LEAN, SIX SIGMA, AND PROCESS IMPROVEMENT: FUNDAMENTALS, METHODS, AND APPLICATIONS FOR LAB PROFESSIONALS" WORKSHOP

Lab Quality Confab and Process Improvement Institute

New Orleans

October 23, 2014

Agenda

- Introductions
- Lean Business System Overview
- What Results Should You Expect?
- Batch vs. Lean?
- Lean Business System Tools - BASICS
- Lean And Change Management
- Linkage To Customer Value
- Lean Video Examples
- Lean Exercises
- What Is An Improvement You Can Make When You Return?

Why Lean?

Lean Gets Results!

Blood Diagnostic Analyzer 10/99

Before	
Operators	10
Units Per Day (includes OT)	1.7
DL per unit (hours)	62
Thru-put Time (Days)	7
Cycle Time (min)	355

After Actuals		
Operators	10	- 0%
Units Per Day (incl. OT)	4	+59%
DL per unit (hours)	**31**	**- 50%**
Thru-put Time (Days)	3.5	- 63%
Cycle Time (Min)	136	- 63%

50% Increase in Productivity – 3rd Pass, after other consultants!

Hospital Patient Services Area 2005

Tray Line (Meal Assembly)

Before

After

Baseline Data

No# of Operators per Day	18
No# of Operators (7 Days)	24
Square Footage	2,500
Seconds to complete (1) Tray	**214**
Meals per Day	2,419
Total Labor Hours	144

Pilot #2 Data

No# of Operators per Day	15	-38%
No# of Operators per Cell	3	
No# of Cells	2	
Square Footage (2 Lines)	552	-78%
Seconds to complete (1) Tray	**15.75**	**-93%**
Meals per Day	2,742	+13%
Total Labor Hours	72	-50%

In Lab Processing Time - 2004

Potential Savings for monitored tests 20% - 70%

Thru-put Time STAT TAT Receipt to Result (Minutes)	Baseline Data	Revised Lean Projections	Variance	Percentage Change Baseline to Projected
APTT (TECAN)	34.00	25.00	9.00	26%
BMETPN (TECAN)	41.00	32.48	8.52	21%
H&H (no TECAN)	19.00	6.10	12.90	68%
HEMGP (no TECAN)	23.00	6.10	16.90	73%

Core Lab Labor Savings - 2004

FTE Impacted by Core-Lab Lean	Pre Lean FTE	Post-Lean Lab FTE	Lean Goal FTE Savings	Lean Goal % FTE Reduction	Lean Goal FTE Reduction	1- YR Lab Goals	Lab % FTE Reduction	Lab yr-1	Lab yr-3
Phlebotomy	28.7	22.2	6.5	23%	$ 199,149.60	3.2	11%	$ 98,042.88	$ 294,128.64
Processing	28.9	25.2	3.7	13%	$ 112,596.12	3	10%	$ 91,915.20	$ 275,745.60
Chemistry*	14.7	9.8	4.9	33%	$ 305,575.30	1.5	10%	$ 93,163.20	$ 279,489.60
Hematology*	19.1	14.0	5.1	27%	$ 315,202.16	2.5	13%	$ 155,272.00	$ 465,816.00
Totals	91.4	71.2	20.2	22%	$ 932,523.18	10.2	11%	$ 438,393.28	$ 1,315,179.84
Overtime					$ 71,762.80			$ 71,762.80	$ 215,288.40
Totals					$ 1,004,285.98			$ 510,156.08	$ 1,530,468.24

1 Year Total Labor Opportunity of $510,156
No FTE Layoffs

SQ Footage Comparison: Options A , B, C

Current and New Building Karlsburger	Current Sq. Ft	Future Ft	Variance	Variance %
Net Available	**34,000**	**55,190**	**21,190**	**62%**
Non Core Laboratory	5,191	8,120	2,929	56%
Micro Laboratory	2,076	3,830	1,754	84%
Core Laboratory	7,929	10,520	2,591	33%
Total Laboratory	15,196	22,470	7,274	48%
Total Non Laboratory	18,804	32,720	13,916	74%

Comparison to New Building Using Architect Analysis 74% Savings Over Architect's 2 Floor Plan

Current and New Building Plan's B & C	Current Sq. Ft	Future Sq. Ft	Variance	Variance %
Net Available	**34,000**	**41,190**	**7,190**	**21%**
Non Core Laboratory	5,191	3,720	(1,471)	-28%
Micro Laboratory	2,076	2,076	0	0%
Core Laboratory	7,929	5,461	(2,468)	-31%
Total Laboratory	15,196	11,257	(3,939)	-26%
Total Non Laboratory	18,804	29,933	11,129	59%

Current Vs Revised New Building Plans with Future Lean SF Comparisons 59% Savings But No Second Floor

Current Building Plan A	Current Sq. Ft	Future Sq. Ft	Variance	Variance %
Net Available	**34,000**	**34,000**	**0**	**0%**
Non Core Laboratory	5,191	3,720	(1,471)	-28%
Micro Laboratory	2,076	2,076	0	0%
Core Laboratory	7,929	5,461	(2,468)	-31%
Total Laboratory	15,196	11,257	(3,939)	-26%
Total Non Laboratory	18,804	22,743	3,939	21%

Utilizing Current State Layout and Scrapping New Building Plans 21% Savings But No New Building

Construction Options vs. Savings Summary

Option	SQ FT New	Renovation	New Const.	Total	Savings
Current and New Two Story Lab Building Architect's Plan	32,500	$4.4M***	$11.8M**	$16.2M	$0
Option B & C – One Story New Lab Building & Renovating Lab	16,000	Need Est.	$5.84M	$5.84M	$10.4M*
Option A – No New Building & Renovating Lab	0	Need Est.	$0	0	16.2M*

* Less Renovation cost per Sq. Ft.
** New cost per Sq. Ft. = $362 based on Flad & Associates Conceptual Pricing Aug 5, 2004
*** Renovation Cost per Sq. Ft. = $162 based cost estimates from FH Construction and Design for 5,280 sq. ft. lab renovation

Overall Lean ED Metrics Summary - 2012

Baseline

- Staff Hours 145
- Volume (patients per day) 71.2
- **D2D (Minutes) 53 min**

Lean Track March

- Staff Hours 159
- Volume patients per day 72
- **D2D (Minutes) (42% reduction) 22.65**

Lean on Acute Track

- Staff Hours 159
- Volume (patients / day) 77.6
- **D2D (Minutes) (47% reduction) 27.9**

Company X - Meeting Results - 2001

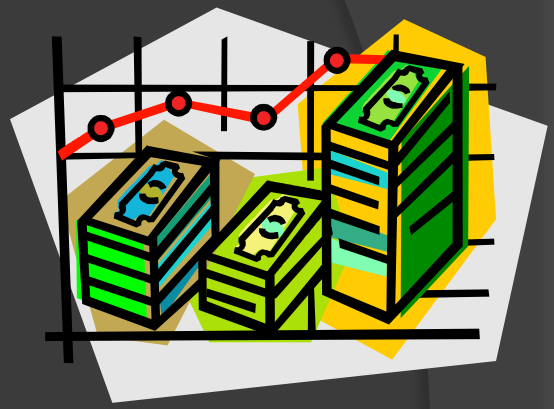
- Production meetings cut from 4 hours a week to 55 minutes
- Cut Finance meetings in ½, 2 ea. 1 hour meetings to 45 minutes
- BDT's meeting cut from 3 hours/week to 3 hours every other week
- Forecasting process cut from ¾ day to 2 hours
- HR cut meetings from 1 ½ hours to 1 hour.
- IT cut several meetings in ½ yielding 500 hours savings.

Total Annual Savings 4,578 hours

Typical Results Yielded through Lean

Up to:

- 90% through put time reductions
- 20-70% increases in productivity
- 90% reductions in inventory
- 95% reductions in Travel Distance
- 10% or more reduction in defects
- 30% reductions in overhead activities
- Significant returns on consulting fees



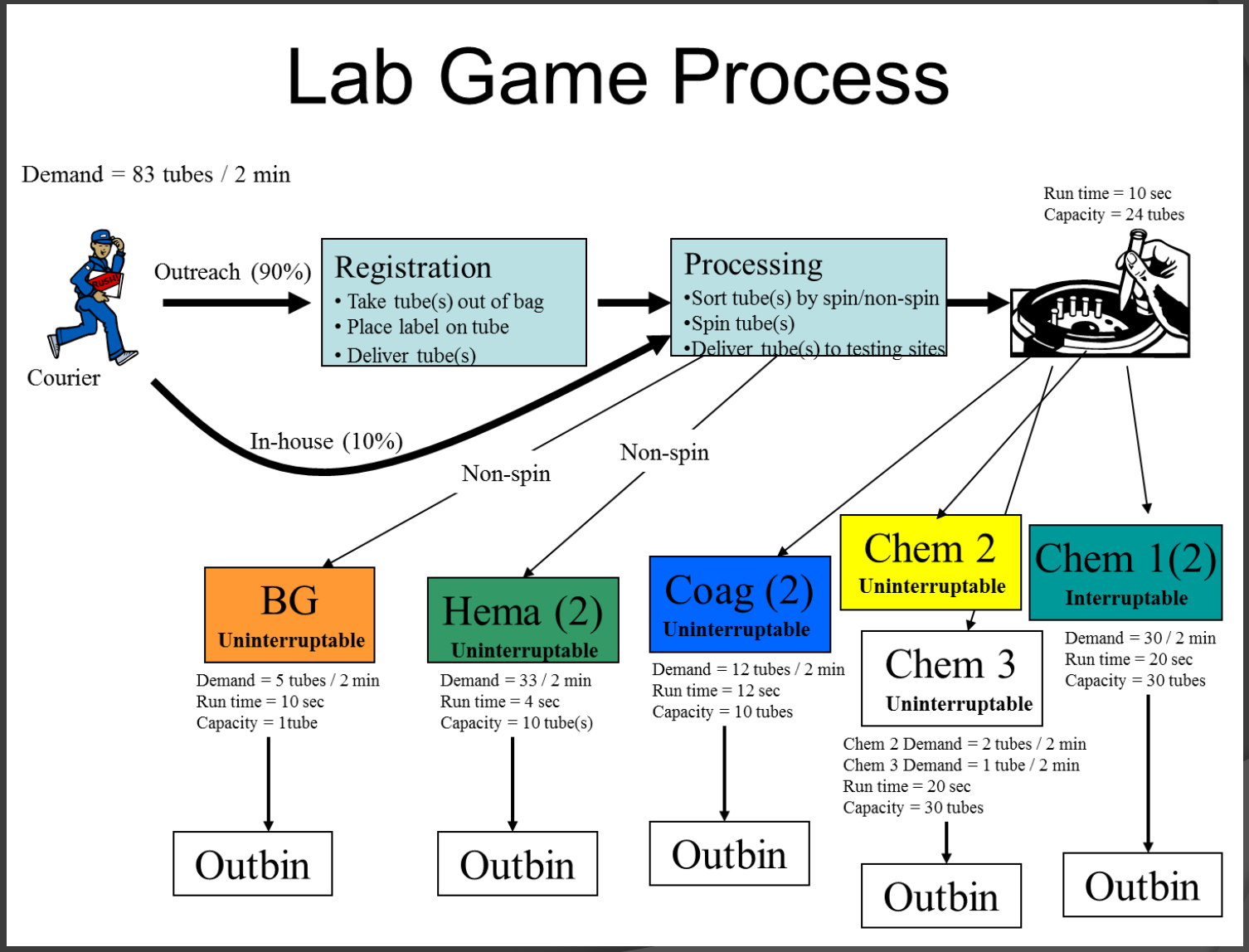
Anyone you dedicate to continuous improvement will pay for themselves 10X

Implementations Are Budgeted But Self Funding!

What is Batch?

What is Lean?

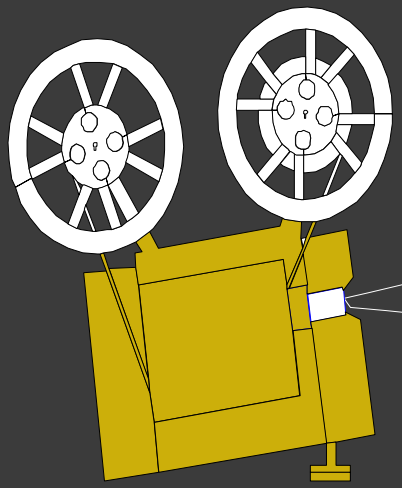
Batch Exercise



Batch Environment

What are the typical characteristics of a **BATCH** environment?

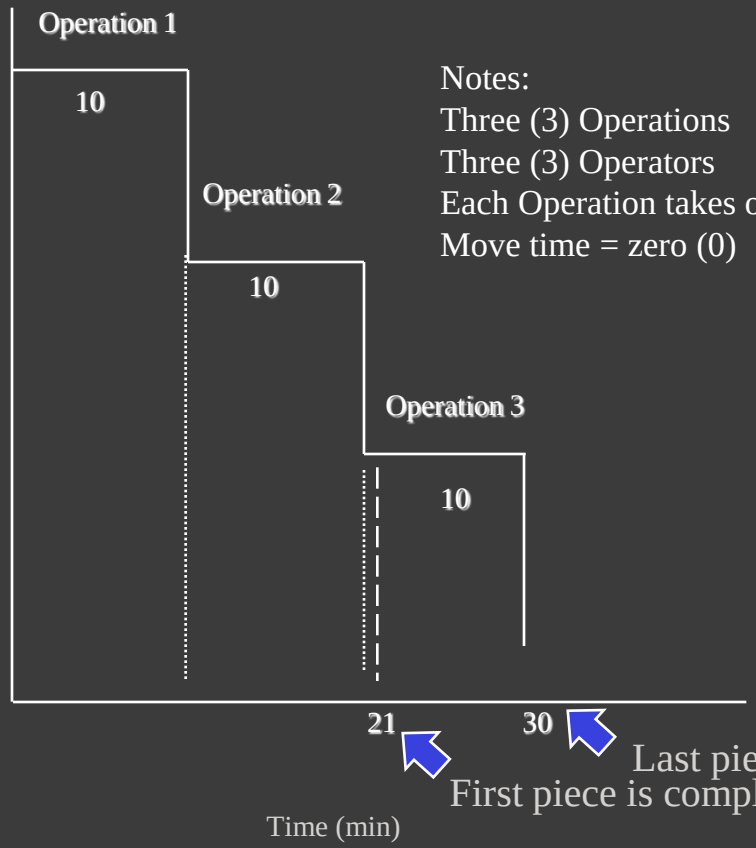
Video



Video on Batching

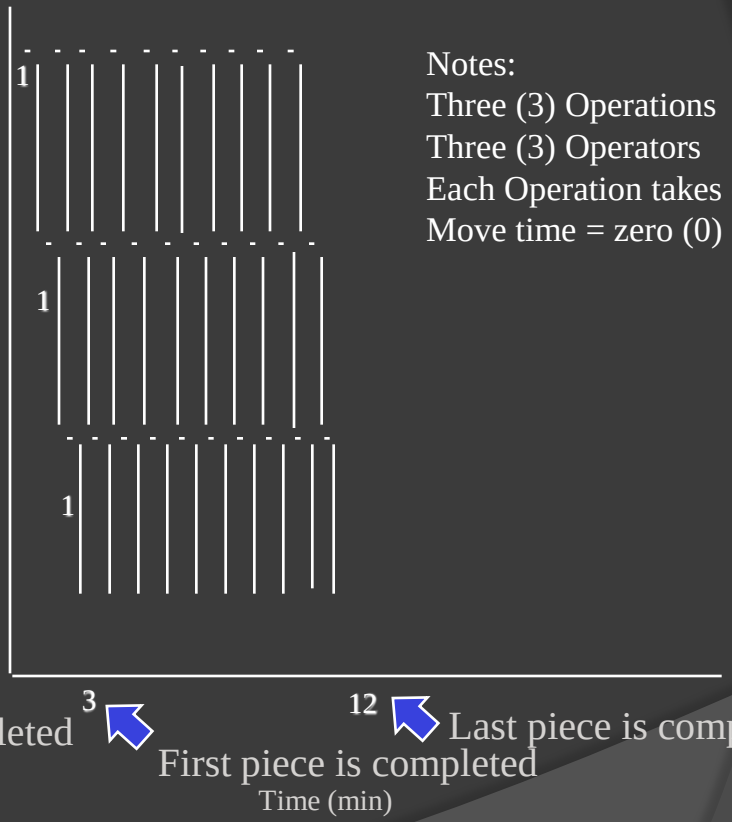
One Piece Flow vs. Batch

Batch



Notes:
Three (3) Operations
Three (3) Operators
Each Operation takes one (1) min.
Move time = zero (0)

One Piece Flow



Notes:
Three (3) Operations
Three (3) Operators
Each Operation takes one (1) min.
Move time = zero (0)

8 Root Causes of Batch

1. Your Minds
2. Setups
3. Travel Distance
4. Equipment
5. Process
6. Idle Time
7. Space
8. Variation

When you are working on something you don't need…
You can't work on something you do need!

Variation is the enemy of Lean!

Today's Realities...

Our Customers Are Continuously Demanding:

- Higher Quality
- Better Service
- Shorter Lead Times
- Lower Prices
- Faster Response Times

Our Businesses Must Grow, but Space and Manpower Cannot:

- Major shortages of qualified personnel
- Skilled labor costs are increasing
- Space is expensive
- Personnel Education & Training is expensive

Our Markets Are Becoming More Competitive Both Nationally And Globally!

