Planning the Lean Effort Before Investing in Automation and New Facilities

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UNC SCHOOL OF MEDICINE
PATHOLOGY & LAB MEDICINE

UNC HEALTH CARE

Outline for Presentation

- Who we are
- Why we chose Lean
- The Lean process and progress
- The Lean-automation connection
- Afterthoughts

UNC Health Care

- 4 Hospitals (soon to be 5)
- 1,188 Attending Physicians
- 31,296 Inpatient Visits
- 100+ Specialties
- 680 Resident Physicians
- 741,980 Outpatient Visits
- 22,347 Surgical Cases
- 708 Licensed Beds
- 5,769 FTEs
- 61,200 ED Visits

UNC Health Care Affiliated Enterprises

- Chatham Primary Care
- Chatham Crossing
- Pittsboro Family Medicine
- Durham Family Medicine
- Highgate Family Medical Center
- UNC Health Care North Carolina Lions Diabetic Eye Care Center
- UNC Family Practice Center
- Four County Primary Care
- UNC Specialty Women's Center
- University Pediatric Surgeons
- Sanford Specialty Clinics
- University Pediatrics
- University Internal Medicine
- University Obstetrics and Gynecology
- Rex Hospital

UNC Health Care

Our Vision

To be the Nation's leading public academic health care system.

Leading. Teaching. Caring.

UNC Hospitals Core Lab Laboratory

Blood Gas

Chemistry

Coagulation

Hematology

Urinalysis/Body Fluids

TDM/Toxicology

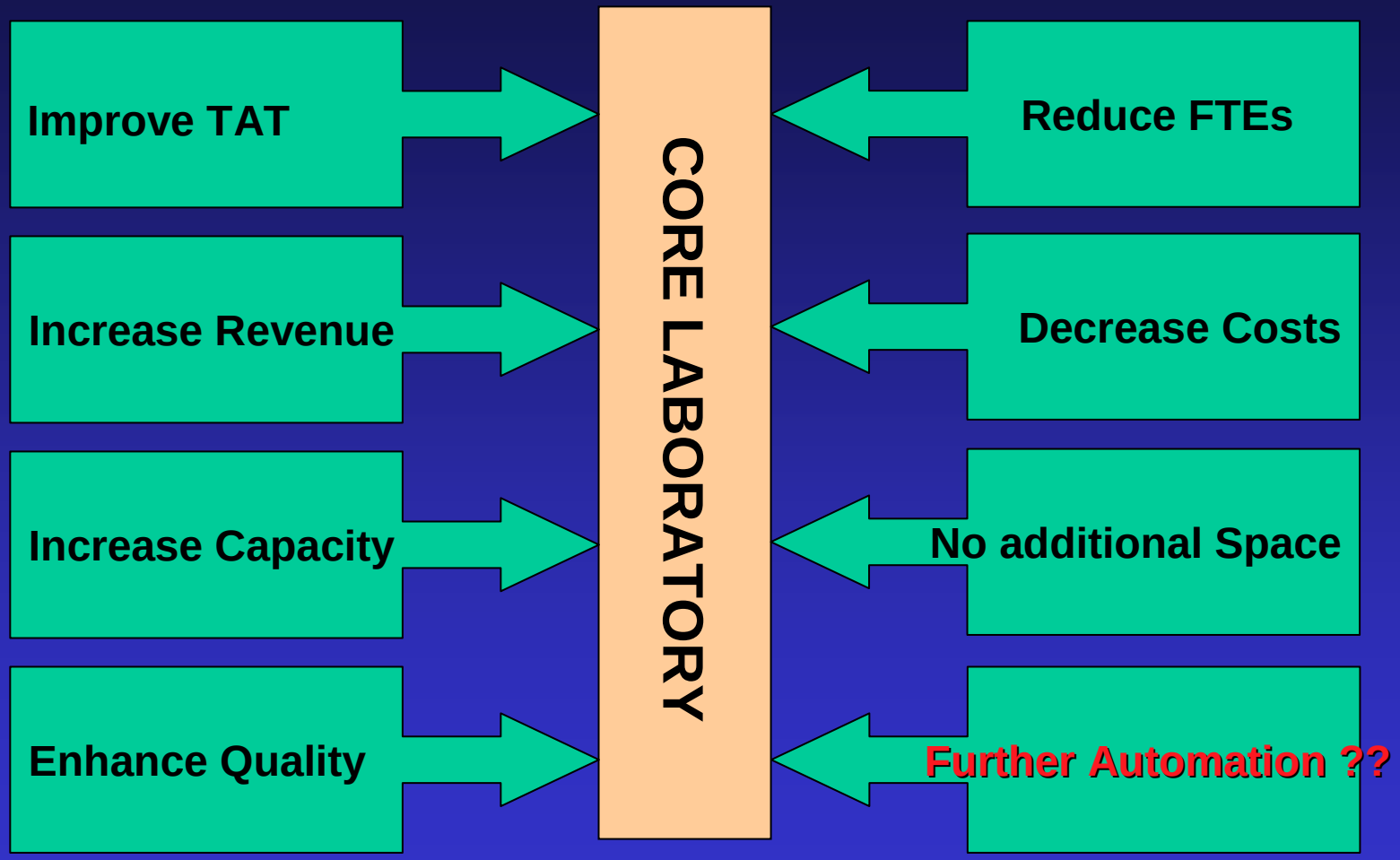
UNC Hospitals Core Lab Laboratory

Vital Statistics:

4.9 Million tests reported (2006-2007)
15-20% STAT
5-6% average annual increase
60% Inpatient, 40% Outpatient
$14.3M budget
78 FTE

By most measures an efficient, cost-effective laboratory

Pressures for Change



Why Pressure to Automate?

- Vigorous marketing campaigns
  - Vendor-sponsored demonstrations for hospital administrators
- Attractive cost-benefit projections
  - Bundling automation with IVD systems
    - One-time capital cost
    - Ongoing personnel cost savings

Automation Realities

ADVANTAGES

- Reduce need for manual activities
  - Enhanced safety
  - Reduced mislabeling
  - Automatic storage and retrieval
- Reduce FTEs

DISADVANTAGES

- Throughput is often a compromise
  - Rack and queue (most current Systems)
  - Reduced flexibility
- High (often hidden) maintenance and renovation costs
- Objective determination of best automation product / configuration is difficult

Automation Realities

“Orderly processes, when operated in an environment of disorder, will still be subject to error .”

– J.O. Westgard

“Automation is like a hammer – you can do good or bad things with it .”

