Avtech Operations Continuous Improvement Activities

Welcome UW IE Students!

November 6, 2002

Lean Manufacturing Motivation

- Per the Avtech 2002 Business Plan:
  - "Improve product quality, schedule performance, and cost through continuous improvement... by better utilizing planning, process flow methods, and systems"

Lean Manufacturing Motivation

- Lean manufacturing changes the focal point from the process to flow of value (value stream).

- Value Stream - all the actions (both value added and non-value added) currently required to bring a product from raw material into the hands of the customer.

Lean Manufacturing Motivation

- Value Stream Improvement - focuses on material and information.

- Process-Level Improvement - focuses on people and process flow and eliminating waste at the shop floor team level.

Lean Manufacturing Motivation

- One of the big advantages of creating flow teams is that it causes us to take a long, hard look at the processes and make improvements by reducing waste.

Lean Manufacturing Motivation

- Results:
  - Lead times are reduced
  - Flexibility increases and we can build the right product at the right time
  - WIP on the manufacturing floor is reduced
  - Space requirements are reduced

Lean Manufacturing Motivation

- Results (cont):
  - Quality is improved by reducing process variation and quality problems are eliminated before they grow
  - Overproduction is reduced and, eventually, even eliminated (producing more, sooner, faster than is required by the next process)

Lean Manufacturing Implementation Steps

- Creating continuous flow teams involves four steps:
  - Define the product family
  - Evaluate the current state
  - Develop the future state
  - Implement

Define the Product Family

- A product family is defined as a group of products that pass through similar processing steps and over common equipment in our downstream processes.
  - Similar assembly procedures
  - Similar testing procedures
  - Similar work content
  - Similar material

Define the Product Family

- Demand Profile requirements
  - Predictable
  - Relatively stable rate
  - Volume high enough to sustain a work team

Evaluate the Current State

- Complete detailed time studies of each element of each process step for the product family.
- Complete detailed study of process flow for the product.
- Note non-value added activities and waste streams.

Evaluate the Current State

- Investigate document changes to improve manufacturing processes.
- Investigate process changes to improve cycle time.
- Create baseline metrics.

Create the Future State

- Create a Gantt chart and define the work team size.
  - A Gantt chart details the sequential process flow to assist in balancing the production line
  - Standardizes work content

Process Gantt Chart

Person 1	6:00	6:15	6:30	6:45	7:00	7:15	7:30	7:45	8:00	8:15	8:30	8:45	9:00	9:15	9:30	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00	12:15	12:30	12:45	13:00	13:15	13:30
Complete assy prior to cal (2) units	B																														
Cal and install select (5) units								B																							
Group B off to coating																															
-30 prep one side														C																	
Install cover and final test																							A								
Group A off to FI																															
-30 prep work																											C				
Solder -30 comp (3)																															
Person 2	6:00	6:15	6:30	6:45	7:00	7:15	7:30	7:45	8:00	8:15	8:30	8:45	9:00	9:15	9:30	9:45	10:00	10:15	10:30	10:45	11:00	11:15	11:30	11:45	12:00	12:15	12:30	12:45	13:00	13:15	13:30
Complete assy prior to cal (3) units	B																														
Assemble less cover group A										A																					
Group A off to inspect																															
Make diode assys															C																
Touch up -50																			C												
Complete -50 assy																							C								
solder -30 comp (2)																															
crimp conn wires																															

Create the Future State

- Change drawings, processes, etc. as needed to support the Gantt chart.
- Create the POU warehouse.
  - Define common and unique parts
  - Determine kanban sizing
  - Coordinate intent to go POU with stores

Create the Future State

- Evaluate resources needed to support the future state.
  - Test equipment
  - Shared resources
  - Physical location
  - Available labor
- Evaluate the future state for improvement in metrics.

Implement

- Change all necessary drawing, procedures, routers, etc.
- Train new team members to the Gantt.
- Physically set-up the work team.
- Set up the warehouse in MMC and in the work area.