What is the Change We are Making?

The “change” is converting from a Batch based system to a Lean thinking based system

Joel Barker's

THE NEW BUSINESS OF PARADIGMS

Back to Zero

Group Exercise

1. **What event or occurrence could set your organization back to zero?**
2. **"What is impossible to do in your business today, but, if it could be done, would fundamentally change it for the better?"**

When a paradigm shifts, everyone goes back to ZERO!

•CONCEPT 6•

Thinking Lean…

Lean is…

Small… Incremental…

Continuous Improvement

Every Day

Lean Definition:

Increasing Customer Value by Eliminating Waste Throughout the Value Stream*

Would You Believe
75 - 95%
of what you are doing now is
Waste!

It can't possibly cost you more money to do something in 4 hours that now takes 4 days

* Based on definition in the book Lean Thinking, Womack & Jones, Simon & Schuster

Lean Mission Statement

TO SEEK OUT NEW WASTE AND DESTROY IT!

Waste Is Like A Virus. It Has The Capacity To:

- Grow Invisibly And Multiply
- Contributes To Poor Customer Service
- Reduces Customer Satisfaction
- Raise Our Costs but Provides No Value Added
- Causes Defects In Our Processes

Waste is like a Virus…
It threatens all our Jobs!

Inspired by Mark Jamrog, SMC Group

The Eight Wastes in Healthcare

- Waste of overproduction
- Waste of idle / wait time
- Waste of transportation
- Waste of over processing
- Waste of inventory
- Waste of movement
- Waste of defects
- Waste of talent

The largest and most difficult waste to find is time … and once you waste time, you can never get it back …

Henry Ford

Source: Taiichi Ohno - Toyota Seven Wastes

How Do We Find Waste?

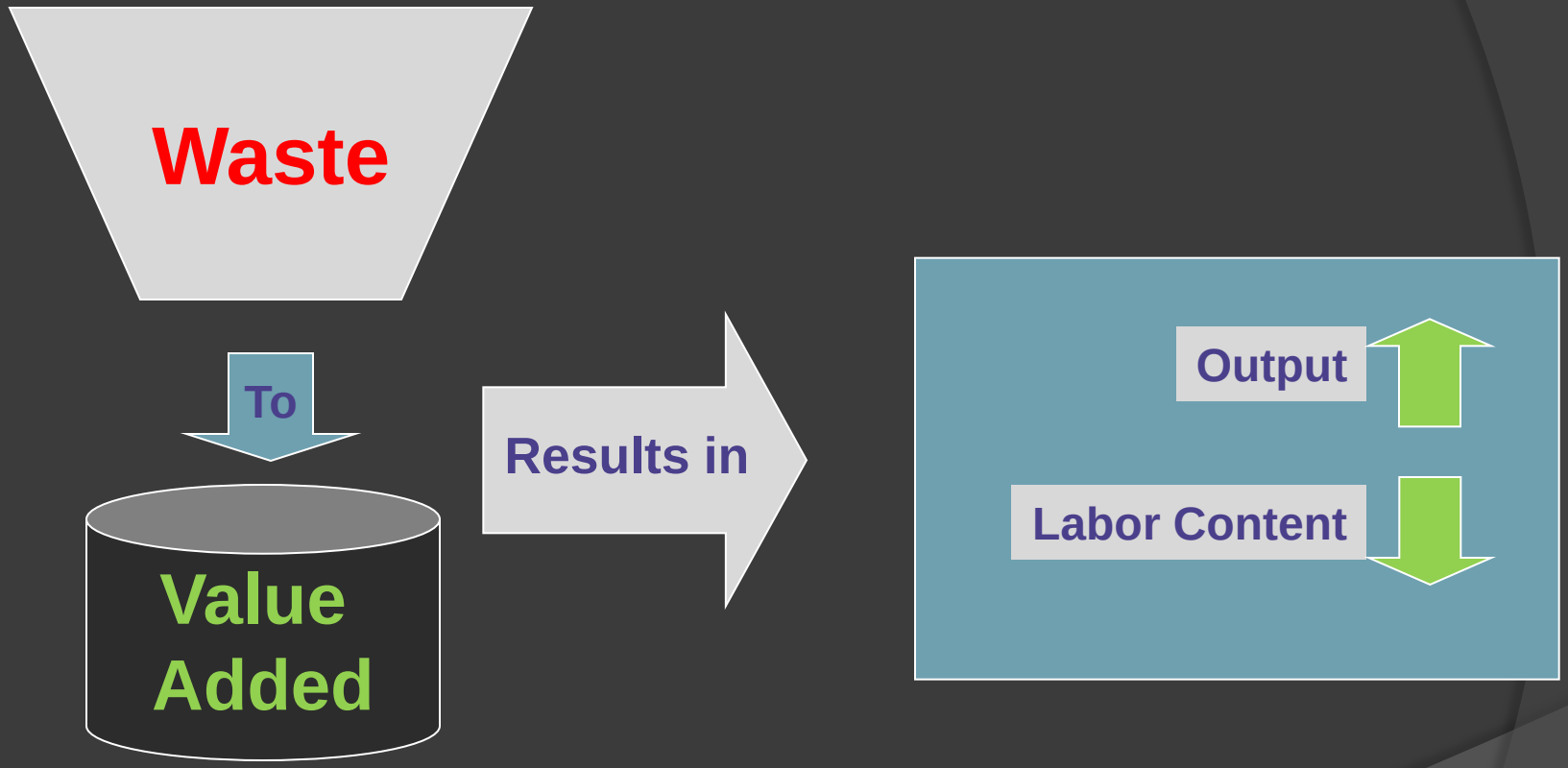
- **Actual Part**
- **Actual Place**
- **Actual Situation**

Today's Homework:
Go back and see how many of the eight wastes you can identify in your area!

Source: Powered by Honda, Nelson Mayo Moody, John Wiley and Sons, ©1998

Batch to Lean Waste Conversion Formula

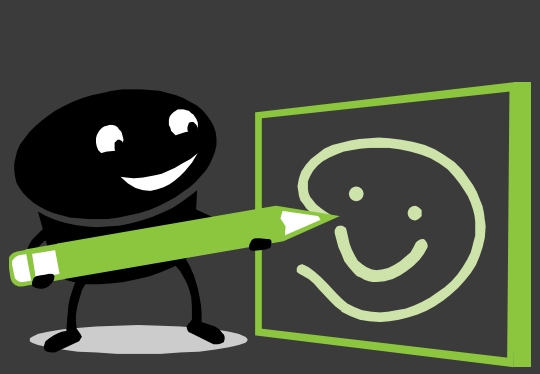
A Lean Business Delivery System™ converts:



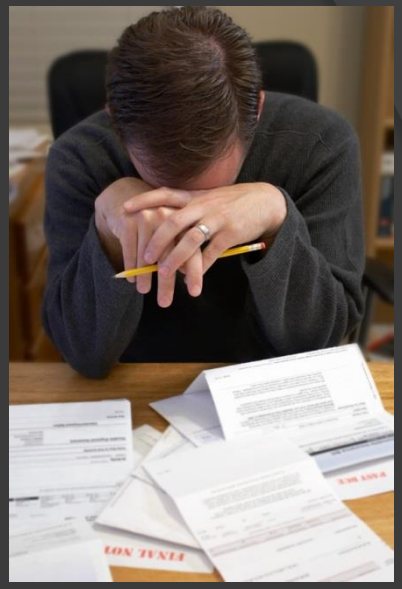
Significant Increases to Productivity and Will Make Your Job of Managing Easier!

Changing Cost Philosophy

Cost Cutting



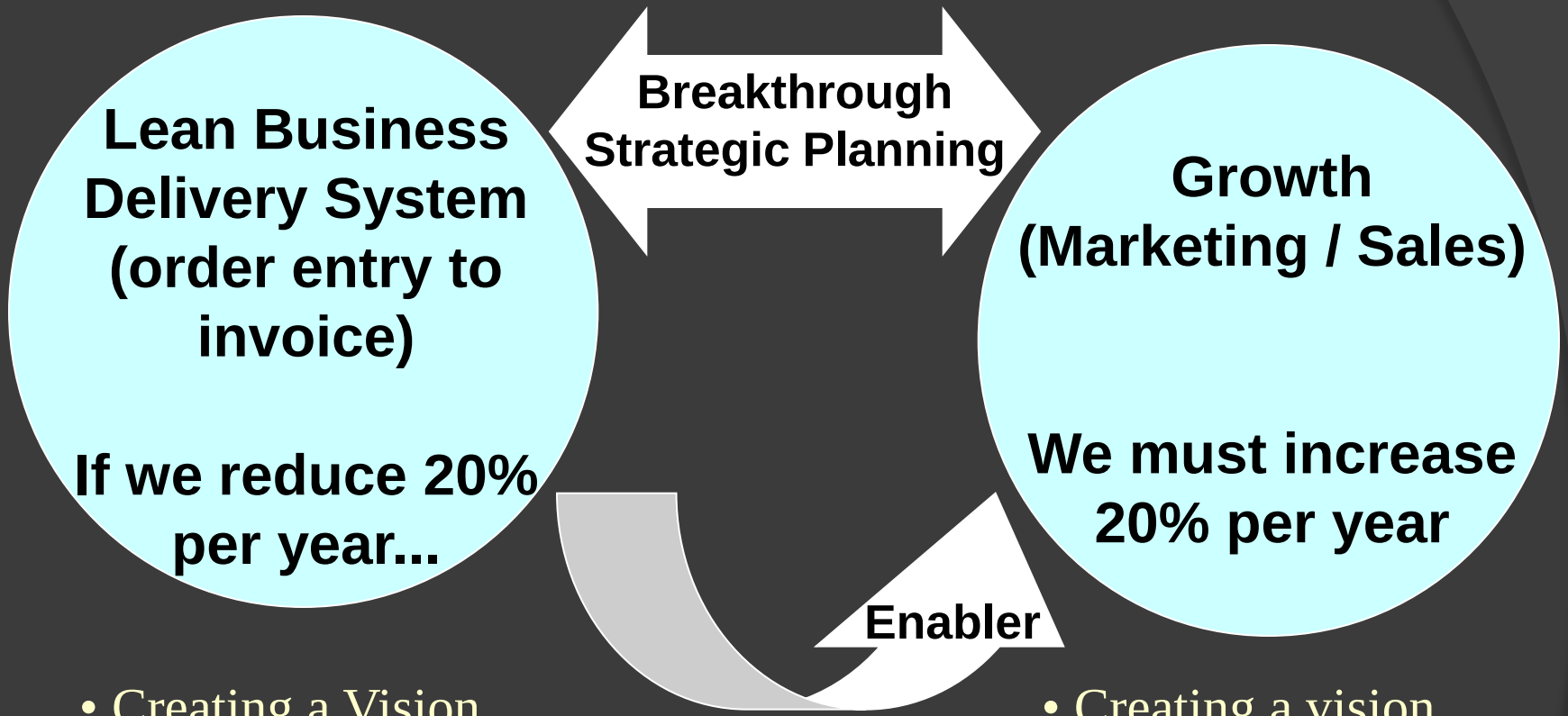
VS.



Cost Reduction

Goal: To Create The Highest Paying Positions With The Lowest Overall Labor Cost!

Business System from a Leadership Perspective



- Creating a Vision
- Operational Excellence
- Lean Accounting

- Creating a vision
- Customer Value Positioning
- Lean Acquisition

We must look at the overall business as a system!

Lean Cash Flow Goal

Lean Formula

Present Capacity = Work + Waste

Lean & Your Customer

Lean Helps You to Identify
"Value" from the
Customer's Point of View!

Fundamental Lean Goal

Provide The Highest Quality Value Added Patient Care With The Optimal Cost In The Shortest Time With A Great Hospital Experience!

Lean is Customer Focused!

The Lean View Point

Lean Forces You To Look At Things Differently.

Once You Get The Lean Customer Value Added Paradigm…

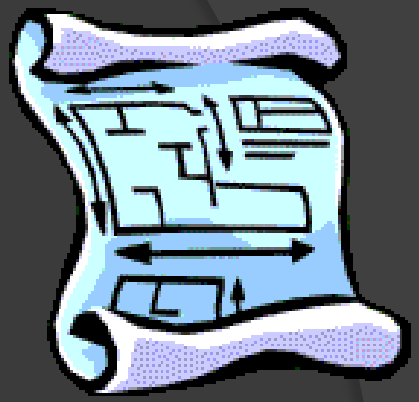
You Will Never Be The Same

Lean & Change

Lean = Paradigm Shift!

As always there will be some resistance to change!

Why Change?



- What is the option?
- We are all interconnected but not typically measured that way

- Is your department “World Class?” What about all the departments you impact?
- How many of you are satisfied with your current processes? Did you create that process?

Success Breeds Complacency

The Change Equation

C x V x N x S > R

- **Do We Have a Compelling Need to Change:**
  - What is your patient satisfaction score?
  - What is your average LOS?
  - How long does your patient wait?
  - What is your turnover time between patients?
  - **Are you satisfied with your results?**

What is the Right Thing To Do for our Patients?

Complacency Test

- When was the last time you made an improvement to your process?
- What is your average implemented suggestions per month from your employees?
- How often do you say “It can’t be done”, “Management won’t let me…”, “I can’t get money…” “We tried that before…”
- We don’t need to get any better…
- My Department’s metrics look great… What does it matter that we impacted the other department… That’s their problem!
- I’m tired of hearing about customer satisfaction issues… we know we have problems… we will fix them when we get that new facility with more beds and space”
- I can’t make any changes because…..

Are You Complacent?

Toyota Suggestion Rate is ____ Suggestions Per Month Per Employee
With a ____% Implementation Rate!

What People Want To Know

- What is the change?
- What are the tools we use to make the change?
- Why are we changing?
- How will it affect me?
  - Now? Future? Job? Personally?
- How will it affect the organization?
  - Now? Future?
- What's in if for me if I go along with the change?
  - Now? Future?
- What's in it for the organization?

Communication is essential!

Barriers to Implementing World Class

I Can't …
It Won't Work….
I Already Know….
Won't Work Here...
Tried that before…
I don't want to run it that way…
You are going to do it anyway...

The Only Limiting Factor Is Your Mind!

Most Loved Words

- What if we could……
- What if we tried……
- How can we….
- I know we can….
- I saw someone else doing it..
- Why didn't it work the last time…
- When was the last time we tried….
- Maybe the manufacturer can help us…
- Let's benchmark a company that is doing that way…
- Let's take the best from YOUR WAY and MY WAY and make it OUR WAY…

Brainstorming is the TQ tool that overcomes the "I Can't" Syndrome?

Lean Tools

There are a lot of pieces...

The KEY is to build a culture that integrates all of them!

Lean Tools Application Process – BASICS

1. Baseline
2. Analyze / Assess
3. Suggest Solutions
4. Implement
5. Check
6. Sustain

Manage By Fact!

Let the Data do the Talking!

Baldridge and Shingo Prize Aligned with Focus on 6th and all Criteria with Iterations of Improvement