– Mark Graban

Reasons for Implementing Lean

- **Proven approach for planning facility improvements and expansion**
- **Most effective way to meet our needs to:**
  - **Remove waste**
  - **Optimize processes**
  - **Improve patient care service**
  - **Improve financial performance**

•Create a Lean environment PRIOR to expanding automation

•Use Lean tools and data to evaluate the impact and value of automation components

Lean Project Implementation

- **Established a “Lean” team to:**
  - **Collect and analyze data**
  - **Suggest recommendations for improvement**
- **Formed a Lean Steering Committee to:**
  - **Provide Leadership Commitment**
  - **Gain Budget Approvals**
  - **Facilitate organizational and staff buy-in**
- **Began 20-Week Project**

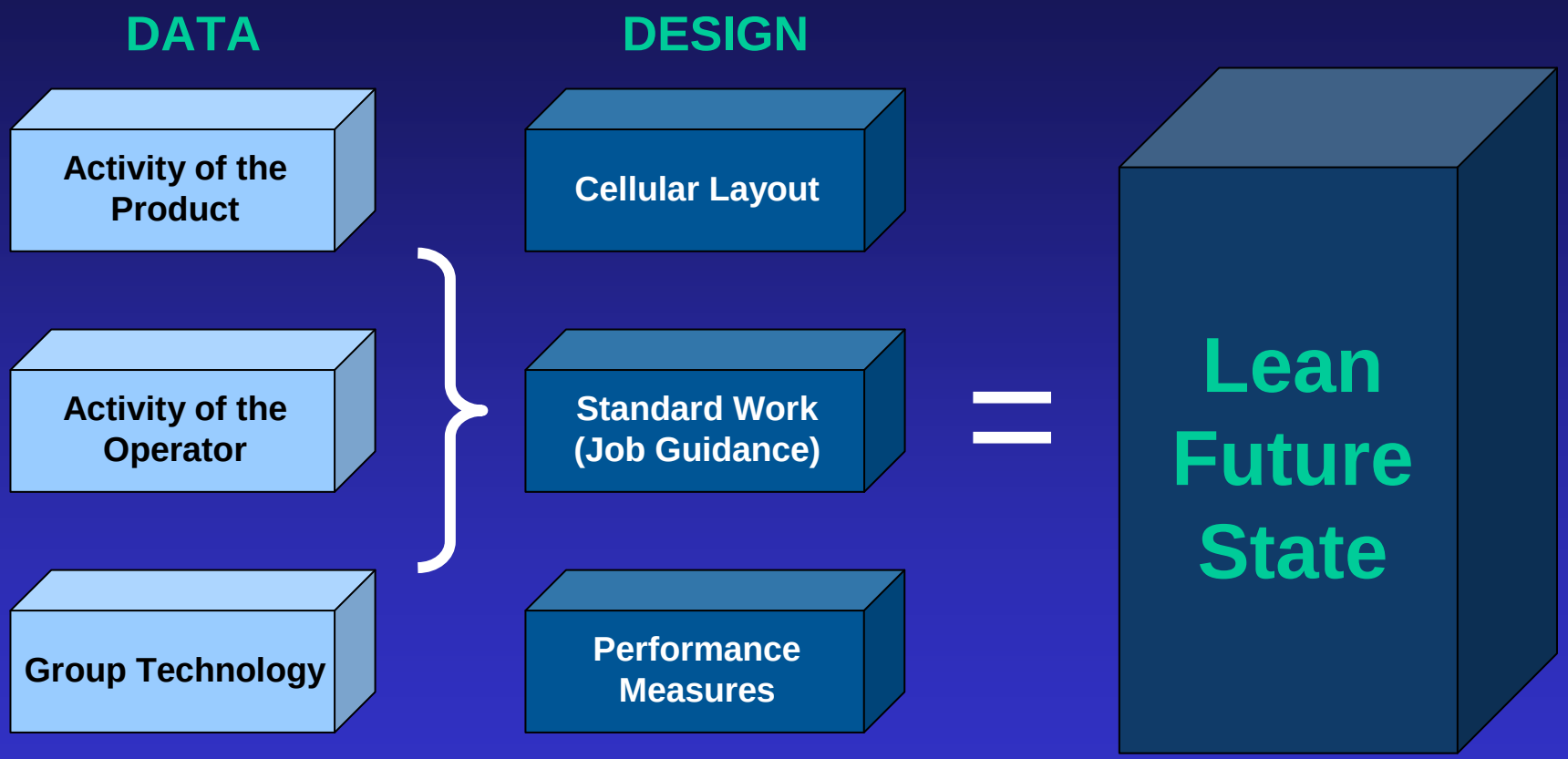
UNC Hospitals Lean Team

- Six-Member Lean Team
  - Senior Technologist, Core Lab
  - Core Technical Specialist
  - 2 Core Technologists
  - Phlebotomy Supervisor
  - Microbiology Supervisor
- Lean Steering Committee
  - Core Laboratory Director
  - Core Laboratory Assistant Administrative Director
  - Director McLendon Clinical Laboratories
  - Administrative Director McLendon Clinical Laboratories
  - Facillity Support Supervisor
  - CQI Specialist
- Lean Senior Consultant

Lean Project Goals

- **Core Lab - Phlebotomy - Micro CPA**
  - **Eliminate Waste**
  - **Improve Turnaround Times**
  - **Meet capacity demands without additional personnel**
  - **Determine most efficient laboratory layout and design**
  - **Define areas of opportunity for further enhancing productivity/safety/error reduction through automation**

Tools and Data to Shape the Future State



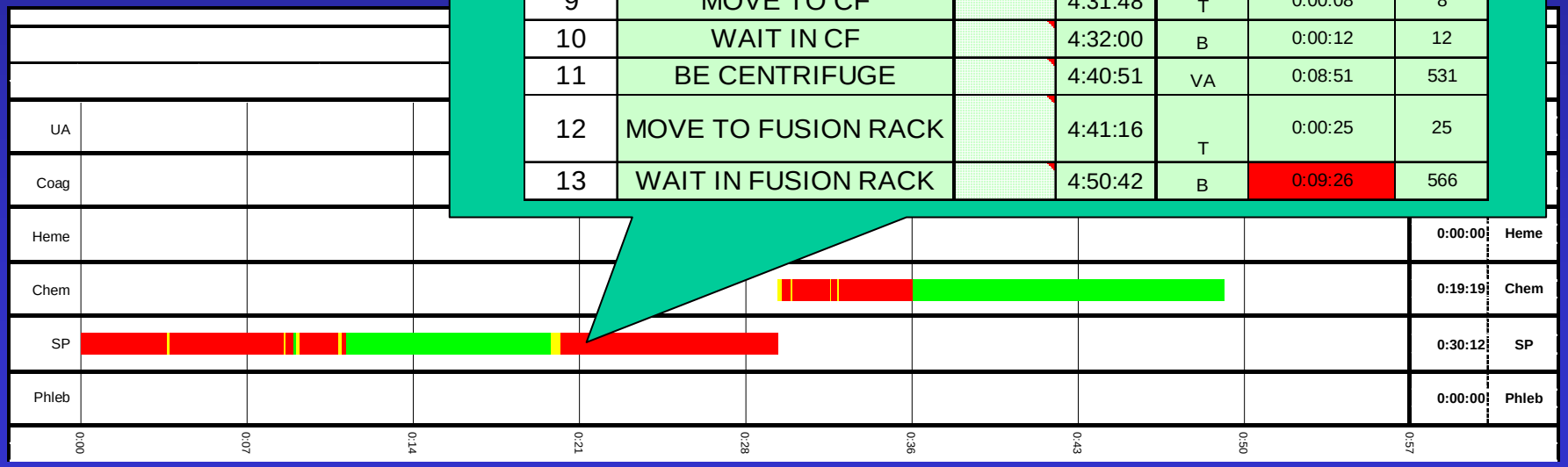
Analyze Product Process Flow

- Videotape the product moving through the process from start to finish
- Break down the activity of the product into distance traveled and time spent in:
  - Storage
  - Value added processing
  - Non-value added processing
    - Examples: Transportation, Inspection