Implement

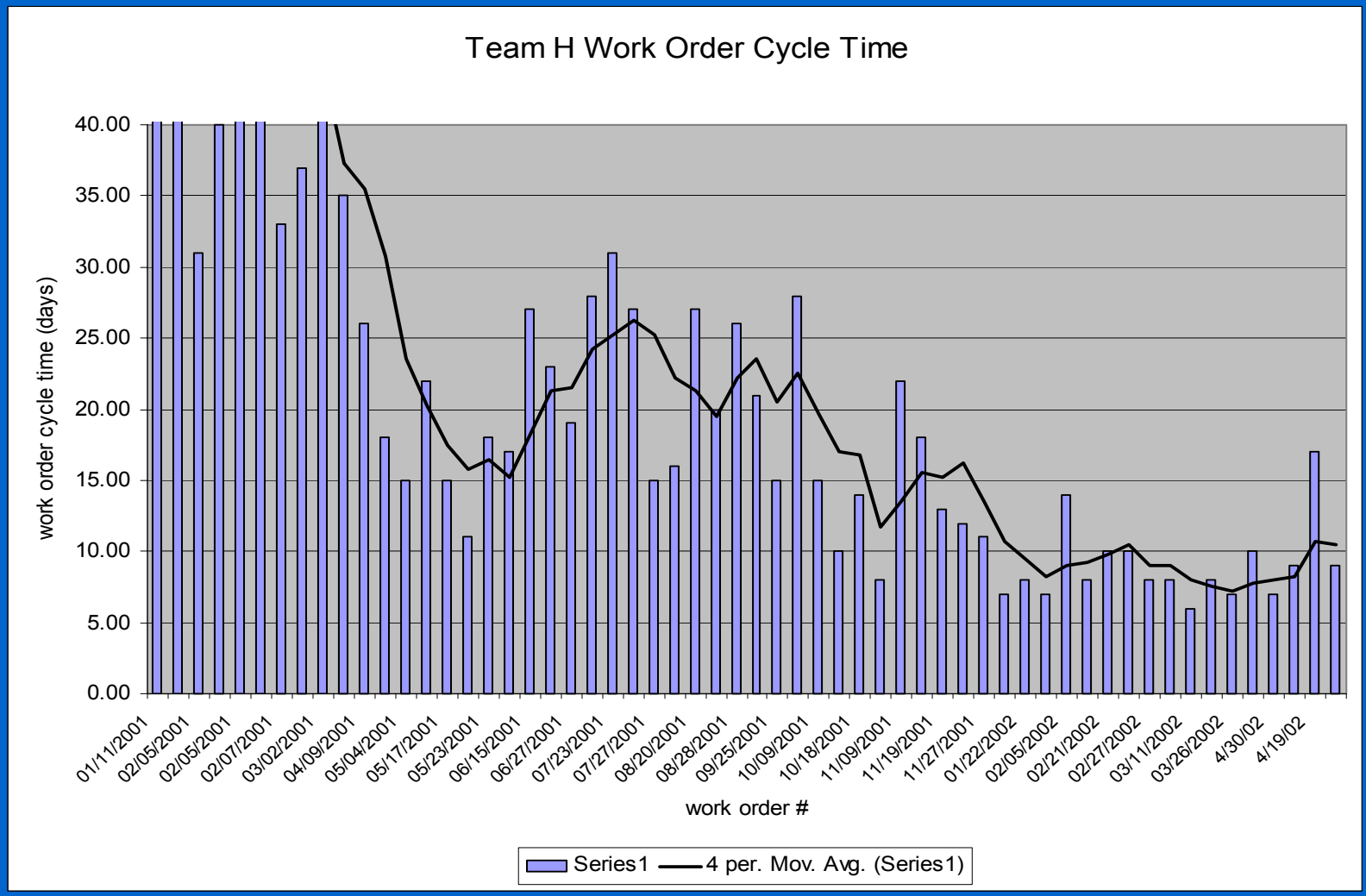
- Start priming the system.
- Kick-off new team.
- Monitor progress continually.