Lean Tools Application Process – BASICS

Follow the BASICS to Implement Lean

		Baseline Pre-Implementation	Assess	Suggest Solutions	Implement	Check Results	Sustain
Deliverables	Objectives	Company Vision, Values and Purpose					
		Principles	Code of Conduct/Contract for Change				
		Company Goals & Objectives	Department Goals and Objectives				
		Lean Vision & Values					Lean Advisory Committee
	Resources	Team Charter Document	Project Expected Results				
		Assign Executive Sponsor					
		Select Leadership Steering Committee					
		Dedicated Lean Resources					
	Analysis	Customer Feedback (VOC)	Customer Value Added Proposition				
		Stakeholder's Analysis	Agreed ROI with Executive Leadership				
		Supplier Analysis	Supplier Data (# of, #certified etc.)				
	Plans	Hoshin Plan					
		High Level Implementation Plan	Executive Review Schedule				
		Project Plan	Phase Gate Review Plan	Phase Gate Review		Draft Control/Sustain Plan	Final Control Plans/Sustain Plans
		Change Management Plan	Opportunities for Improvement	Standard Work	Quick Win Results and Celebration	Five S Audit Sheet/TPM Checklists	Plan for Continuous Process Improvement
		Resource Plan	Dedicated CI resources	Roles and Responsibilities Matrix			Employee Idea System/Employee Satisfaction Program
		Communication Plan	Quick Hits List			Pilot Results	
		Training Plan	Cross Training Plan	Cross Training Matrix			
		Materials Plan	Layout / Master Layout	Group Tech Matrix - Identify Product / Process Families	Material Flow Plan/PFEP		
		Measurement Plan	Baseline Metrics: Customer Demand/Takt time/#QDIP plan/ Industrial Eng., quality, delivery	Lean Metrics	Visual Displays/Visual Controls	#QDIP Data	
People Tools	Analysis	Employee Satisfaction	Succession planning				
		Customer Satisfaction					
	Psychology	Myers-Briggs (MBTI)					
		Learning Organization	Knowledge Man				
		Team Dynamics (Forming)	Team Dynamics C				
		Psychology of Change	Change Equation (M				
	Lean Training	BASICS Process					
		Lean Overview Training	Gemba Wa				
		Lean Champion Training					
		Lean Topic Training					
		Project Leader Training					
	Skills Training	Effective Meeting Techniques	Location Meeting Re				
		Communication Skills	Crucial Conver				
		Problem Solving					
		Creative Thinking	Brainstorm				
BASICS Process		Baseline Pre-Implementation	Assess				
Task Tools	Customer Analysis	Customer data: Sales,warranty, quality, delivery, demand				Block Diagram		Lean Advisory Committee	
	Location Analysis	Location Lean Audit	Collect Current Data			Create Metric Plan	Define Panel Charts	Ongoing Data Collection Plan	Balanced Scorecards
		Area Readiness Assessment	Current Work Procedures			Five S	Position and Label Tool Locations	Five S Audit Plan	
		People Assessment	Full Work Analysis			Staffing Analysis and Plan			
		Project Control Matrix	Assess Roles and Responsibilities			Ten Most Wanted List of Improvements		Action Plans	
		Interviews, SME, KANO, etc	Feedback from process participants			Fit Up List			
	Material Flow	Plant Layout Analysis	Group Tech Matrix, Product Process Flow			Layouts - master and area			
		Material Flow Analysis	Water Spider Process			Material Warehouse/Routes/ Inside bins/Kanbans - production and with drawl			
		Level Loading (Heijunka)	Materials Strategy, Inventory Turns, Thruput			Plan for Every Area with calculations			
		Process Flow Mapping	Value Stream Mapping/Value Add Percentages			Line Balance - bumping			
	Process Capability	Process Capability Analysis	Workstation Analysis			Part Production Capacity Sheet			
		Video and Photo Documentation	Ten Cycle Analysis/Waste Diagnosis			Standard Work Combination Sheet/Job Breakdown/Standard Work/Work Breakdown/Workflow analysis			
		SMED - Setup Reduction				SMED / Setup Reduction			
		QFD House of Quality	Quality Tools -SFMEA, DFMEA, PFMEA, Control Plans			Workstation Design improvements	Control Plans/Sustain Plans		Six Sigma Tools
		Critical To Quality Matrix							
		Operational Equipment Effectiveness (OEE)							
		Equipment Reliability (TPM)				TPM		TPM Checklist	
	Product Design & Accounting	DFM Analysis	Cost Benefit Analysis						
		Lean Accounting							
Implementation	Resources	Select Pilot Executive Champion	Gemba Walks with Executives			Project recommendations and approvals		Gemba Walks	Gemba Walks
		Select Pilot Area and Leader						I.D. Gaps	Transition to Value Stream Manager
		Select PI Consultant	Initial Walk Through With PI Consultant			Identify quick wins	Implement quick wins	Develop Actions to address gaps	
		Choose Pilot Team/Area	Begin Overview Lean Training			Layout recommendations and approvals	Implement Layout Design		
		Identify dedicated CI resources	Analyze the Product Flow			Develop Kanban and Heijunka	Implement Kanbans		Continuous Process Improvement
	Objectives	Charter the Pilot Team	Develop Group Tech Matrix			Develop Andon Plan			Implement Sustain and Follow up Plans
		Set Pilot objectives and goals	Conduct Work Flow Analysis			Recommendations and materials strategies	Implement materials strategies	Process Capability	
		Identify Potential Risks	Setup / Changeover Analysis			5s, Visual Mgmt	Tool Location and Labeling		
	Plan/Roadmap	Develop implementation plan	Solicit feedback from process participants			Develop new work procedures, guidelines	Implement new workstation designs		
		Develop training plan for Pilot team	Implement change management plan			or standard work procedures	Implement Standard Work		Implement new idea system
		Develop change management plan	Build Ahead or Work Arounds in Place prior to implementation phase					Update Metrics	
		Develop communication plan					New Performance Metrics, Day by	Review Metrics vs. Targets	Implement new Reward System
		Develop budget for Pilot					Hour and Month by Day Charts	Update ROI	Lean Projects Budgeted in Annual
								Share Pilot results and revisions	Create Plan for Area Tours/Presentations
									Reducing labor/lead time with PDCA
									Implement TPM
Communication Plan		Leadership / Executive Briefings	Leadership updates			Leadership Updates	Board Level Report Out		
		PI Consultant meetings							
		Union Leadership Meetings							
		Location Rollout Meeting		Weekly or Bi Monthly Mgmt updates					
		Implementation Schedule		Milestone Posting		Milestone Posting	Milestone Posting	Milestone Posting	Milestone Posting
		Visual Implementation Schedule		Visual Communication Postings		Visual Communication Postings	Visual Communication Postings	Visual Communication Postings	Visual Communication Postings
		Visual Measures		Assess current metrics		Define Lean metrics	Post Metrics/Visual Displays	Visual Scorecard	Visual Scorecard
		60 second Elevator Speech				Recognize Successes	Recognize Successes	Recognize Successes	Recognize Successes
Timeline		Up to 3 months		Up to 2 Months		Up to 2 Months	Up to 2 Months	Up to 2 Months	Ongoing

Lean… Hard At Work

Definitions - Value Added

Value Added

- Physically changes the product / patient
- Customer cares about it
- Done right the first time

Non Value-Added, but Necessary

- It must be done based on our current processes TODAY, but does not meet all three (3) criteria above

You Must Look at Value Added From the Eyes of Your Customer!

The New Customer Driven Economy

Everything Starts With the Voice of the Customer

- **Customer Surveys**
- **Customer Demand**
- **Customer Expectations**

Do You Know What Your Customer Wants?

Production Smoothing / Tact Time

Customer Demand = 21,000 Tubes/ Week
= 3,000 / Day

TT = Available Time / Customer Demand

Available Time = $\frac{1440 \text{ min/day}}{3{,}000 \text{ /day}}$

= 28.8 seconds
This is equal to:
Approx 2 tubes per minute

Demand Lab Projection Analysis

Core Lab		2001 Actual	2002 Actual	2003 Actual	May YTD 2004	May 2004 Annualized	2004 Budget
InPatient							
LABORATORY - GENERAL	72005001	49	121	380	195	468	392
LABORATORY - CHEMISTRY	72005001	431,003	494,810	583,681	262,726	630,542	570,811
LABORATORY - HEMATOLOGY	72005001	176,121	194,029	212,358	93,067	223,361	211,899
LABORATORY - COAGULATION	72005001	88,986	100,302	110,897	48,802	117,125	112,926
LABORATORY							
Total InPatien							
Growth % InP							
Outpatient							
LABORATORY							
LABORATORY							
LABORATORY							
LABORATORY							
LABORATORY							
Total Out Pati							
Growth % Out							
Total InPatien							
Total Growth							

Diffs Demand by Hour (avg 172 sec, morning 257 seconds (tougher diffs)

	shift 1									shift 2			
Hour	7	8	9	10	11	12	13	14		15	16	17	18
# of Diffs	24	14	5	10	8	7	4	14	86	3	8	8	7
mins per hour doing diffs (257s peak, 172s non peak)	102.8	60.0	14.3	28.7	22.9	20.1	11.5	40.1	37.5	8.6	22.9	22.9	20.1
Extra time	(42.8)	0.0	45.7	31.3	37.1	39.9	48.5	19.9	22.5	51.4	37.1	37.1	39.9
Cum / shift	24	38	43	53	61	68	72	86		3	11	19	26
Cum	80	94	99	109	117	124	128	142		145	153	161	168

Fluid Demand by Hour (8.4min/fluid)

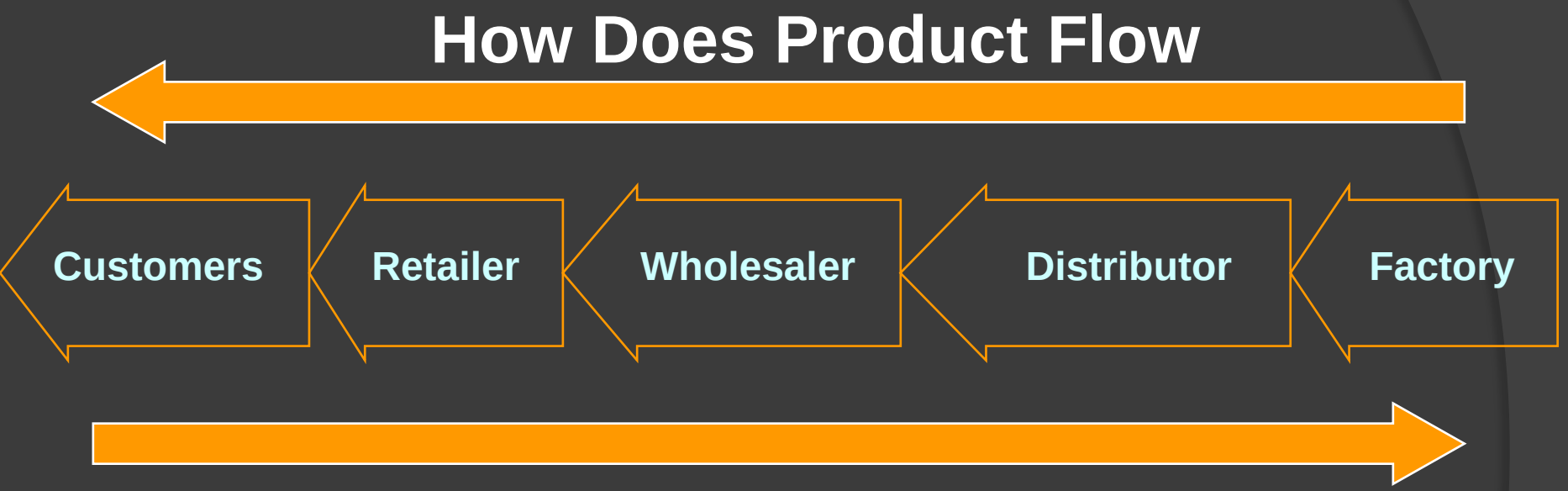
Hour	7	8	9	10	11	12	13	14		15	16	17	18
1-Oct			1	1	3	1		3		2	1		
7-Oct			2				1				1	1	
24-Sep		2		3		1	1	2					
Total /hour	0	2	3	4	3	2	2	5	21	2	2	1	0
average/hour	0.0	0.7	1.0	1.3	1.0	0.7	0.7	1.7		0.7	0.7	0.3	0.0
Average / Shift								7.0					
mins per hour doing fluids	0.00	6.99	10.48	13.98	10.48	6.99	6.99	17.47		6.99	6.99	3.49	0.00
Time per shift doing Fluids Mins								73.38					
Time per shift doing Fluids hours								1.22					

Demand Projection Analysis by Hour for Diffs

Demand/Capacity Analysis by Machine

Machine	Max Instrument Volume Per Hour (from MFG)	Per Hour	July 04 Hourly Volume	12% Factor added for Peak Demand in 2004	2005	2006	2007	2008	2009	2010	2011	2012
% Increase per Year				112%	105%	105%	105%	139%	105%	105%	105%	105%
Modular	4100	Tests	1497	1676.6	1760.5	1848.5	1940.9	2697.9	2832.8	2974.4	3123.1	3279.3
917	1200	Tests	699	782.9	822.0	863.1	906.3	**1259.7**	**1322.7**	**1388.9**	**1458.3**	**1531.2**
CX3	600	Tests	137	153.4	161.1	169.2	177.6	246.9	259.2	272.2	285.8	300.1
Asxym 1	80	Tests	30	33.6	35.3	37.0	38.9	54.1	56.8	59.6	62.6	65.7
Axsym 2	80	Tests	44	49.3	51.7	54.3	57.0	79.3	**83.3**	**87.4**	**91.8**	**96.4**
Centaur	240	Tests	185	207.2	217.6	228.4	239.9	**333.4**	**350.1**	**367.6**	**386.0**	**405.3**
Chemistry	**1540**	**Tests**	**2592**	**2903.0**	**3048.2**	**3200.6**	**3360.6**	**4671.3**	**4904.8**	**5150.1**	**5407.6**	**5678.0**
Pro-Forma	**3080**	**Tests**	**2592**	**2903.0**	3048.2	**3200.6**	**3360.6**	**4671.3**	**4904.8**	**5150.1**	**5407.6**	**5678.0**
New Machines to be procured 2005	**4620**	**Tests**	**2592**	**2903.0**	3048.2	3200.6	3360.6	**4671.3**	**4904.8**	**5150.1**	**5407.6**	**5678.0**
	6160	**Tests**	**2592**	**2903.0**	3048.2	3200.6	3360.6	4671.3	4904.8	5150.1	5407.6	5678.0
Hematology												
Sysmex	240	Tubes	92	103.0	108.2	113.6	119.3	165.8	174.1	182.8	191.9	201.5
Stago	125	Tests	102	114.2	120.0	**125.9**	**132.2**	**183.8**	**193.0**	**202.7**	**212.8**	**223.4**
Atlas	225	Tubes	20	22.4	23.5	24.7	25.9	36.0	37.8	39.7	41.7	43.8
TECAN	500	Tests	362	405.4	425.7	447.0	469.3	**652.4**	**685.0**	**719.3**	**755.2**	**793.0**
Iris												

Value Stream Mapping Tool



Your Total Costs And Inventory in Your Supply Chain Are Compounded as A Result Of The Makeup Of The Overall Value Stream