Activity of the Product

STEP	DESCRIPTION OF ACTIVITY	Alt. Start Time (optional)	Input Actual Time (on camera)	FLOW CODE		
		TOTAL			Hour:min:sec	Seconds
					0:49:31	2971
1	WAIT IN TUBE STATION	4:20:30	4:24:15	B	0:03:45	225
2	MOVE TO BUCKET		4:24:21	T	0:00:06	6
3	WAIT IN BUCKET		4:29:18	B	0:04:57	297
4	MOVE TO PROCESSING BENCH		4:29:22	T	0:00:04	4
5	WAIT ON BENCH		4:29:43	B	0:00:21	21
6	RECEIVE IN LAB		4:29:50	VA	0:00:07	7
7	MOVE TO RACK		4:29:59	T	0:00:09	9
8	WAIT IN RACK		4:31:40	B	0:01:41	101
9	MOVE TO CF		4:31:48	T	0:00:08	8
10	WAIT IN CF		4:32:00	B	0:00:12	12
11	BE CENTRIFUGE		4:40:51	VA	0:08:51	531
12	MOVE TO FUSION RACK		4:41:16	T	0:00:25	25
13	WAIT IN FUSION RACK		4:50:42	B	0:09:26	566

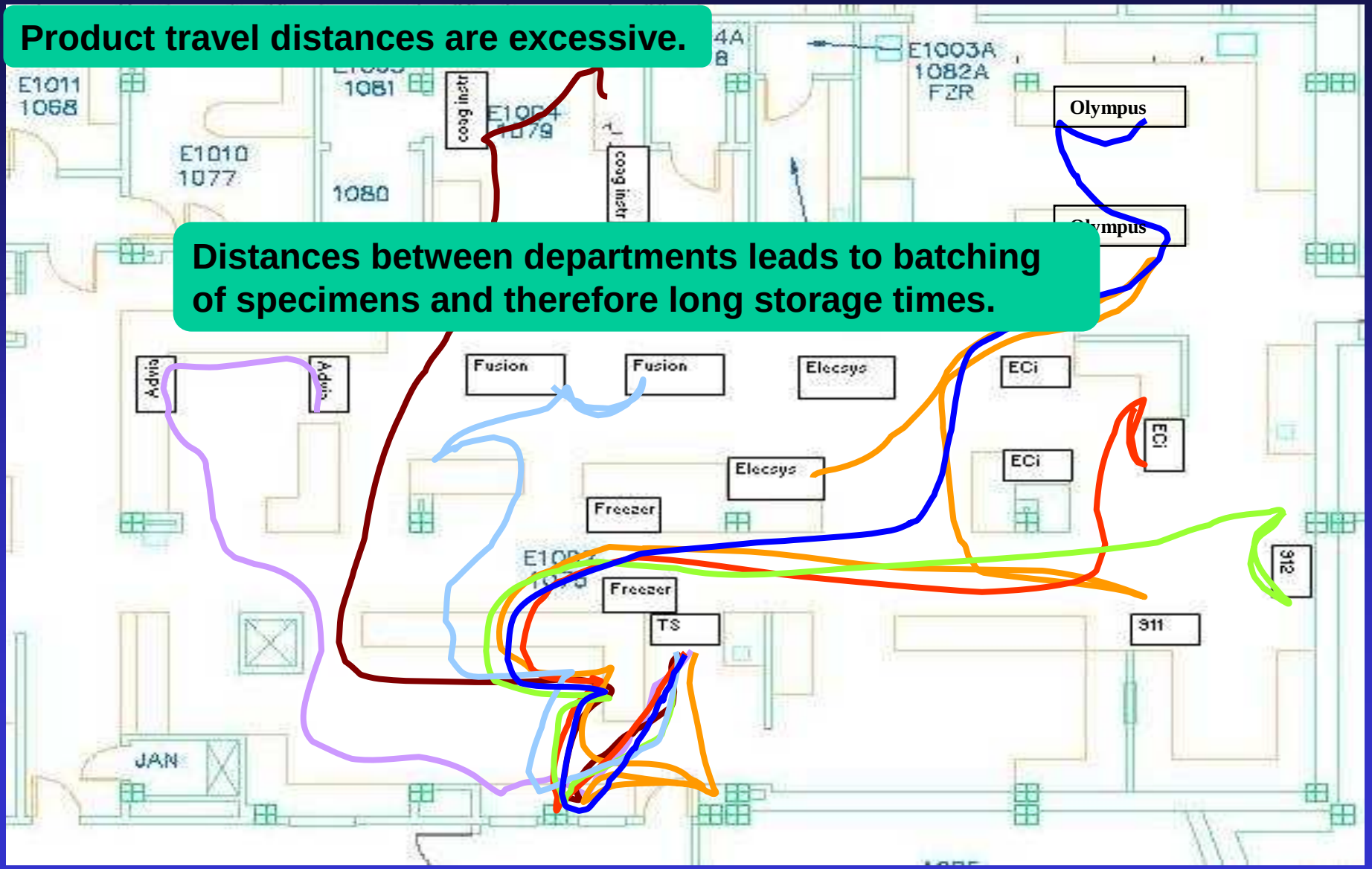
TOTAL VALUE A
TIME
45.3%



Activity of the Product

Product travel distances are excessive.

Distances between departments leads to batching of specimens and therefore long storage times.