Lean Manufacturing Benefits

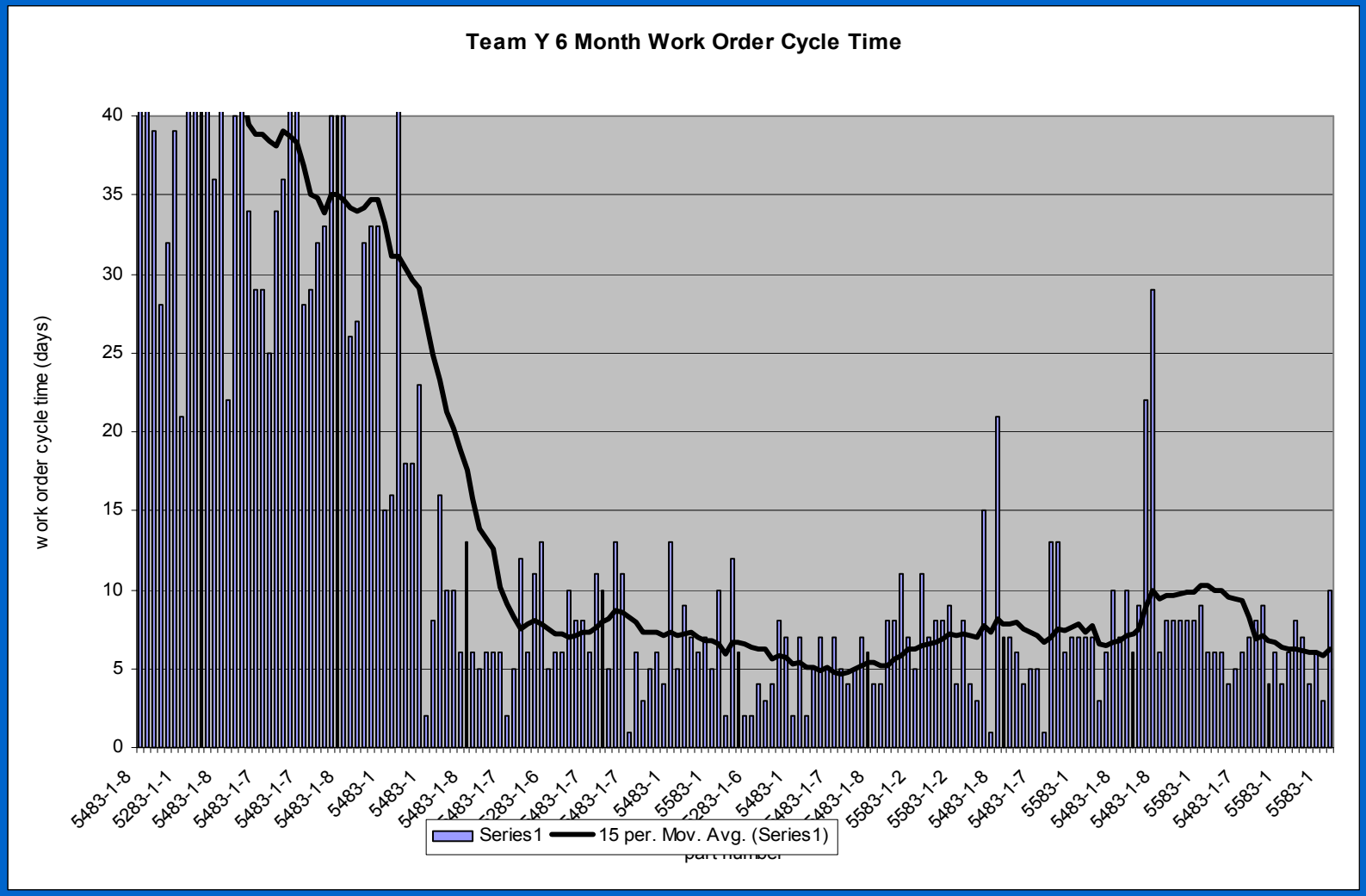
Cycle Time Reduction

- The benefits of reduced cycle time include:
  - reduced lead time
  - improved ability to meet customer demand changes
  - ease of management
  - less dependence on forecasts
  - less inventory required for same throughput