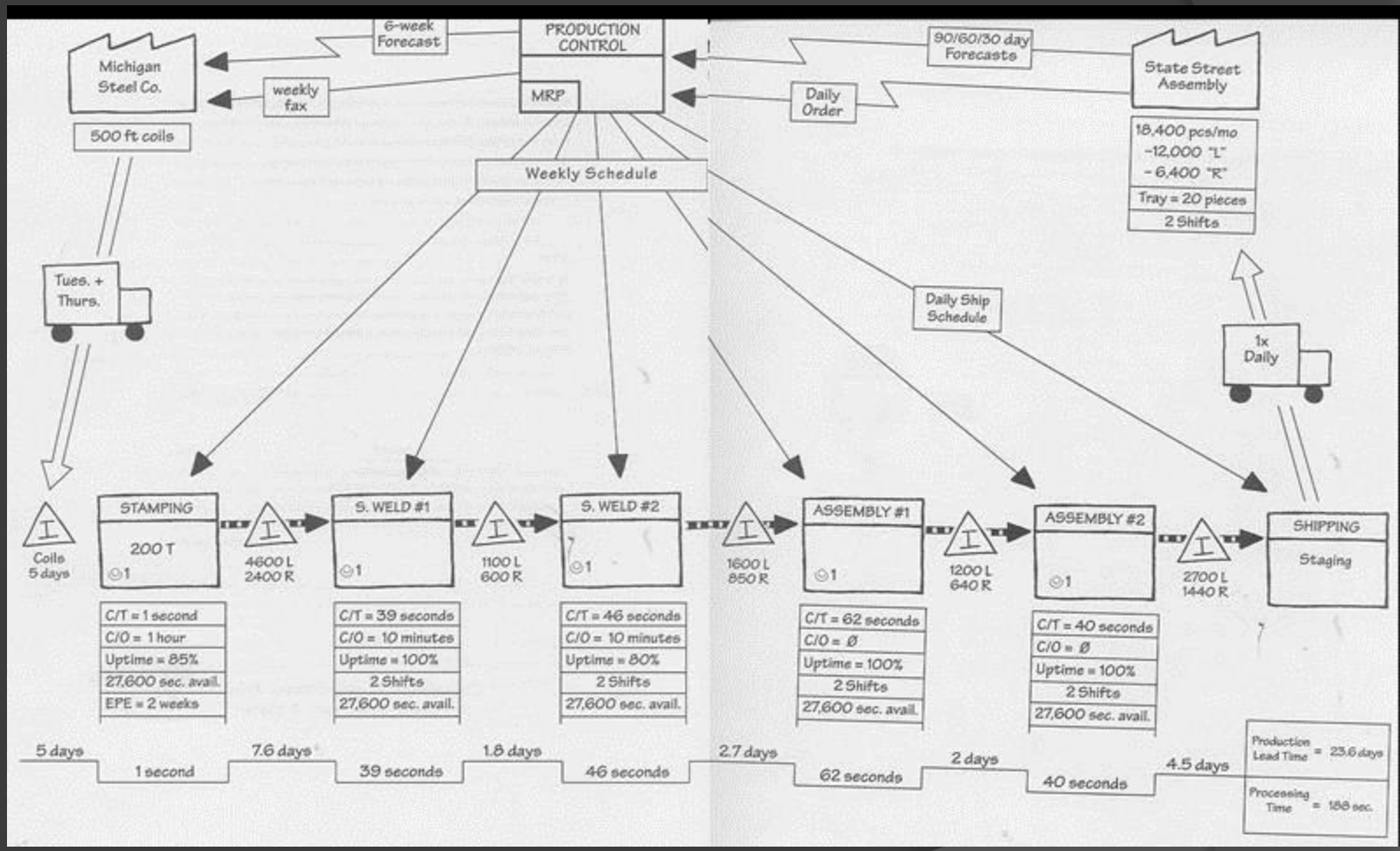
Value Stream Mapping – Parts

Information Flow

Material Flow

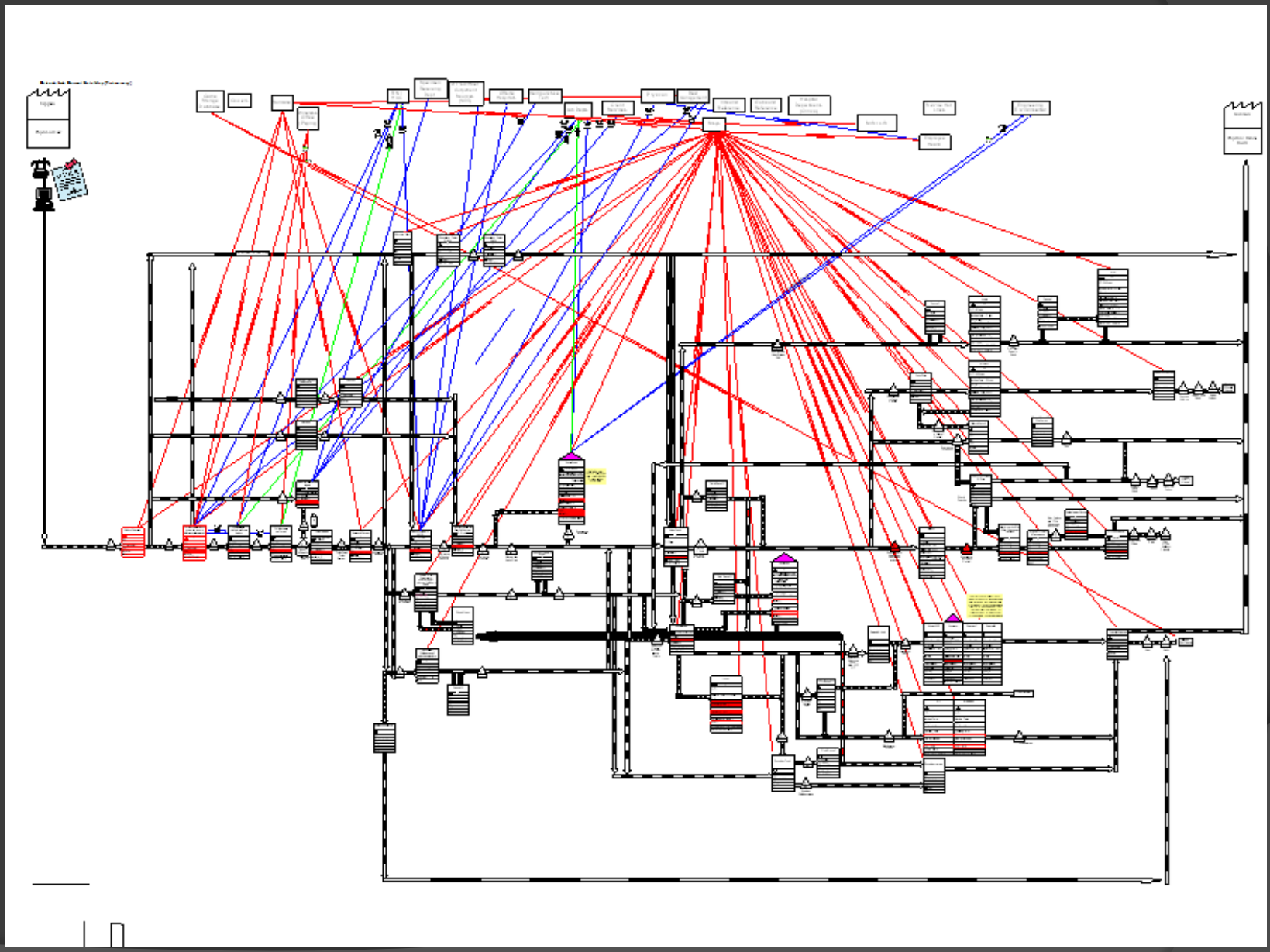
How I build the product

How long it takes to build the product

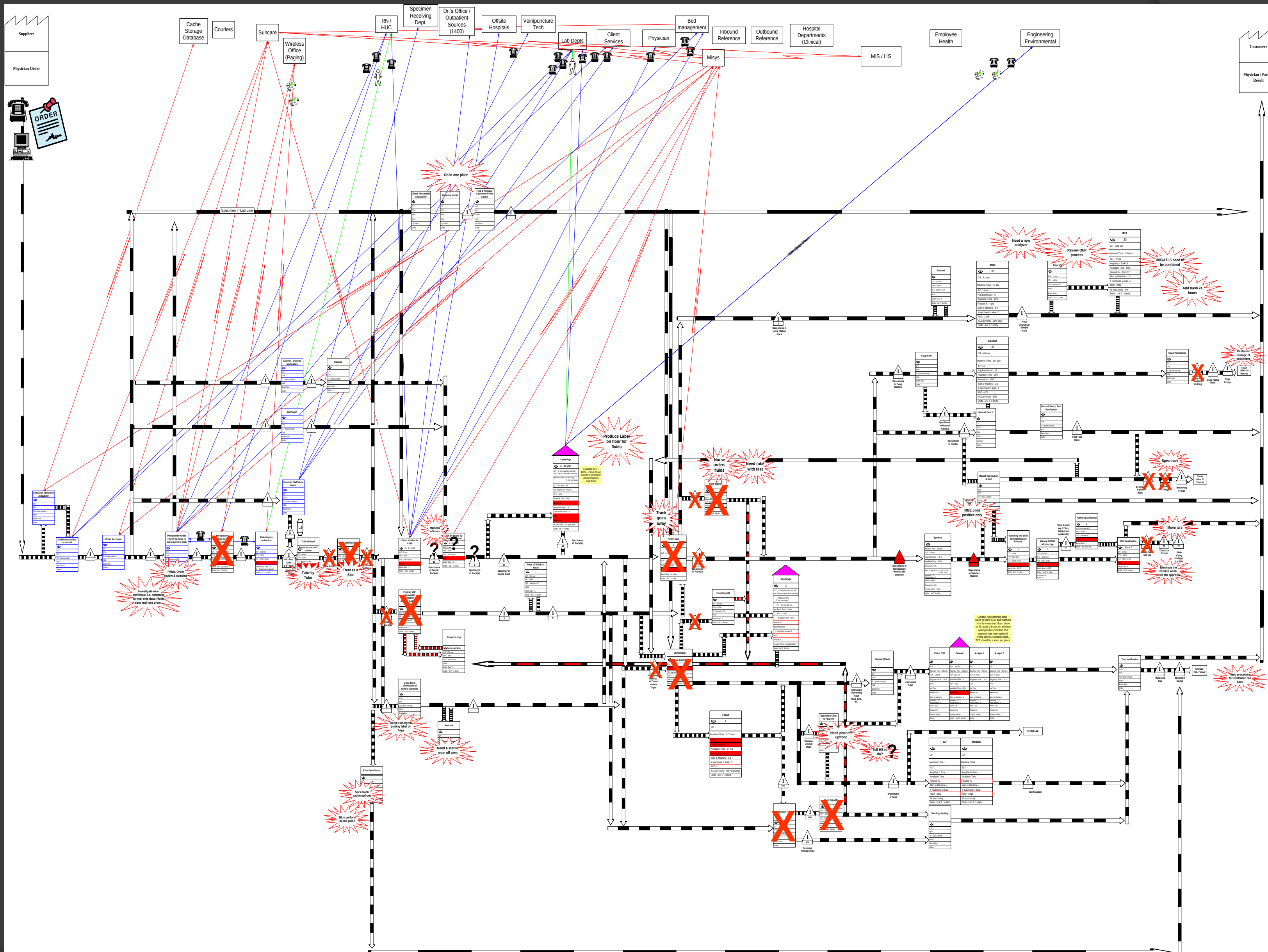


Source: Learning to See, Rother & Shook, pg 32 & 33, The Lean Enterprise Institute, © 1998