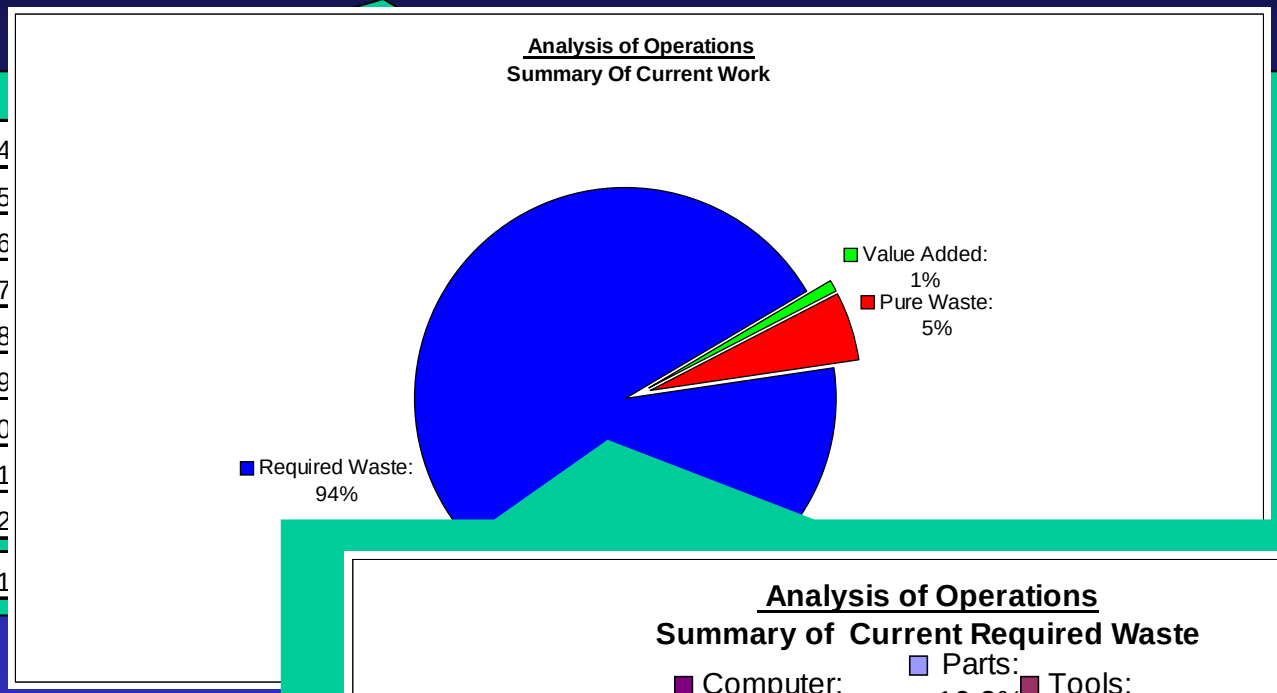


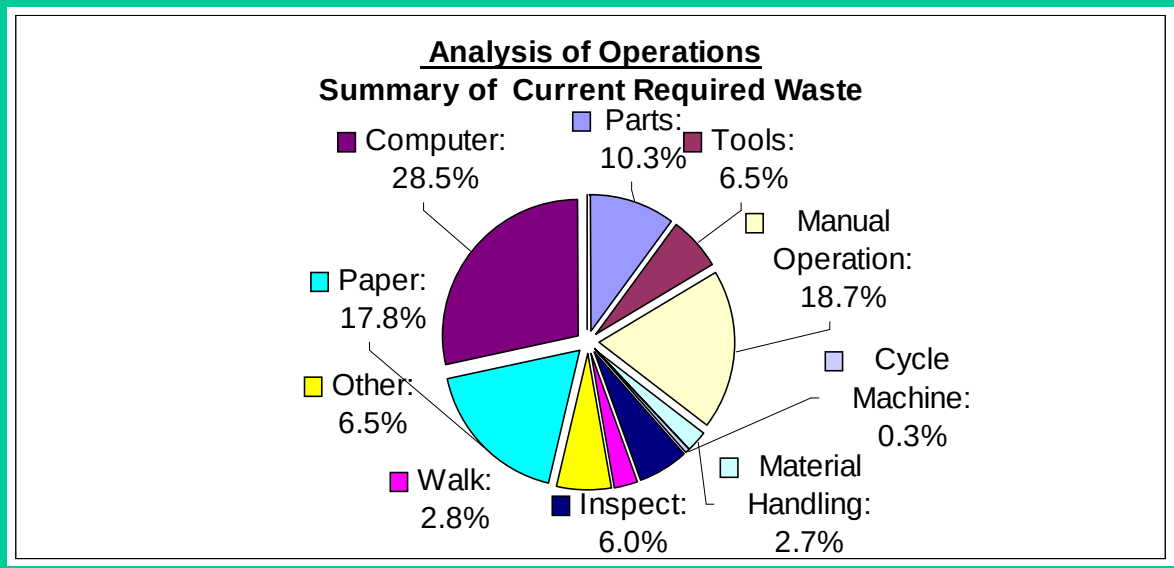
Analyze Activity of the Operator

- Videotape the tech moving through the process from start to finish (minimum 5 cycles)
- Break down the activity of the operator into distance traveled and time that is:
  - Value Added
  - Required Waste
  - Pure Waste

Activity of the Operator

Routine Processor





Designing the Layout

- Design a layout giving prime location to highest volume analyzers
- Set up core structure that will contain >90% of high volume tests and lower volume critical tests
- Design layout in a cellular formation to achieve efficient walk patterns and flexibility in number of operators

Designing the Layout

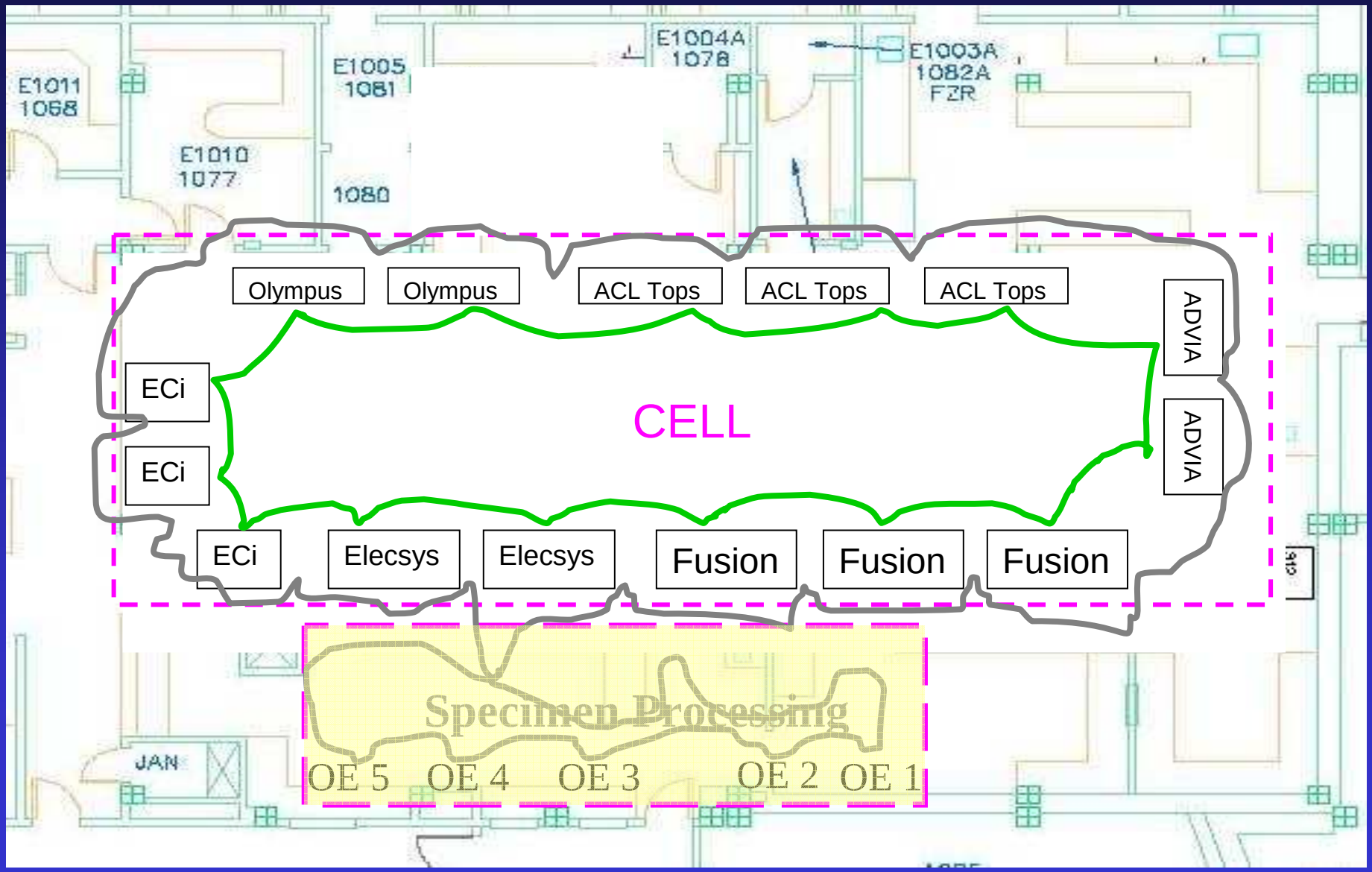
Group Technology Data

Instrument	% of Total Tests Core Lab
VITROS 5.1	72.23%
ADVIA	7.82%
ACL TOPS	4.83%
ABL 750	4.72%
OLYMPUS	3.18%
ECI	3.07%
ELECSYS	2.09%
IQ200	1.15%
912	0.50%
GC	0.12%
BF	0.11%
MANUAL	0.10%
CLINITEK	0.06%
TDX	0.01%
REFRACTOMETER	0.01%
TLI-Q	0.00%
TOTAL	**100.00%**

Represents 97.94% of the Test Volume in the Core Lab!

