch To Comp. Air

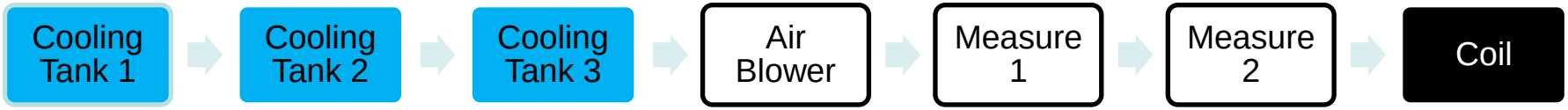
- Initial State
  - Nitrogen
- Final State
  - Compressed Air
  - $1,300 annual savings
  - No 100% N_2 fumes released

Action Item: Redundant Blower

- Initial State



- Final State



  - $650 annual savings

Action Items

Recommendation	Initial State	Future State	Reduction	Annual Savings	Status
Optimize Curing Process	115.2 kW	38.4 kW	76.8 kW	$55,300	In Progress (95%)
Insulate Extruder Barrel	3.7 kW	0.1 kW	3.6 kW	$2,600	In Progress (75%)
Switch from Nitrogen to Compressed Air	12 ft^3/hr N_2	12 ft^3/hr Air	12 ft^3/hr N_2	$1,300	In Progress (95%)
Remove Redundant Blower	0.9 kW	0 kW	0.9 kW	$650	In Progress (50%)
TOTAL	**119.8 kW, 12 ft^3/hr N_2**	**38.5 kW, 12 ft^3/hr Air**	**81.3 kW, 12 ft^3/hr N_2**	**$59,800**	

Internship Benefits

- Project Management
- Models
  - Cost Analysis
  - Energy Flow
- Lean Manufacturing Principles

Q & A