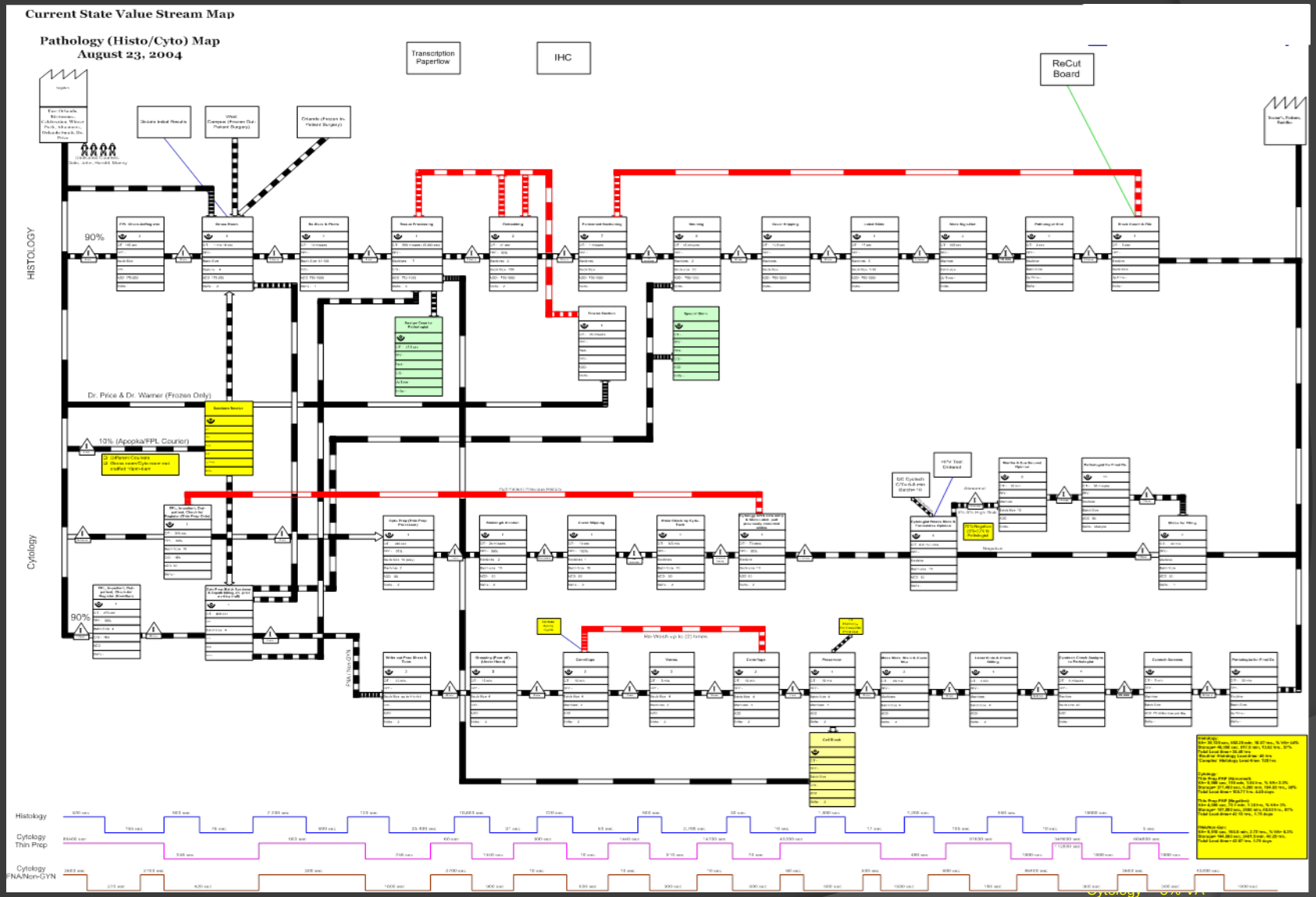
Current State Core Lab VSM



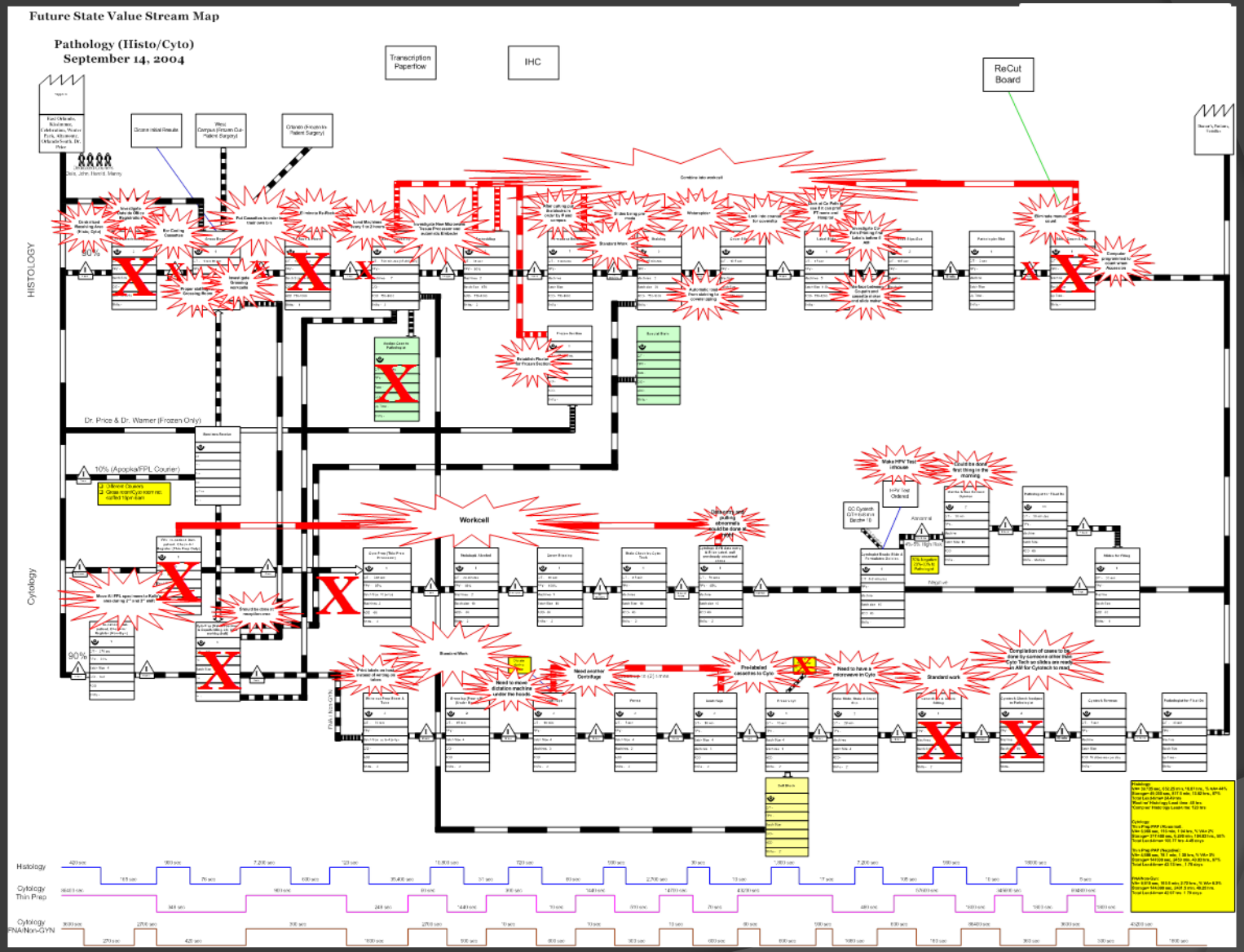
VSM Future State Core Laboratory



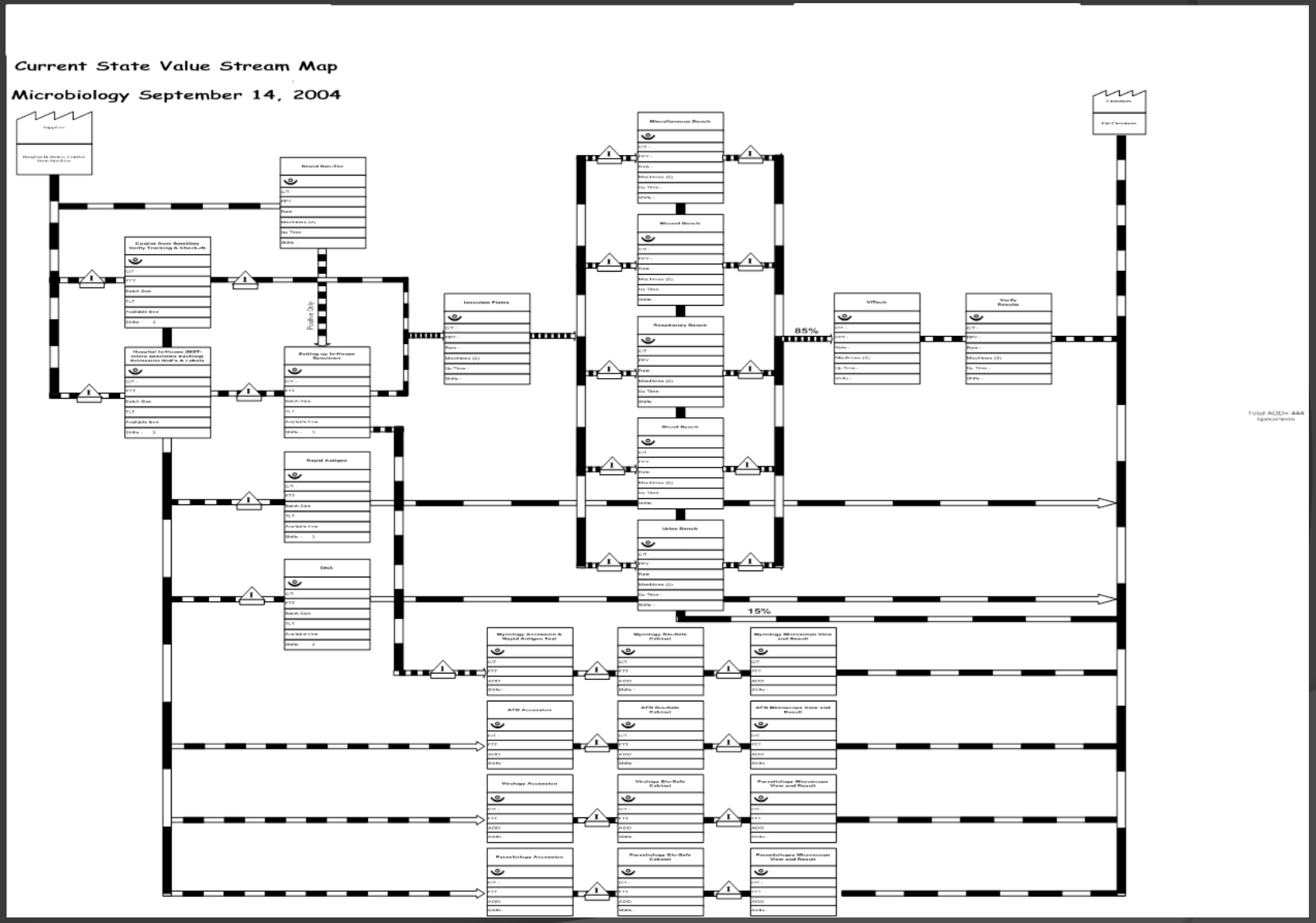
Cytology and Histology VSM



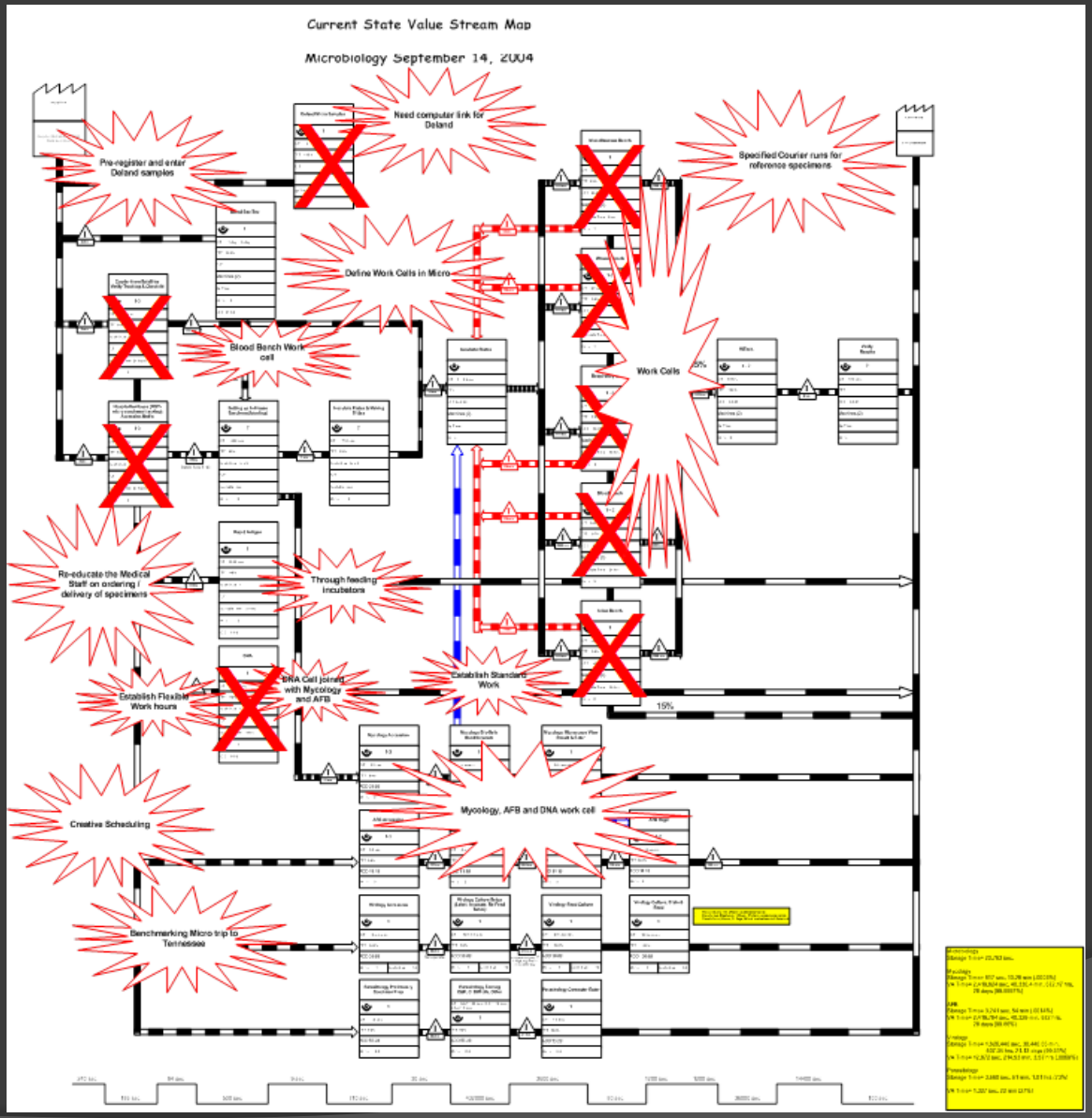
Cytology and Histology Future State VSM



Microbiology VSM



Microbiology Future State VSM



Identify & Rank Improvement Opportunities

- After reviewing and designing the “Future State” process, list the opportunities to improve process speed.
- Rank the effect of each opportunity based on impact to the strategic planning goals.
- Rank the risk and impact to other departments for each solution.
- Create and action item/ project list for improvements.

Process Excellence Initiative
Project Selection - Prioritization Matrix

	Criteria	Financial savings	Improves Clinical Quality	Improve Customer Satisfaction	Improve Employee Satisfaction	Total
	Weight					
Projects	Non-administered doses / returns to pharmacy. (now 30%)	9	5	1	9	24
	FPY medication delivery system for new / stat doses.	5	9	9	9	32
	Cart, tubes etc., where does it go when it gets to the unit?	5	5	9	9	28
	FPY at pharmacy order entry. (now 67%)	5	9	5	9	28
	Missing information and errors on MARs.	1	5	1	9	16
	FPY robot drug filling process (now 85%).	5	1	1	5	12
	Pyxis inventory count accuracy. (says 4 but only 2 there)	9	1	5	5	20

Rank	Explanation
1	Low Impact
5	Medium Impact
9	High Impact

Four Things A Product Can Do?

Total Thru-put Time

Transport

Inspect

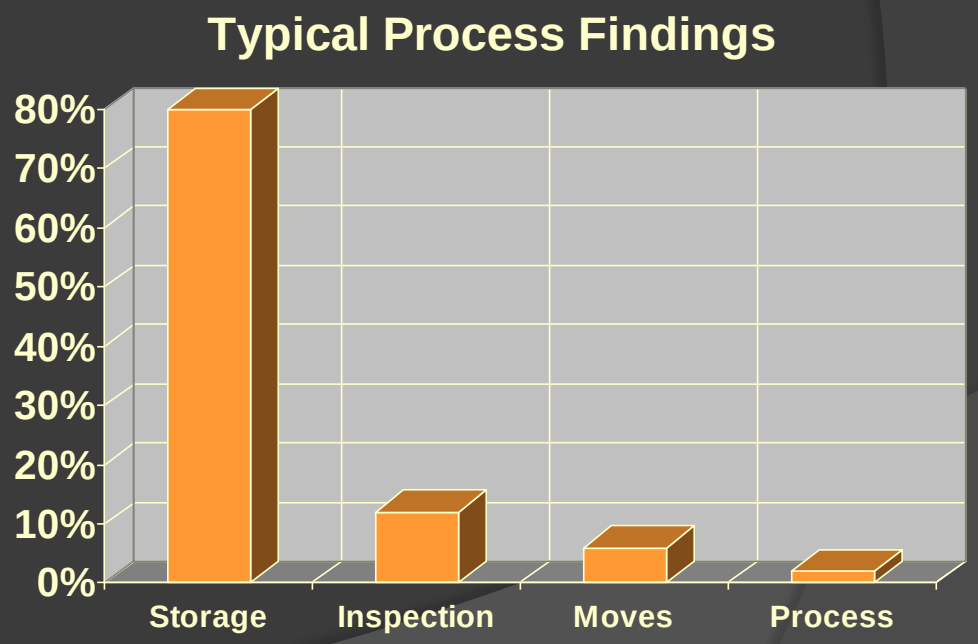
Process

Store

What is "World Class?"

"See the Product…Be the Product…"

Bob Loeffler – Lean Core Team Novatec



Product Flow Analysis for Core Lab Specimen

Note:
"Lean"
Process
Step
Omissions

33	x	b	❐	wait in bin at tube system		3:38:52	306	0	
34		t	⊙	pick up tube		3:38:54	2	2	2
35		nv	○	open tube		3:38:58	4	4	
36	x	t	⊙	to bucket		3:39:00	2	0	2
37	x	l	■	wait in bucket to unload rest of tubes		3:39:35	35	0	
38	x	t	⊙	pick us up		3:39:37	2	0	2
39	x	b	❐	did something with towels		3:39:40	3	0	
40	x	t	⊙	to counter		3:39:47	7	0	2
41	x	b	❐	???		3:39:54	7	0	
42	x	t	⊙	pick up		3:39:55	1	0	2
43		nv	○	take us out of bag		3:39:59	4	4	
44	x	t	⊙	to counter		3:40:00	1	0	3
45	x	nv	○	read label		3:40:02	2	0	
46	x	b	❐	OER		3:40:46	44	0	1
47	x	t	⊙	pick up to label		3:40:47	1	0	
48	x	nv	○	label tube		3:40:49	2	0	
49	x	t	⊙	move to scanner		3:40:50	1	0	0.5
50	x	nv	○	scan		3:40:51	1	0	
51	x	t	⊙	move back		3:40:52	1	0	0.5
52	x	b	❐	CVIS		3:41:04	12	0	
53	x	t	⊙	move to bin		3:41:11	7	0	20
54	x	b	❐	wait in bin		3:41:14	3	0	
55	x	t	⊙	to centrifuge rack		3:41:18	4	0	
56	x	b	❐	wait for other parts to be loaded in centrifuge		3:41:32	14	0	
57	x	t	⊙	move to hema tracker		3:41:55	23	0	89
58	x	b	❐	wait while a different tube is put in the tracker		3:42:16	21	0	
59	x	t	⊙	move to Tecan rack		3:42:22	6	0	25
60	x	b	❐	wait while other tubes are unloaded		3:42:33	11	0	

Processing in Lab – PFA Results

TAPE #	#11A	Summary	Baseline	Post Lean Projected	Reduction	Reduction %
Test	K	Total Steps	77.0	33.0	44.00	57%
Description	T23401 potassium test	Orig Sec:	1,809.0	1,135.0	674.00	37%
Input Boundary	order	Min:	30.2	18.9	11.23	37%
Output Boundary		Hours:	0.5	0.3	0.19	37%
Available Time / Day (in hours)	24	Days	0.0	0.0	0.01	37%
Processing In lab		Distance	998.0	707.0	291.00	29%
		check:	1,125.0	511.0	614.00	55%
		Va %	26.81%	26.81%	0.00%	0%
		NVA %	0.77%	0.44%	0.33%	43%
		Storage	30.62%	0.61%	30.02%	98%
		Inspect	0.00%	0.00%	0.00%	#DIV/0!
		Transport	3.98%	0.39%	3.59%	90%

37% Savings in Processing Time

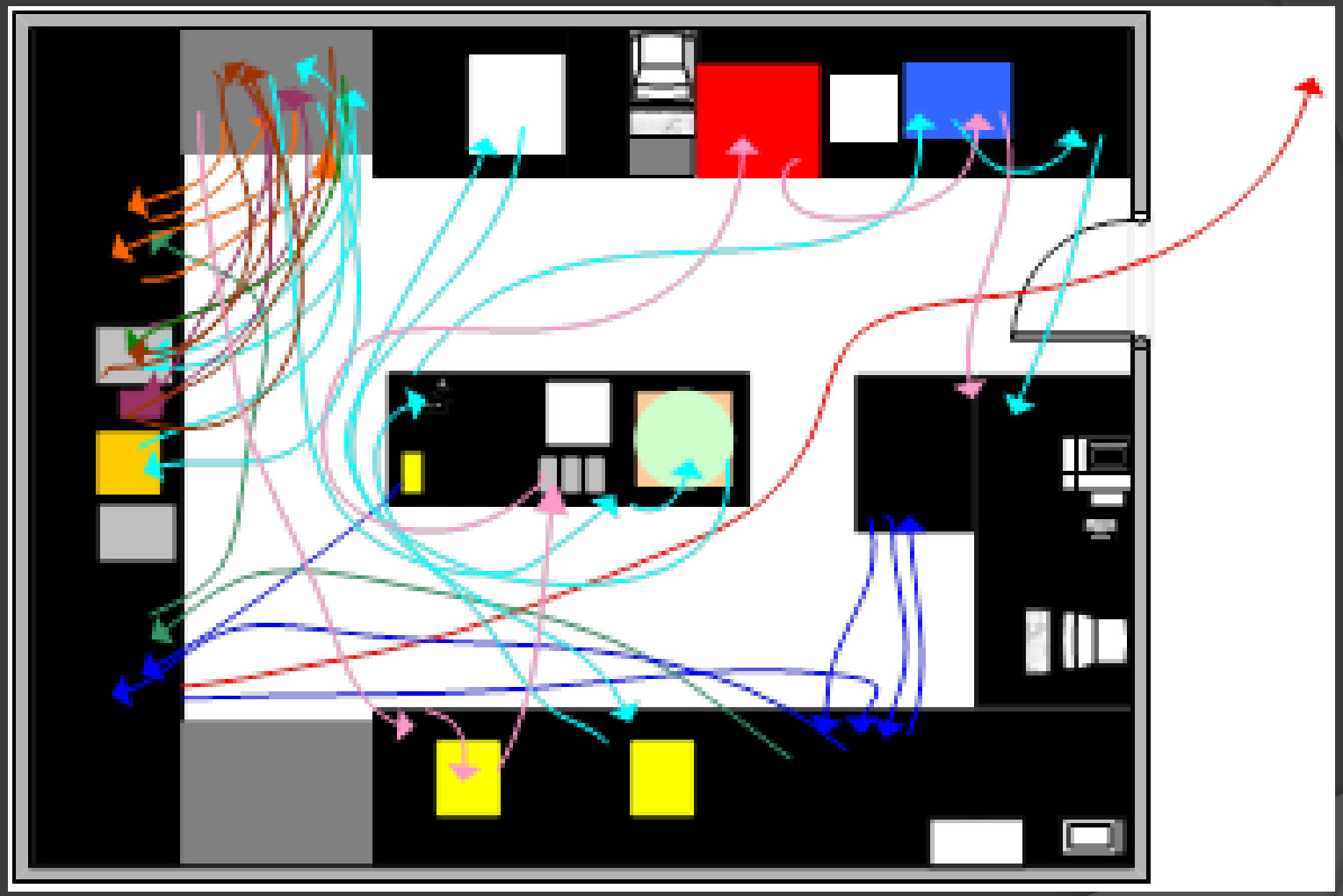
Note: Does not include collection time

Product Process Flow Analysis Urine

TAPE #	#2B	Summary	Baseline	Post Lean Projected	Reduction	Reduction %
Test	W15521 Urin	Total Steps	78.0	55.0	23.00	29%
Description	Orange Top	Orig Sec:	2,960.0	1,746.0	1,214.00	41%
Input Boundary		Min:	49.3	29.1	20.23	41%
Output Boundary		Hours:	0.8	0.5	0.34	41%
Available Time / Day (in hours)	24	Days	0.0	0.0	0.01	41%
Issues With Equipment - See Notes		Distance	242.8	49.8	193.00	79%
		check:	2,960.0	1,746.0	1,214.00	41%
		Va %	4.53%	4.53%	0.00%	0%
		NVA %	3.38%	3.34%	0.03%	1%
		Storage	81.99%	46.22%	35.78%	44%
		Inspect	0.00%	0.00%	0.00%	#DIV/0!
		Transport	10.10%	4.90%	5.20%	52%