Represents the remaining 2.06% of the Test Volume in the Core Lab.

Operator Walk Pattern: Future State

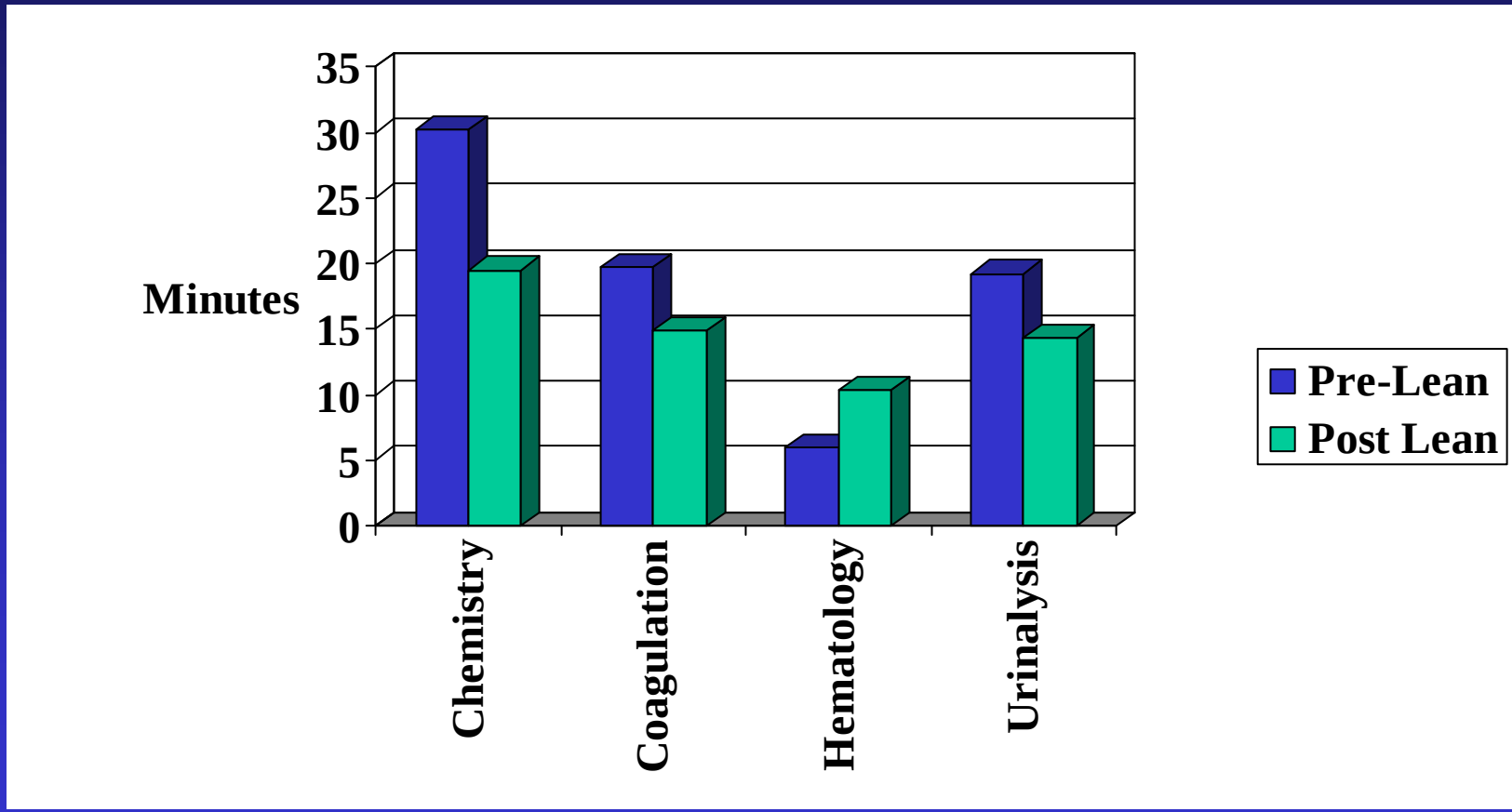


What Have We Done So Far?
Specimen Processing

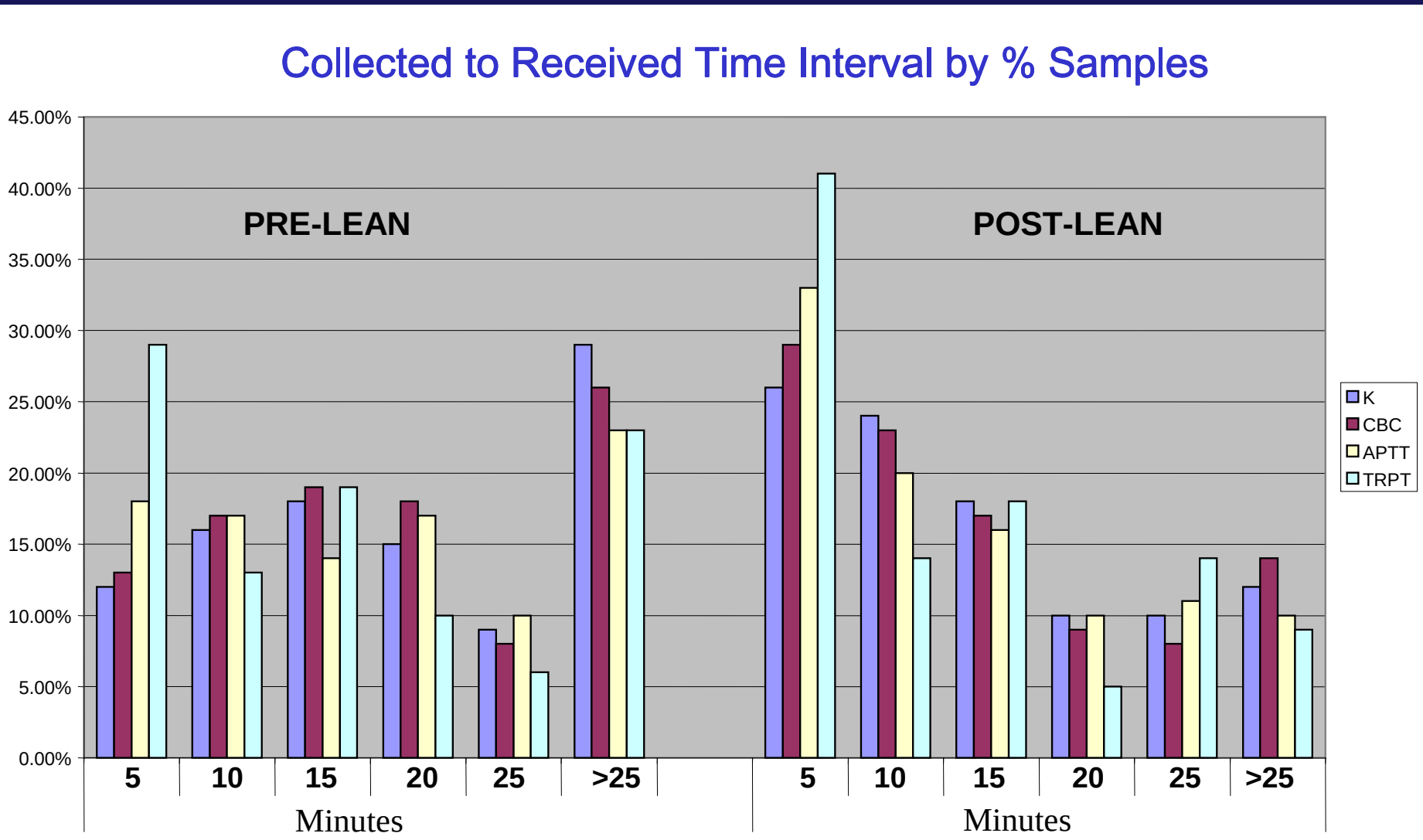
- **Design a layout**
  - **to enhance FIFO sample flow and processor flexibility and create optimal walk patterns**
- **Design Standard Work**
  - **to eliminate wasted space and effort and enhance specimen throughput**
- **Create new positions**
  - **to interface specimen processing work cells activities and promote single piece flow**