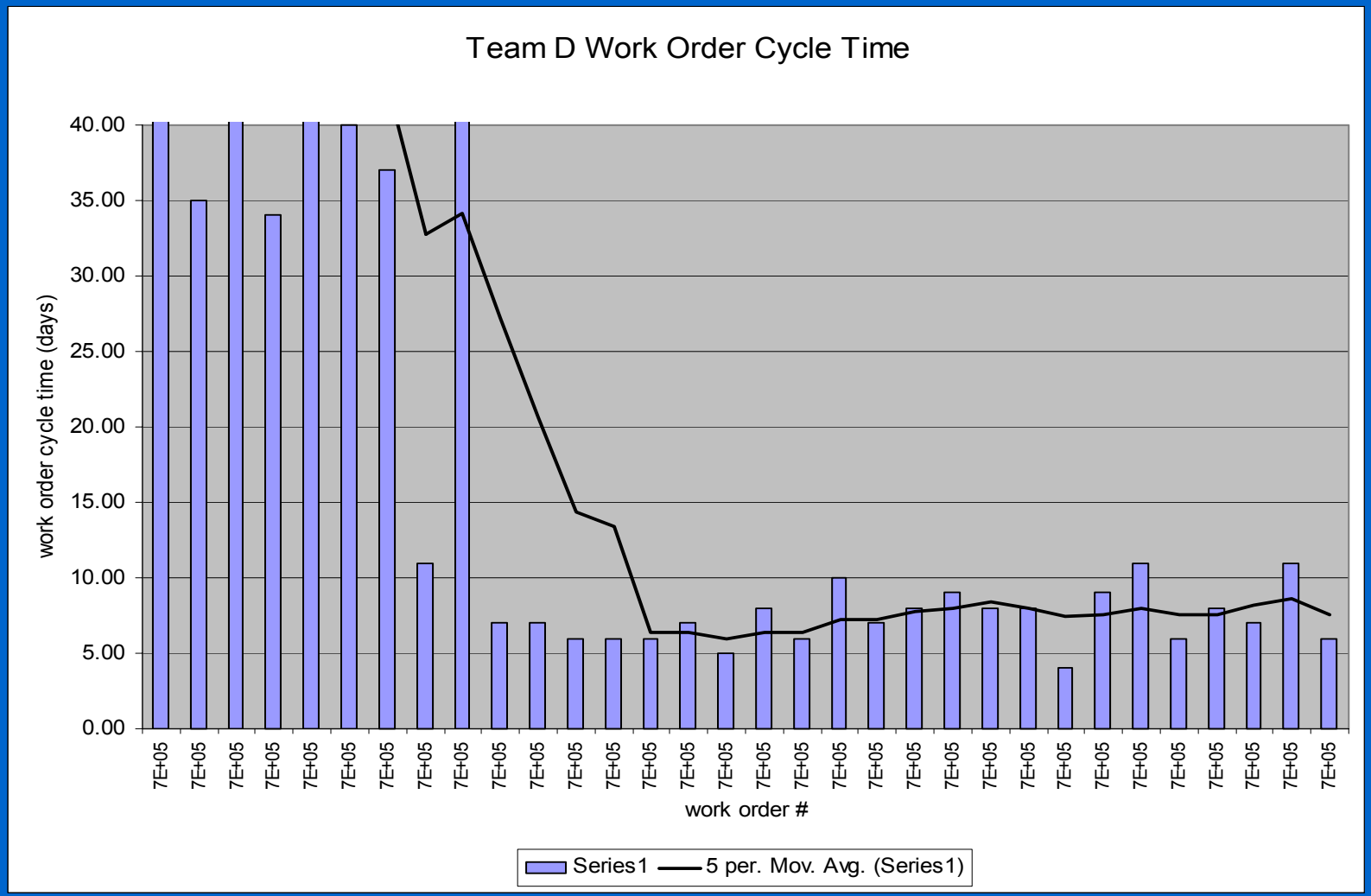
Team H Cycle Time



Team Y Cycle Time



Team D Cycle Time



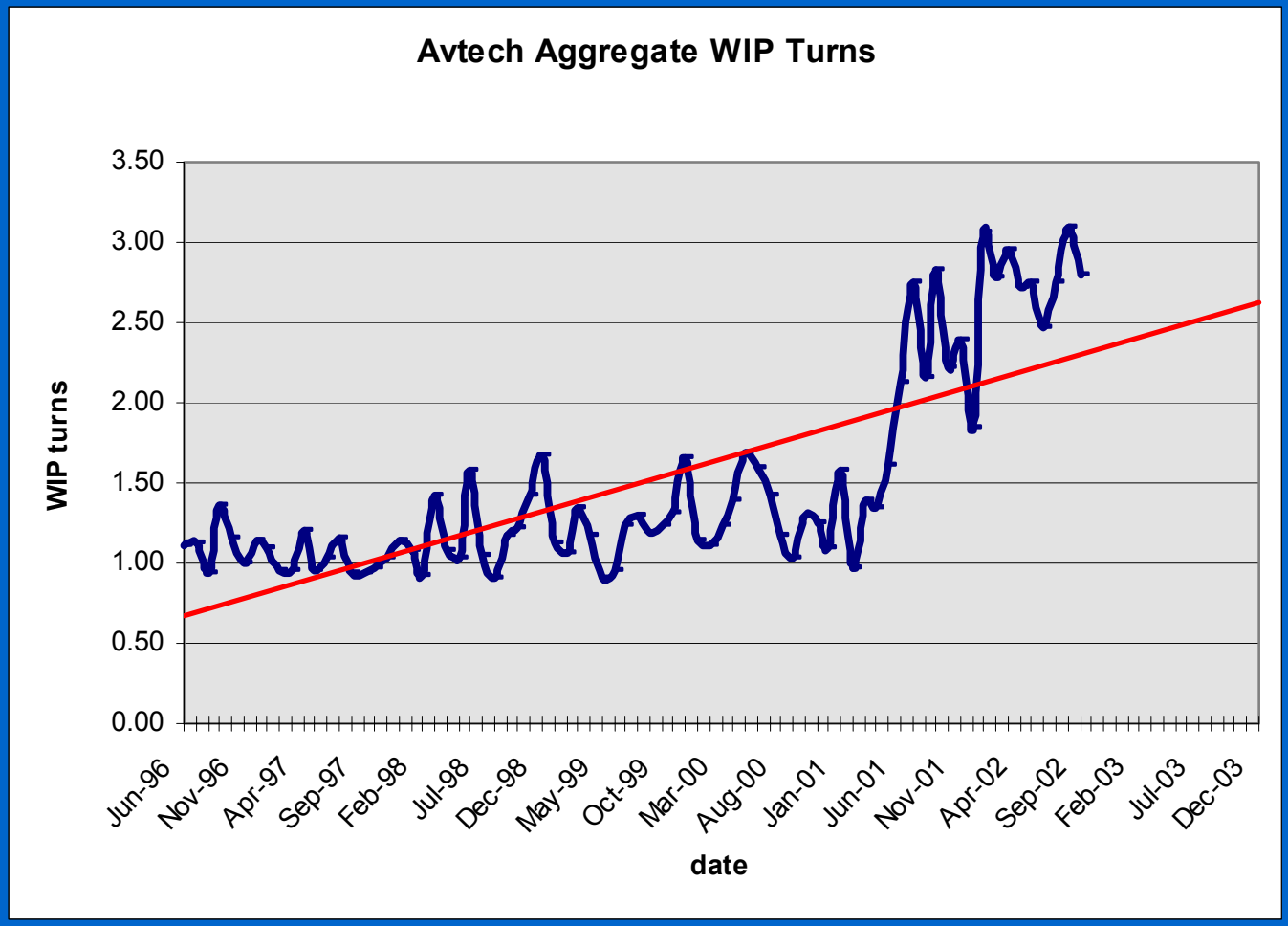
Cycle Time Reduction

- Average cumulative cycle time reduction across teams D, H, and Y is
  - 116 days

WIP Turns and WIP $

- The benefits of increased WIP turns and decreased WIP $'s include:
  - Lower inventory levels (as upstream inventory levels are decreased in conjunction with the reduction)
  - Less capital tied up in inventory (as upstream inventory levels are decreased in conjunction with the reduction)
  - Converts inventory into revenue more quickly
  - Quality issues or Engineering changes easier to manage
  - Less dependence on forecast