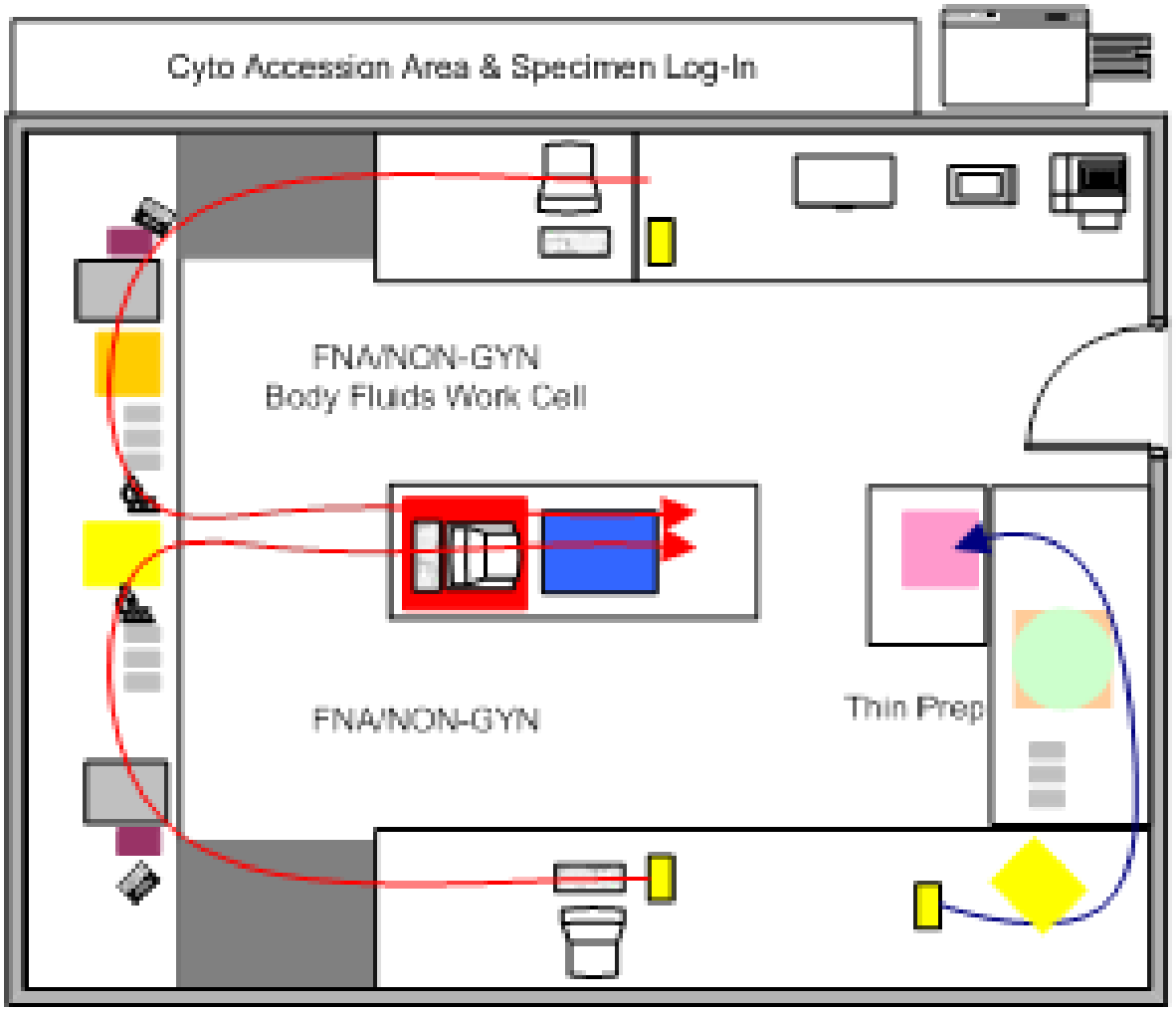
No. of Steps	OMIT	Flow Code	Flow Symbol	Description	Alt. Start Time (Optional)	Cumulative Time	Baseline Time	Post Lean Estimate Time	Distance (in feet)
1		va	○	collected	9:52:00	9:54:00	120	**120**	
2		b	🕘	wait for arrival in lab	9:54:00	10:05:31	691	**691**	

Cytology Current Point to Point Diagram



Point to Point Follows the Product

Cytology Lean Walk Pattern



Machine Analysis Is Critical

Machine Summary Sheet												
Tubes / Samples	Modular	917	CX3	Sysmex	Stago	Asxym 1	Axsym 2	Iris	Centaur	Atlas		TECAN
Available Time (sec/day)	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400
Total Daily Volume	1033	475	66	857	104	141	706	103	648	164	4297	8688
Takt Time	83.6	181.9	1309.1	100.8	830.8	612.8	122.4	838.8	133.3	526.8	20.1	9.9
Avg Hourly Volume Tubes	43	20	3	36	12	66	13	4	17	7	221	362
Peak Demand Per Hour Tubes (Karen Data)	101	45	6	92	30	95	19	8	66	15	477	362
Hours of Peak Demand (neeeds range for peak demand!	11:00	12:00	4:00 - 6:00	4:00	4:00	15:00	15:00	13:00	14:00	16:00	4.3	
Takt Time at Peak Demand (tubes)	35.6	80.0	600.0	39.1	120.0	37.9	189.5	450.0	54.5	240.0	7.5	9.9
Manual Verification %	37.7%	54.0%	39.6%	54.0%	40.0%	31.1%	35.7%	100.0%	43.3%	10.0%		0
Verification Volume (tubes)	389.44	256.50	26.14	462.78	41.60	43.85	252.04	103.00	280.58	16.40	1872.3	-
Capacity at Peak Demand (tests / hour)	4100	1200	600	240	325	80	80		240	225	7090.0	500
Current Peak Demand March 2004 adjusted by 12% (tests / hour)	1676	782	153	103	114	33.6	49.3		207	224	3341.9	362
Year we hit peak capacity tests/hour	2017	2008	2027	2016	2006	2017	2009		2008	2046		2008
Downtime %												
PM Checklist (Yes/No)												
Cycle Time (if applicable)												12 - 22 min

Group Technology Matrix

- Realign products or service by grouping products / procedures into families according to common processes.
- Use GT Matrix to determine families of products or services

Tube Type	Lab Machines and Processes																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
A		1		2			3			4				5				
B			1					2				3				4		
C		1		2		3				4				5				
D			1		2		3	4								5		
E		1												2				
F			1		2		3	4								5		
G		1		2						3				4				
H															1			
I						1												
J											1							

Other considerations:

- Patient Volume
- Diagnosis
- Service Line
- Sales Dollars
- Labor Content
- Test Type

Tube Type	Qty per Day	TT min (based on 1440 min /day)	Registration	Processing	Centrifuge	CHem1	Chem 2	Chem 3	Coag	Hema	BG
Non Spin Cell											
Orange Top	120	12.0	x	x							x
Green Top	792	1.8	x	x						x	
Totals	912	1.6									
Spin Cell											
Blue Top	288	5.0	x	x	x				x		
White Top	24	60.0	x	x	x			x			
Yellow Top	48	30.0	x	x	x		x				
Lavender Top	720	2.0	x	x	x	x					
Totals	1080	1.3									
Overall Totals	1992	0.7									

Group Technology – Product Family Cell

Chemistry Cell

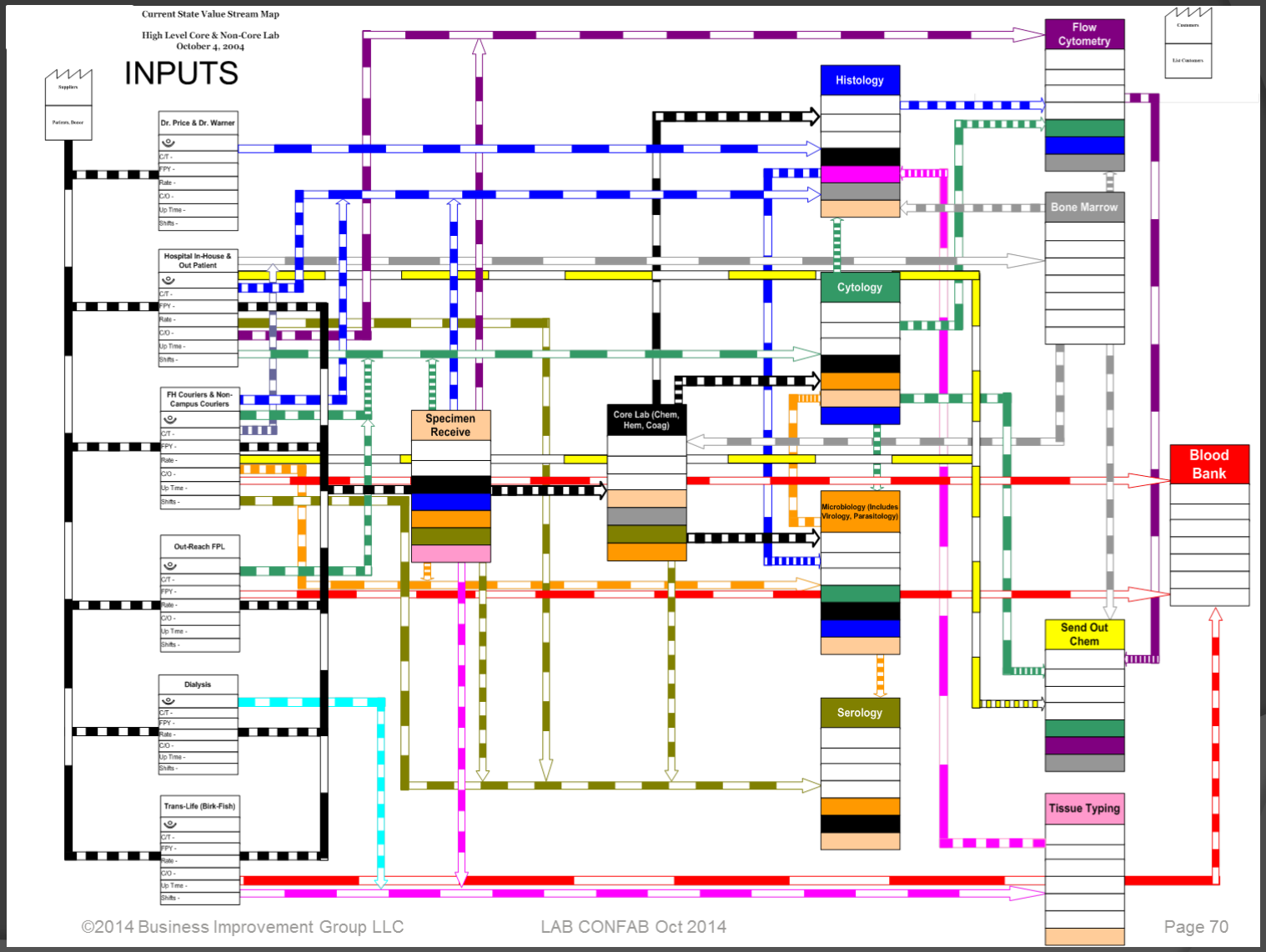
Urine Analysis Cell

- Identify Families Based On Product Process Flow
- Create Cells Based On Product Process Flow
- Check Availability Of Machines To Create Cells
- Reorganize Machines To Create Cells

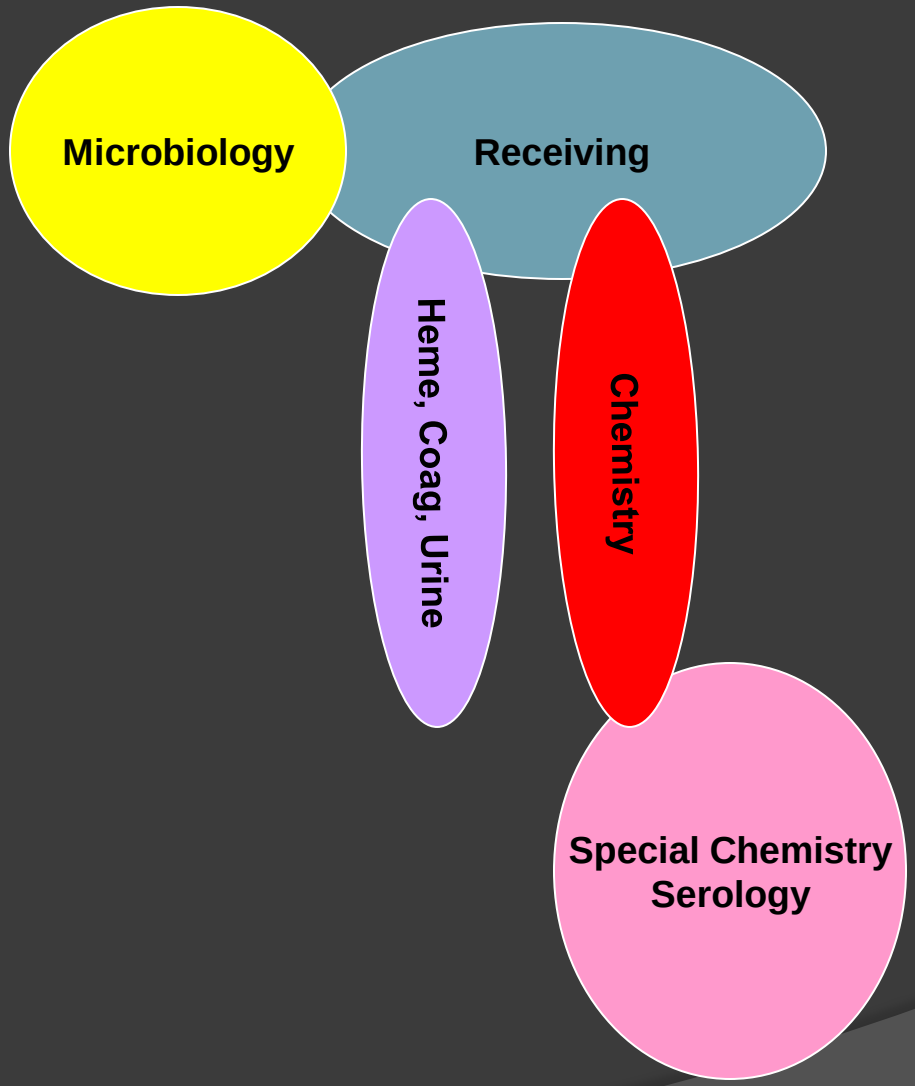
High Level Value Stream Map Legend

- High level map is sorted by color
- Color represents each of the non-core departments
- Process boxes contain colors of departments where adjacencies exist
- Block arrows show where specimens enter and travel to each department

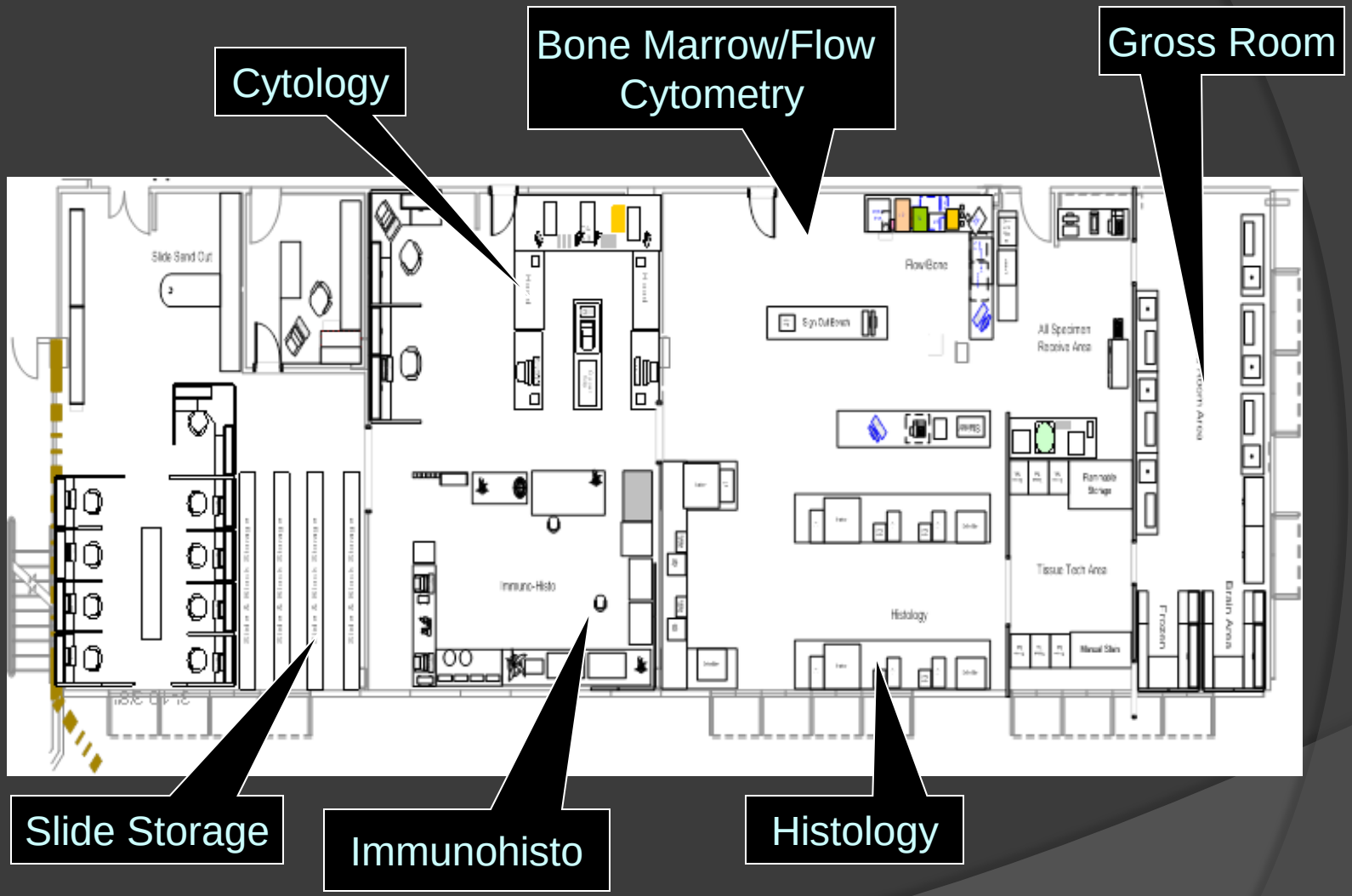
High Level Value Stream Map Legend



Departmental Relationship



Proposed New Non-Core Lean Layout



Analyze The Operator

What are the two things the Employee (Operations) can be doing?