Impact of Lean

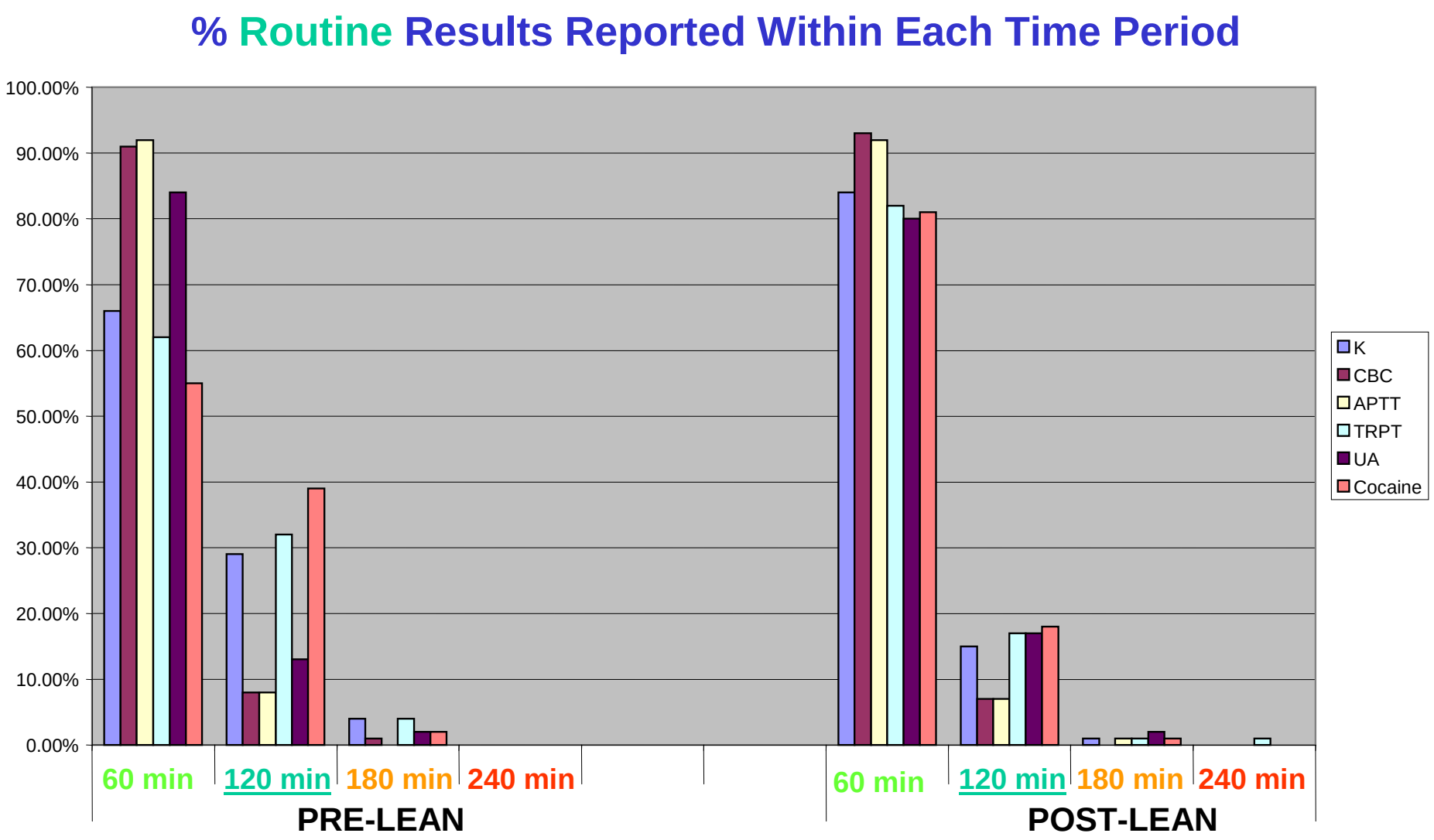
Mean Sample Wait Time in Processing



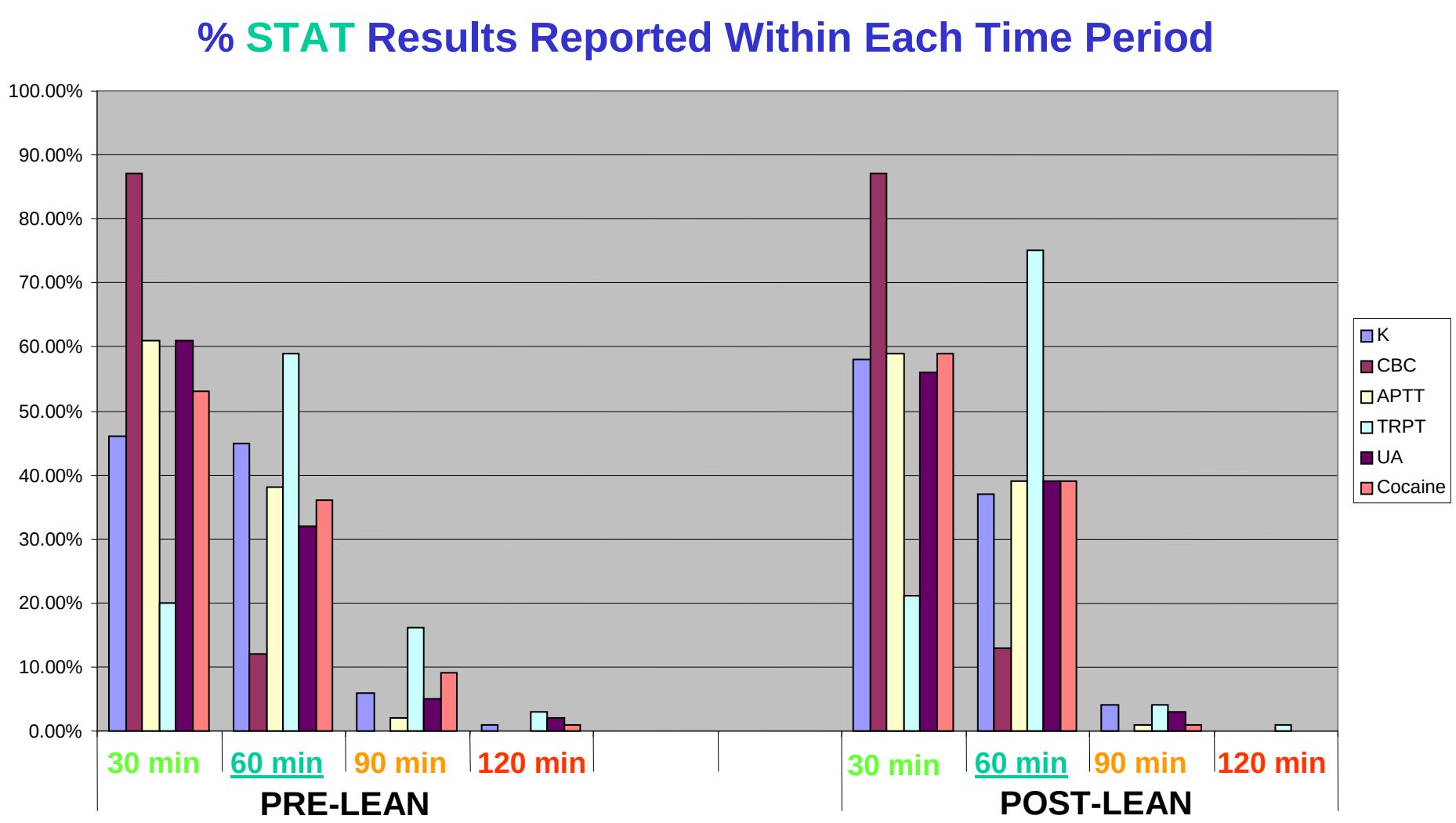
Collected to Received Interval



In-Lab Turnaround-Time
(Received to Reported)



In-Lab Turnaround-Time
(Received to Reported)



Potential Staffing Efficiencies Post-Lean

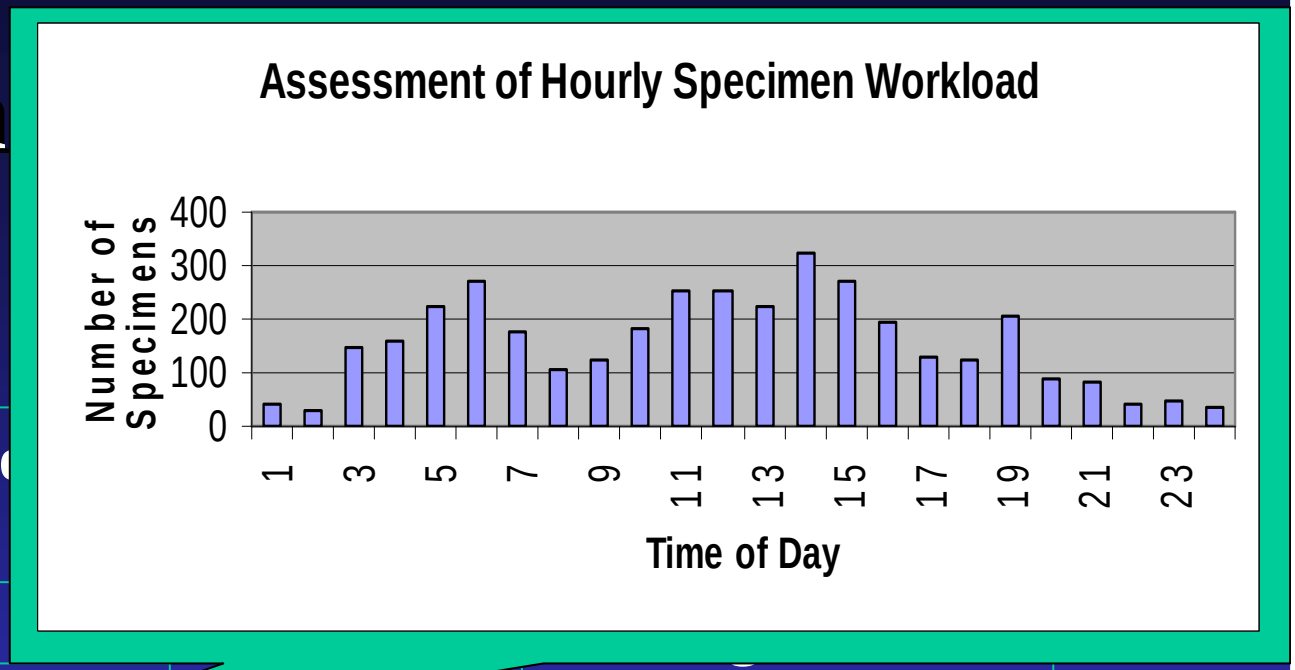
Standard Work
Practic

Matc
Cycle
Reflect

Level I
Worklo

JOB STEP	DESCRIPTION OF JOB CONTENT	Analysis Information (Process Type & Estimated Time)		Cumulative Operator Time	
		CODE	ESTIMATE	Seconds	Hr:Min:Sec
1	PICK UP CARRIER AT TUBE STATION	PT	2	2	0:00:02
2	OPEN CARRIER	MAN	2	4	0:00:04
3	REMOVE SAMPLES FROM CARRIER	PT	2	6	0:00:06