Aggregate WIP Turns



Improved workplace organization

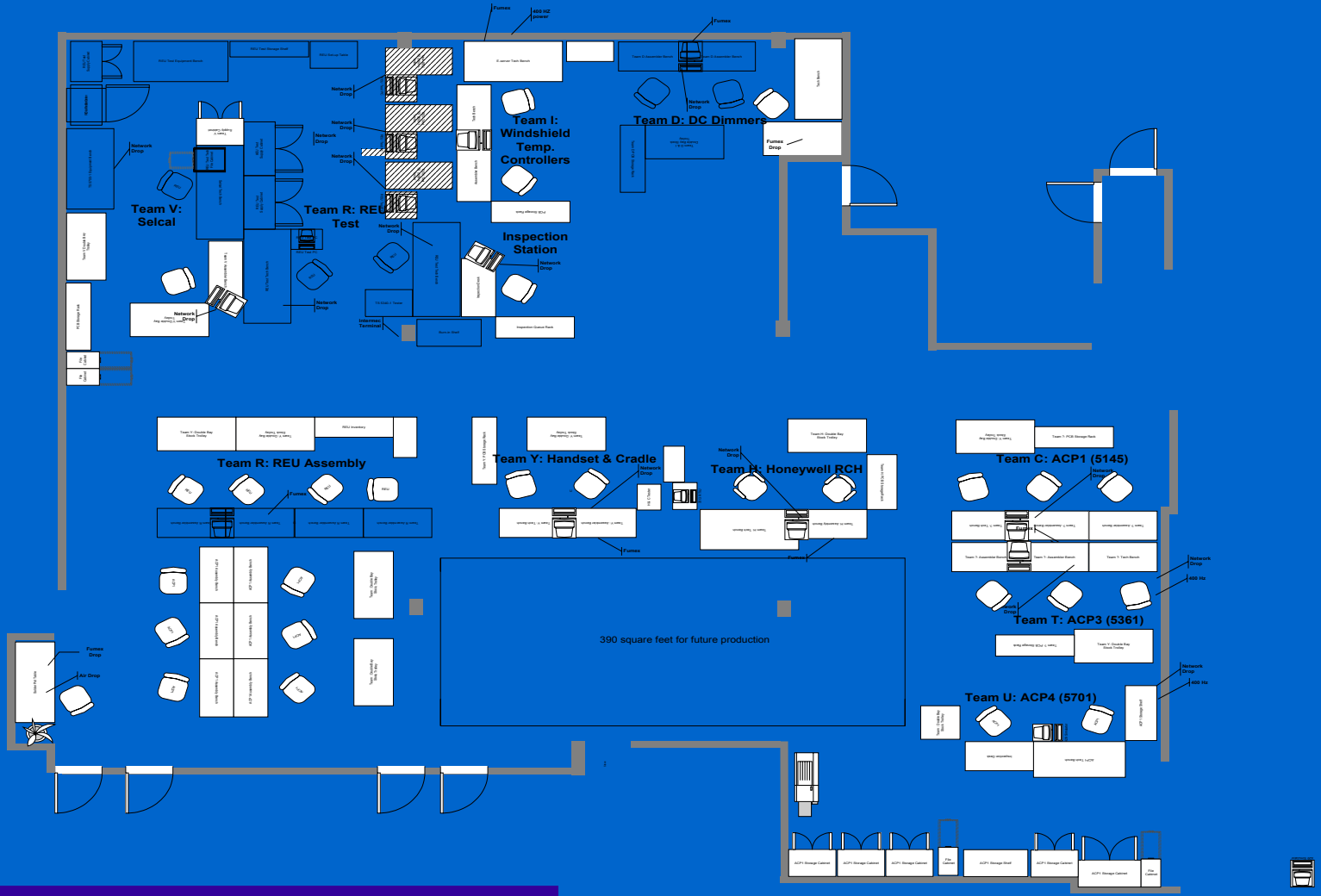
- The benefits of better workplace organization include:
  - Forces the question “do we really need this?”
  - Ease of movement of cells
  - PC’s on bench allow for easy access to documentation and reduce workstation clutter
  - Efficient use of manufacturing floor space

Improved Workplace Organization

- "Old", cluttered, disorganized inventory storage system in REU

Improved Workplace Organization

Reduced Footprint



Improved Workplace Organization

- Cumulative effect of re-organizations
  - 460ft^2 of free manufacturing space
  - Unoccupied work cells available for new teams
  - Eliminated a number of unnecessary pieces of equipment

POU Inventory Management

- Benefits include:
  - Shorter cycle time
  - Reduction in overall product labor content
  - Ownership of inventory
  - Mobility
  - Skill-set proliferation
  - Better workplace organization
  - Reduction of non-value-added activity

POU Inventory Management

- Reduced Stores storage by 4.43 shelves.
- Reduced non-value added kitting labor by 807 hours per year or $4,462 per year.

POU Inventory Management

- Cumulative reduction of labor content across the products manufactured by teams D, H, and Y is
  - Headcount reduction of 2.6 people
  - Labor content reduction of $64, 896

Operator Enrichment

- Team members learn a broader set of skills
  - Warehouse management
  - Inspection certification
  - Test stamp certification
- Increased accountability for team performance
- CRSO returns
  - Improved TAT
  - Closed feedback loop on product quality

Operator Enrichment

- Self-manage
  - Warehouse accuracy
  - Work order release
- Increased cross-training
- Source inspection
- Self-verification
- Assembler - Tester Model
- Modified application for batch teams

Future Applications

- Shared resource kanban
- Supplier kanbans
- Cross-training of team members and regular rotation
- Manufacturing Flow Documents (MFD's)

Future Applications

- 5S programs
- Incorporating more “shared resource processes” into the small teams
- EOQ application where appropriate
- Value stream mapping and mixed model continuous flow

Future Applications

- POU implementation into shared resources
- Eliminate dedicated inspectors by incorporating them into the assembly processes
- Working with customers to increase the frequency of deliveries