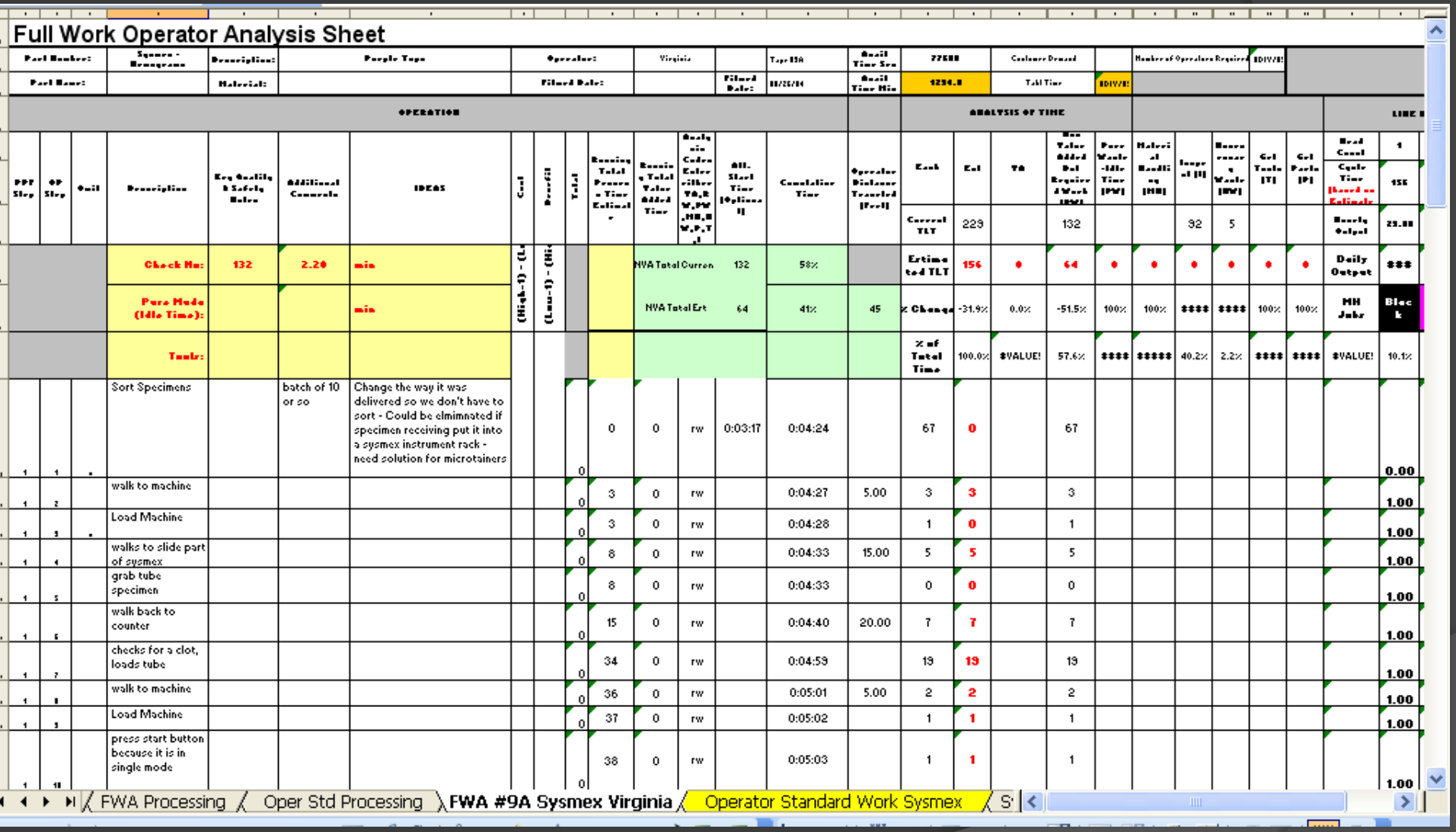
Full Work Analysis

- 1.Value Added
- 2. Non-Value Added

What is "World Class?"

Quality First…. The Speed Will Come!

Operator Full Work Analysis



Full Work Operator Analysis Sheet

Part Number:	Square - Monogram	Description:	Purple Tape	Operator:	Virginia		Type 85A	Avail Time Sec	27588	Customer Demand		Number of Operators Required	#DIV/0!		
Part Name:		Material:		Filmed Date:		Filmed Date:	11/25/14	Avail Time Min	1234.8	Takt Time	#DIV/0!				

OPERATION															ANALYSIS OF TIME										LINE B	
PPF Step	OP Step	Unit	Description	Key Quality & Safety Rules	Additional Comments	IDEAS	Cost	Benefit	Total	Running Total Process Time Estimate	Running Total Value Added Time	Analysis Codes Enter either VA,E,W,PW,NR,B W,P,T or I	All. Start Time (Optional)	Cumulative Time	Operator Distance Traveled (Feet)	Each	Est	VA	Non Value Added But Required Work (NVR)	Pure Waste -Idle Time (PW)	Material Handling (MH)	Inspect (I)	Measurement Waste (MW)	Get Tools (T)	Get Parts (P)	Head Count	1
																Current TLT	229		132			32	5			Cycle Time (Based on Estimate	155
			Check Mn:	132	2.20	min	(Hi	(Lo			NVA Total Curren		132	58%		Estimated TLT	156	0	64	0	0	0	0	0	0	Hourly Output	23.88
			Pure Mode (Idle Time):			min					NVA Total Est		64	41%	45	% Change	-31.9%	0.0%	-51.5%	100%	100%	****	****	100%	100%	MH Jobs	Black
			Tools:													% of Total Time	100.0%	$VALUE!	57.6%	****	*****	40.2%	2.2%	****	****	$VALUE!	10.1%
1	1		Sort Specimens		batch of 10 or so	Change the way it was delivered so we don't have to sort - Could be elmimnated if specimen receiving put it into a sysmex instrument rack - need solution for microtainers			0	0	0	rw	0:03:17	0:04:24		67	0		67							0.00
1	2		walk to machine						0	3	0	rw		0:04:27	5.00	3	3		3							1.00
1	3		Load Machine						0	3	0	rw		0:04:28		1	0		1							1.00
1	4		walks to slide part of sysmex						0	8	0	rw		0:04:33	15.00	5	5		5							1.00
1	5		grab tube specimen						0	8	0	rw		0:04:33		0	0		0							1.00
1	6		walk back to counter						0	15	0	rw		0:04:40	20.00	7	7		7							1.00
1	7		checks for a clot, loads tube						0	34	0	rw		0:04:59		19	19		19							1.00
1	8		walk to machine						0	36	0	rw		0:05:01	5.00	2	2		2							1.00
1	9		Load Machine						0	37	0	rw		0:05:02		1	1		1							1.00
1	10		press start button because it is in single mode						0	38	0	rw		0:05:03		1	1		1							1.00

FWA Processing | Oper Std Processing | FWA #9A Sysmex Virginia | Operator Standard Work Sysmex | S

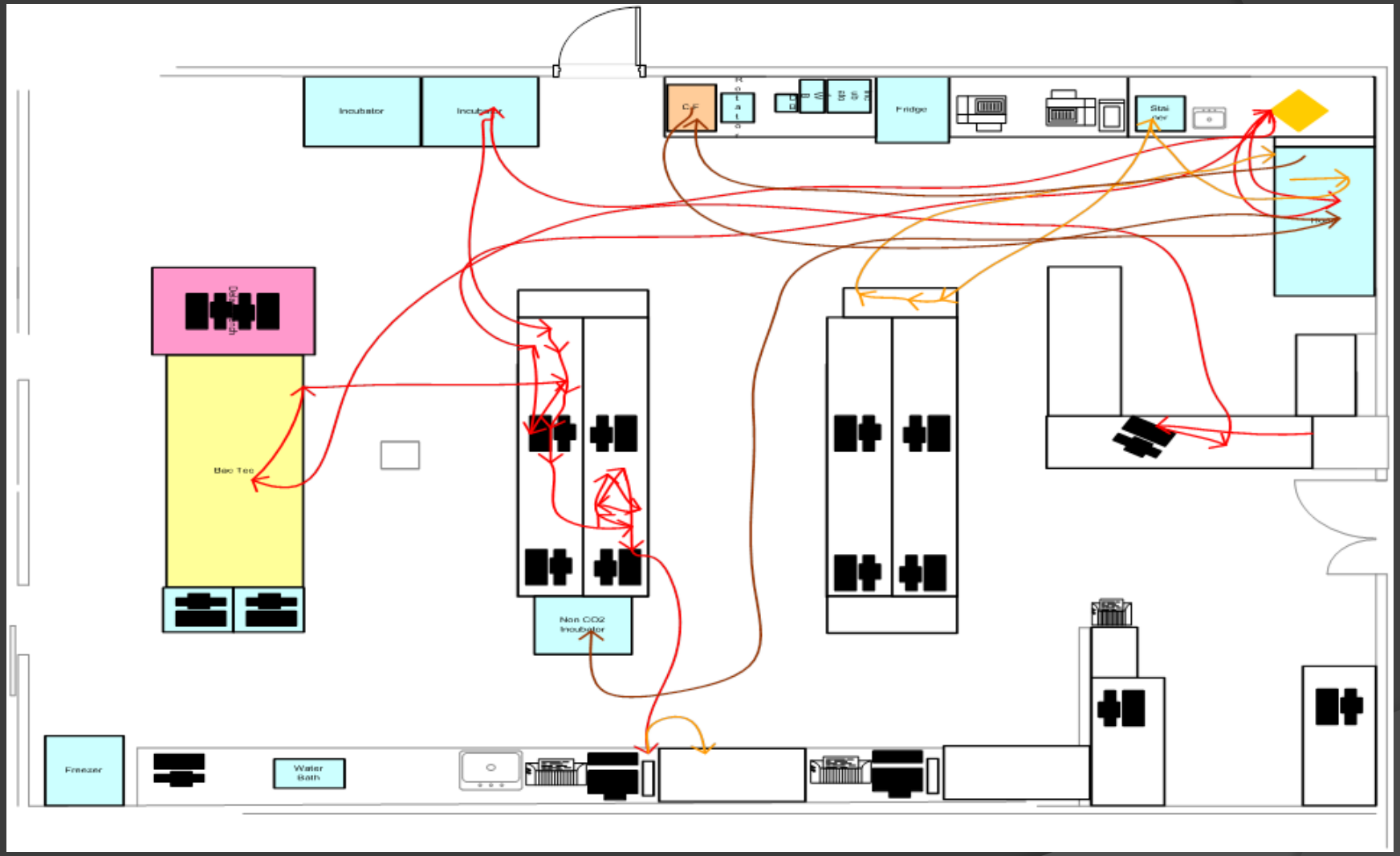
Operator Ten Cycle Analysis

Part No		Avail Time Hours/ Day		Avail Time Seconds / Day:	Avail Time Minutes per day	Total Labor Time	Takt Time (sec):
Part Name		24.00		86400	1440	61.1	79
Machine	1	2	3	4	5	6	7
Machine cycle times							
Machine Name							
				Cumulative	3:15:42	3:14:56	3:15:28
Part No:					Cycle 1	Cycle 2	Cycle 3
Description:							
Step No.	Description	Comments	Ideas	Cycle Time Min	2.57	0.32	0.75
				Cycle Time Secs	154	19	45
1	Walk to tube, Grab a tube, dump the bag and put tube back			Alt. Start Time (optional)	3:13:37	3:13:44	3:13:51
				Cum	3:13:44	3:13:51	3:14:04
				Split Time	7	7	13
2	Move tubes to workstation			Alt. Start Time (optional)	3:14:04		
				Cum	3:14:10		
				Split Time	6		
3	Sit in Chair			Alt. Start Time (optional)			
				Cum	3:14:17		
				Split Time	7		
4	remove from bag			Alt. Start Time (optional)		3:14:21	
				Cum	3:14:21	3:14:26	
				Split Time	4	5	

Staffing Analysis by Hour

	Mon-Fri	# machines	Staffing by hour		1	2	3	4	5	6	7	8			9	10	11	12	13	14	15	16			17	18	19
			Day												Eveni										Nig		
	Task		Dept	Tube Volume	7	8	9	10	11	12	13	14		Tube Volume	15	16	17	18	19	20	21	22		Tube Volume	23	0	1
Chem	*(mod, 917, cx3)*	***3***	CH*	762	2	2	2	2	2	2	2	2		407	2	1	1	1	1	2	2	2		406	2	1	1
Chem	Float - Chem	m	CH													1									1	1	1
Chem	*Axysm*	***2***	CH*	126	1	1	1	1	1	1	1	1		108	1	1	1	1	1	1	1	1		84	1	1	1
Chem	*Centaur*	***1***	CH*	463	1	1	1	1	1	1	1	1		164	1									21			
Total Tubes				1351										679										511			
Avg Tubes Per Person		***6***		337.75										246.91										177.74			
					4	4	4	4	4	4	4	4	**32**	**4**	4	3	2	2	2	3	3	3	**22**	**2.75**	4	3	3
Hem	Sysmex	**1**	HE*	304	1	1	1	1	1	1	2	2		196	2	1	1	1	1	1	1	1		357	1	1	1
Hem	Coag/Urine	**3**	HE*	236	1	1	1	1	1	1	1	1		174	1	1	1	1	1	1	1	1		67	1	1	1
Total People		**4**			2	2	2	2	2	2	3	3	**18**	2.25	3	2	2	2	2	2	2	2	**17**	2.125	2	2	2
Hem	Diff	m	HE*	56	2	2	2	2	2	2	2	2		86	1	1	1	1	1	1	1	1		42	1	1	1
Hem	Manual	m	HE*	1	1	1	1	1	1	1	1	1		7	1	1	1	1	1	1	1	1		2.3	1	1	1
Total Tubes				597										465.25										470.43			
Avg Tubes Per Person		**4**		113.71										112.79										110.69			
					5	5	5	5	5	5	6	6	**42**	**5.25**	5	4	4	4	4	4	4	4	**33**	**4.125**	4	4	4
Total Tubes Main Lab Cell				1948	Takt Time			14.78						1144.3	Takt Time			25.17						981.43	Takt Time		
Processing	Tecan	**1**	SR		1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1					
Processing	ED		SR		1	1	1	1	1	1	1	1			1	1	1	1	1	1	1	1			1	1	1
Processing	Front desk		SR		4	4	4	4	4	4	4	4			4	4	4	4	4	4	4	4			2	2	2
Processing	Back bench		SR		1	2	2	2	2	2	2	2			2	2	2	2	2	2	2	2			1	1	1
Total Processing					7	8	8	8	8	8	8	8	**63**	**7.875**	8	8	8	8	8	8	8	8	**64**	**8**	4	4	4
Chem	*Drugs*	*m*	CH		1	1	1	1	1	1	1	1			1												
Chem	Misc	m	CH		1	1	1	1	1	1	1	1			1												
Chem	DPC	m	CH		1	1	1	1	1	1	1	1			1												
	Axysm-float	m	CH*																		1	1			1	1	1
Chem	Special Chem	m	CH		1	1	1	1	1	1	1	1			1												
Chem	Electrophor	m	CH		1	1	1	1	1	1	1	1			1												
Chem	Sendouts	m	CH		1	1	1	1	1	2	2	2			2	2	1	1	1	1							
Manual Chemistry					6	6	6	6	6	7	7	7	**51**	**6.375**	7	2	1	1	1	1	1	1	**15**	**1.875**	1	1	1
Volume																											
	Task		Dept	Tube Volume	7	8	9	10	11	12	13	14		Tube Volume	15	16	17	18	19	20	21	22		Tube Volume	23	0	1
Phlebotomy	**Phlebotomy**				8	9	9	9	9	9	9	9	**71**	**8.875**	7	7	7	7	7	7	7	6	**55**	**6.875**	6	6	6
Volume																											
	PKU	m	CH		1	1	1	1	1	1	1	1			1	1											
	BM	m	HE		1	1	1	1	1	1	1	1			1												
	Flow	m	HE		1	1	1	1	1	1	1	1			1												
	BM/Flow float	m	HE				1	1	1	1	1	1			1												
	Serology	m	SE		2	2	2	2	2	2	2	2						1	1	1	1	1			1	1	1
	TOTAL				**46**	**50**	**52**	**53**	**54**	**57**	**58**	**59**			**56**	**44**	**42**	**44**	**45**	**46**	**47**	**47**			**40**	**17**	**18**

Micro Blood Walk Pattern



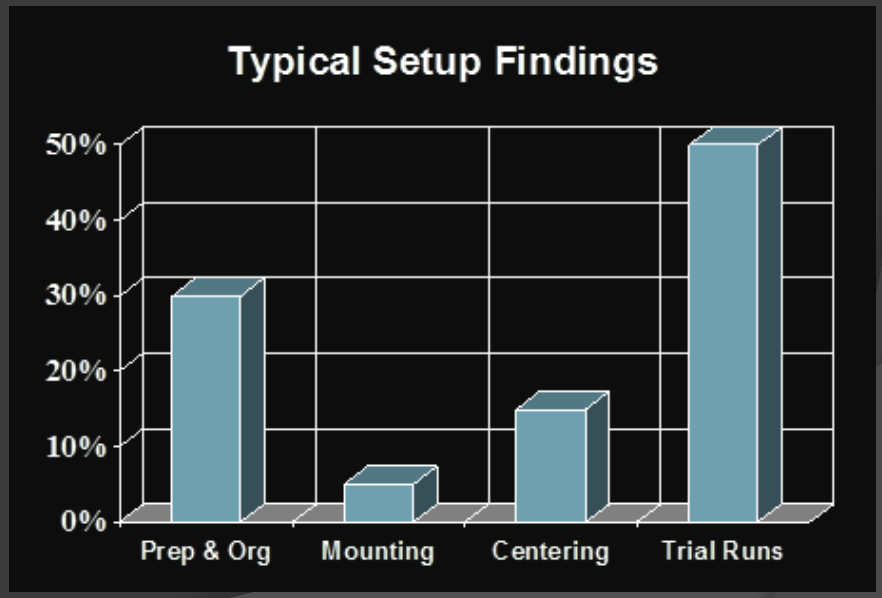
Spaghetti Diagram Follows the Person

Analyze The Changeover or Setup

Internal vs External Time

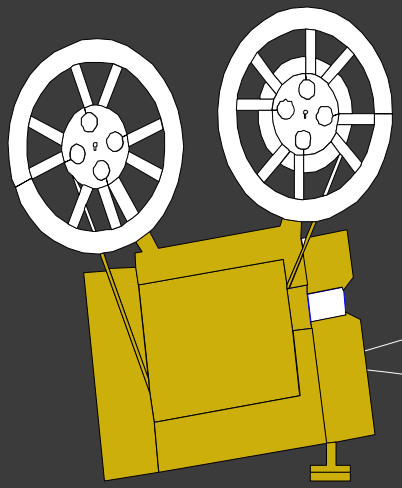
Definition of Setup Time:

The amount of time taken to change a machine from the last part of a production lot to the first good part of the next production lot.