4	CLOSE CARRIER	MAN	1	7	0:00:07
5	PUT CARRIER IN TUBE STATION	MAN	2	9	0:00:09
6	SEND CARRIERS	CYCLE	2	11	0:00:11
7	MOVE TO OE BENCH	MH	5	16	0:00:16
8	DROP OFF SPECIMENS	PT	2	18	0:00:18
9	WALK TO TUBE STATION	WK	5	23	0:00:23
10	PICK UP CARRIER AT TUBE STATION	PT	2	25	0:00:25

Potentia



Standard W
Practices

Match Process
Cycle Times to
Reflect Workload

Assignments to
More Closely
Match Workflow
Patterns

Level Individual
Workloads

Potential Staffing Efficiencies Post-Lean

Pre-Lean Configuration

- 2 stat processors
- 3 routine order entry
- 1 aliquoter
- 1 rover

Post Lean Configuration

- 5 order entry
- 1 aliquoter
- 1 distributor

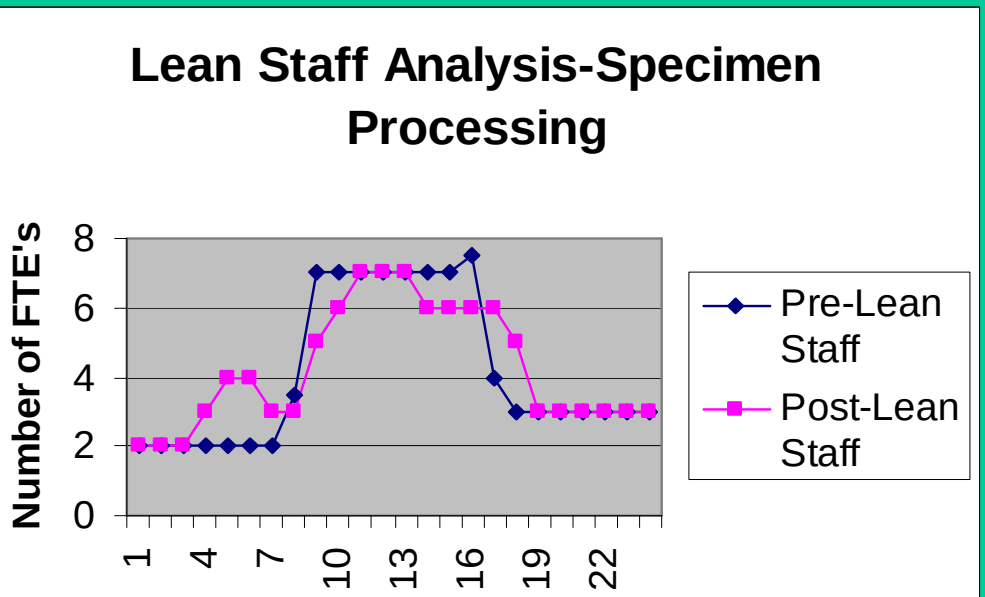
Re[illegible]

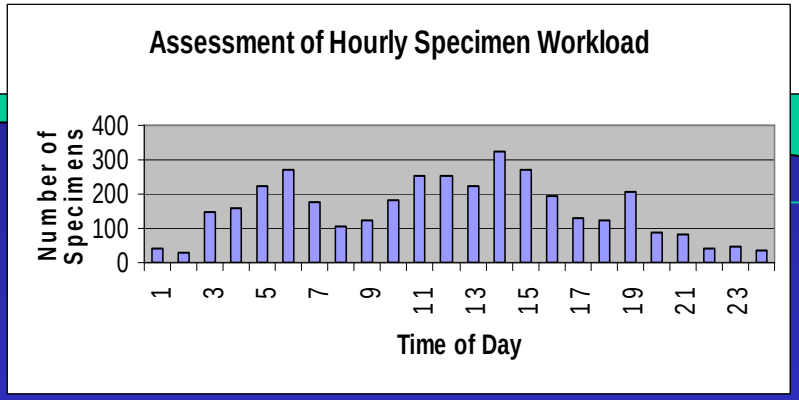
Match Workflow Patterns

Level Individual Workloads

Efficiencies

an





Redistribute Staffing Assignments to More Closely Match Workflow Patterns

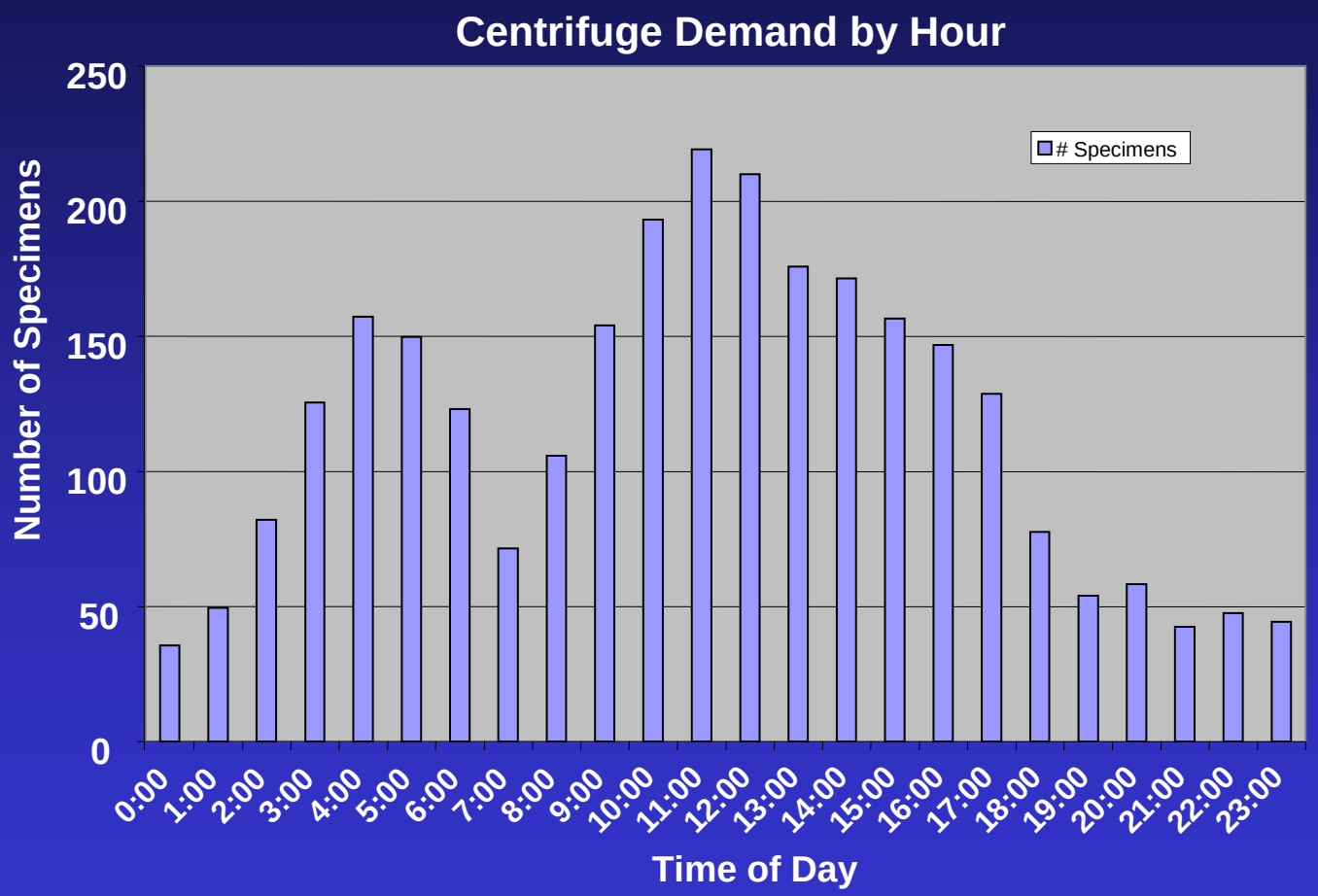
Level Individual Workloads

Lean as a Path to Automation

What Lean Provides:

- **Optimized workflow and standardized processes**
- **Performance metrics that enable continuous monitoring of processes and compilation of performance data**
- **Data, Tools and the Mindset to evaluate future changes**

Using Lean Data and Tools to Evaluate Future Changes



Using Lean Data and Tools to Evaluate Future Changes

Centrifuge (CF) Data	Manual / Standard	Automation
CF capacity (# of tubes)	86	100
Time to Load CF (min)	0.5	3
Time to Balance CF (min)	0.5	1
CF Spin Time (include ramp up and down) (min)	5.5	5.5
Time to Unload CF (min)	0.5	3
Total Time (min) / CF Cycle	7	12.5
# of Cycles / HR / Centrifuge	8.571428571	4.8
# of Centrifuges	2	4
# of Cycles / HR / Total	17.14285714	19.2
# Tubes Required/ CF Cycle	12.8	11.4

What's next?

- Utilize Lean tools and data to provide objective answers for the following questions:
  - Are there processes that still do not meet our productivity, quality of service and financial goals?
  - How would potential automated enhancements compare with current Lean state?
    - Efficiency, throughput?
    - Flexibility?
    - Cost?

We believe that starting with a Lean-state Laboratory and using Lean evaluation tools is the best way to make objective, data-driven decisions about the need for, and impact of, future automation strategies

Management Things We did Well

- Communication
- Protected Lean Team function
- Real-time metrics

Tools and Data to Shape the Future State

Management Things We Could Have Done Better

- Communication!
  - Achieving buy-in from management of all areas affected
- Selection of Steering Committee
  - Maximize clout!
- Planning for future transfer of Lean expertise

and, the BIGGEST CHALLENGE…

Keeping it Going!!