(Clock time, not labor time)

Video

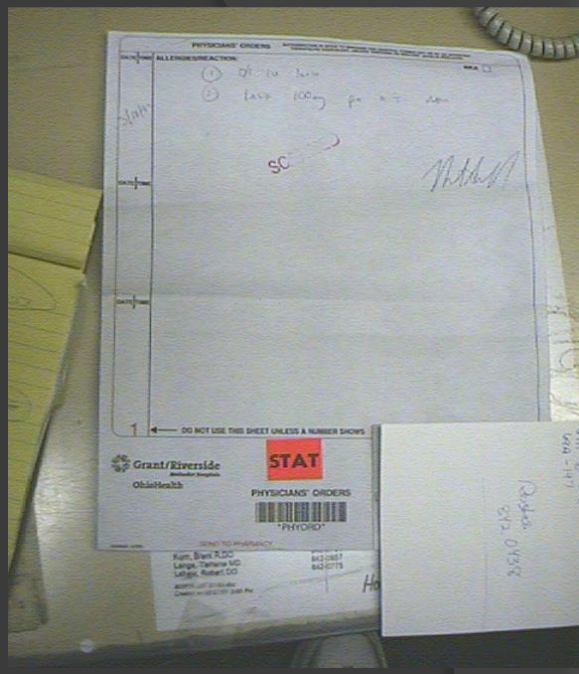


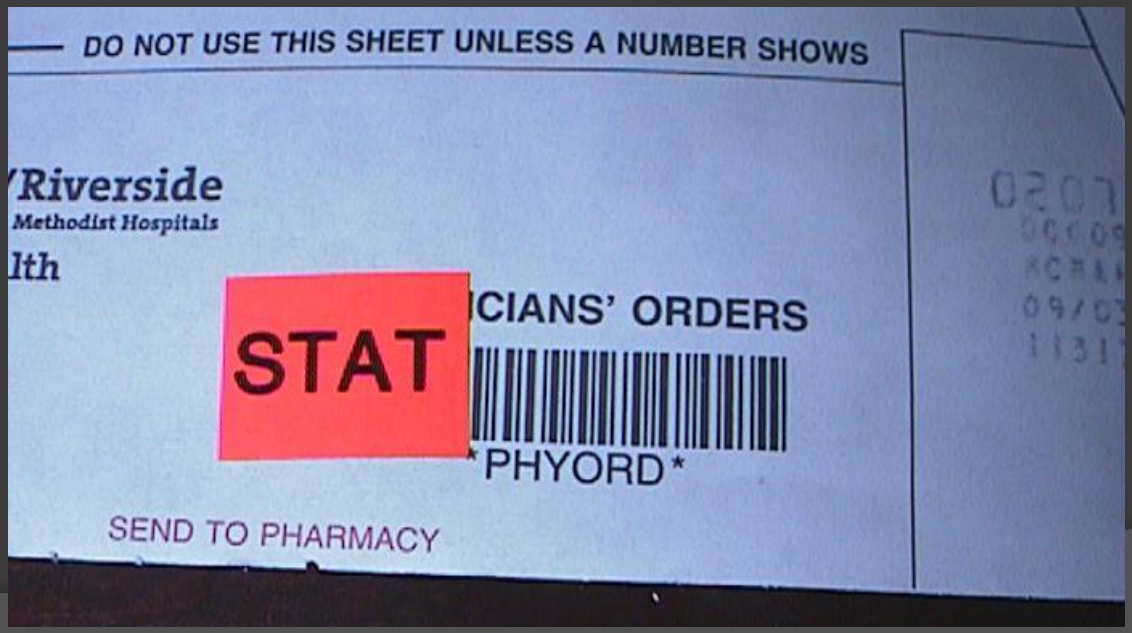
Video on Setup Reagent Change Over

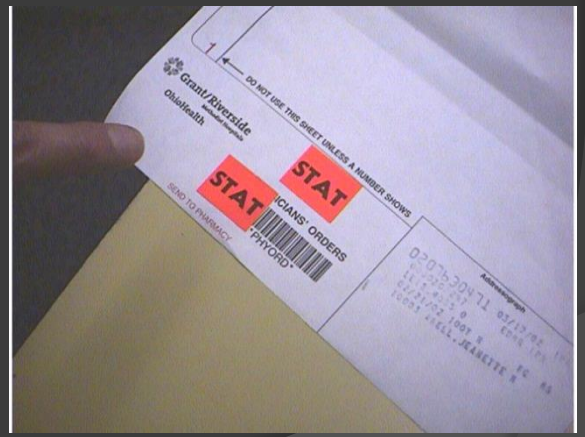
Why Standard Work?

What Is Standard Work

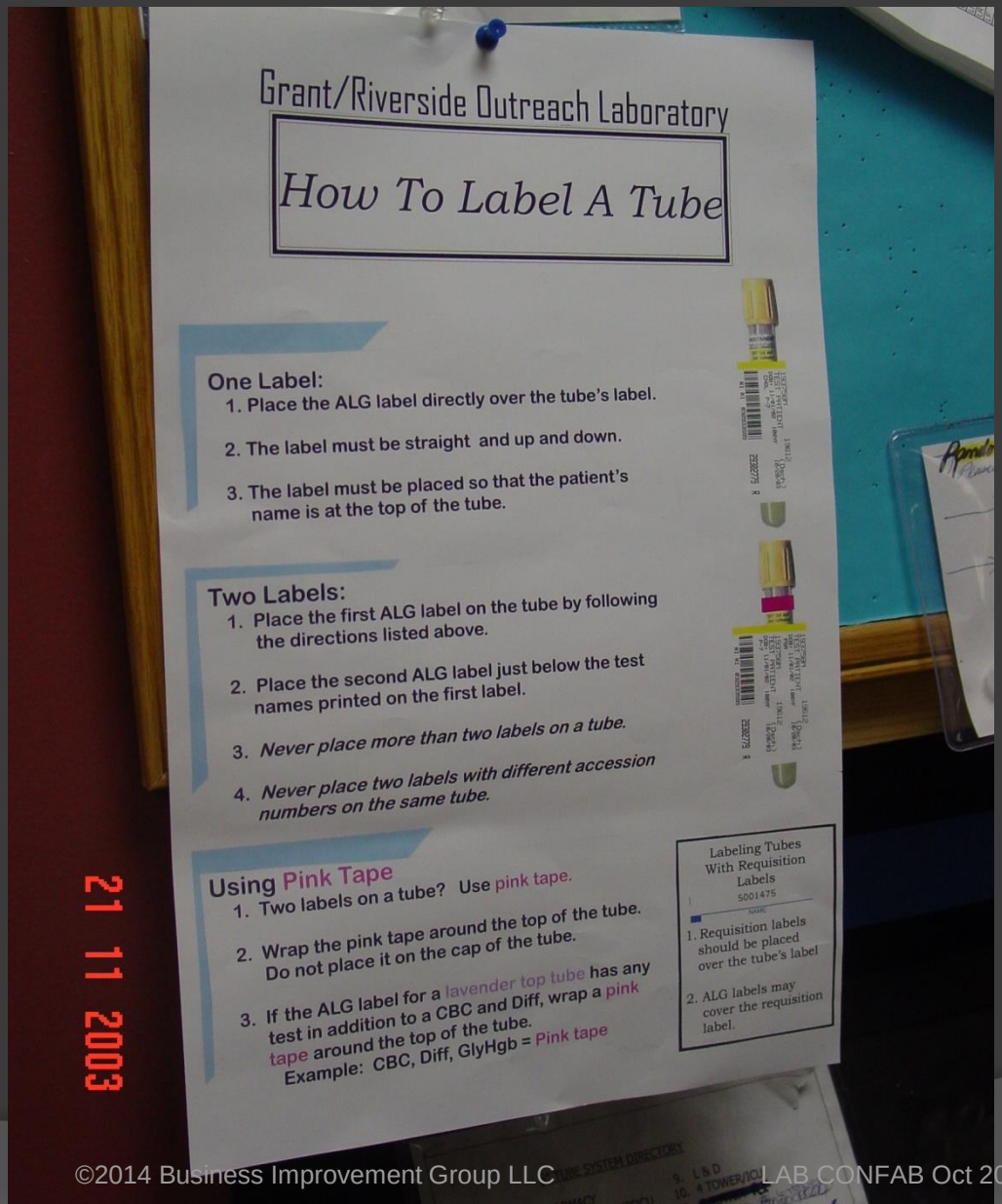
- Sequence of Operations
- Cycle Time
- Standard Work In Process







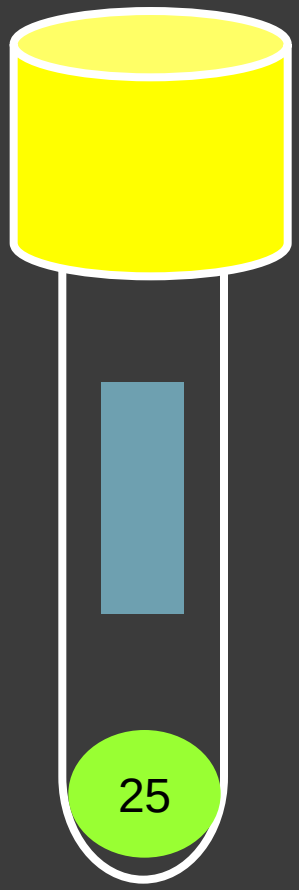
Work Instruction



Work instructions are different from standard work. They do not include times for each step.

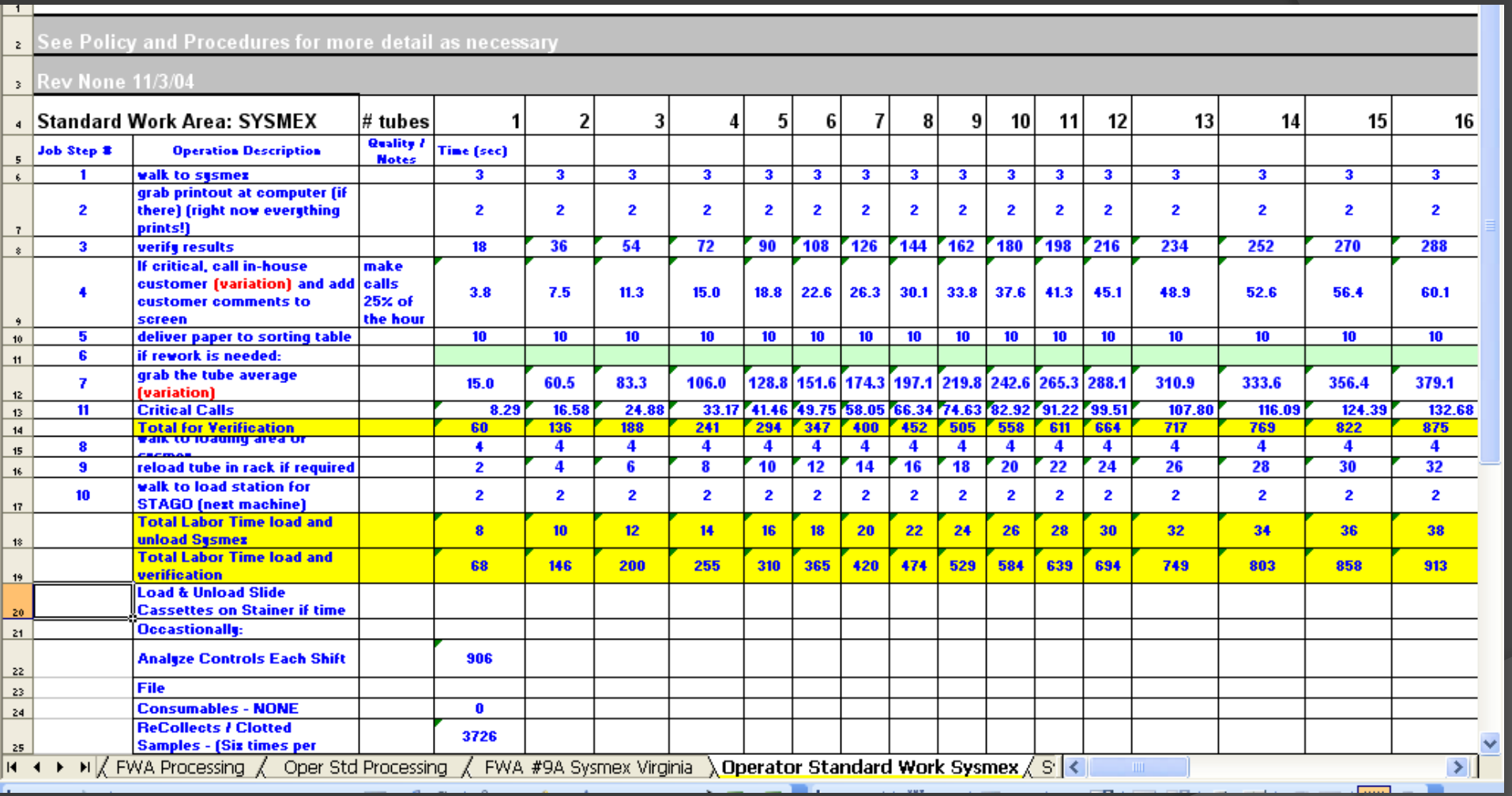
Registration Standard Work Example

- **Red tubes are STAT**
- **Clear Tubes are normal processing**



1.	Take tubes, labels, and caps out of bags	3 seconds
2.	Place testing label on tube per visual sample on this form.	3 seconds
a)	Note: Quality Step – It is very important that the label be 2 inches from the bottom of the tube in order for the testing machines to read the labels. If the label is more than 1/8 inch off in either direction, it cannot be read.	
3.	If it is a Stat tube, then place a red sticker directly above the test sticker and under the cap.	4 seconds
a)	Note: Quality Step - There needs to be a ¼ inch clearance between the stat label and the cap and the stat label and the testing sticker.	
4.	If the tube has a number on the bottom, record the time on the strip provided and place it in the tube.	5 seconds
5.	Place cap on top of the tube	3 seconds
6.	Put tube back in the bag	3 seconds
a)	Note: if there are multiple tubes per bag, then these steps must be completed until all the tubes are in the bag.	5 seconds
7.	Deliver the bag to processing	
		Total 26 seconds

Operator Standard Work Sheet



See Policy and Procedures for more detail as necessary

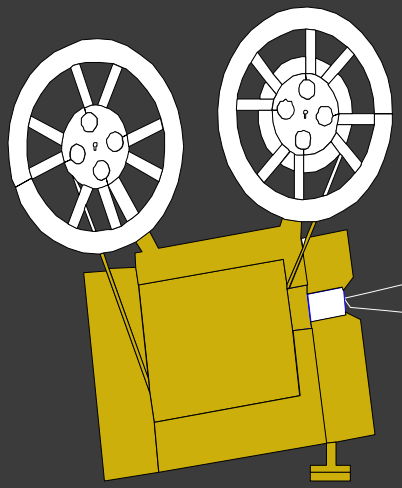
Rev None 11/3/04

Standard Work Area: SYSMEX		# tubes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Job Step #	Operation Description	Quality / Notes	Time (sec)															
1	walk to sysmex		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	grab printout at computer (if there) (right now everything prints!)		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	verify results		18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288
4	If critical, call in-house customer (variation) and add customer comments to screen	make calls 25% of the hour	3.8	7.5	11.3	15.0	18.8	22.6	26.3	30.1	33.8	37.6	41.3	45.1	48.9	52.6	56.4	60.1
5	deliver paper to sorting table		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
6	if rework is needed:																	
7	grab the tube average (variation)		15.0	60.5	83.3	106.0	128.8	151.6	174.3	197.1	219.8	242.6	265.3	288.1	310.9	333.6	356.4	379.1
11	Critical Calls		8.29	16.58	24.88	33.17	41.46	49.75	58.05	66.34	74.63	82.92	91.22	99.51	107.80	116.09	124.39	132.68
	Total for Verification		60	136	188	241	294	347	400	452	505	558	611	664	717	769	822	875
8	walk to loading area of sysmex		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
9	reload tube in rack if required		2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32
10	walk to load station for STAGO (next machine)		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Total Labor Time load and unload Sysmex		8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38
	Total Labor Time load and verification		68	146	200	255	310	365	420	474	529	584	639	694	749	803	858	913
	Load & Unload Slide Cassettes on Stainer if time																	
	Occastionally:																	
	Analyze Controls Each Shift		906															
	File																	
	Consumables - NONE		0															
	ReCollects / Clotted Samples - (Six times per		3726															

FWA Processing | Oper Std Processing | FWA #9A Sysmex Virginia | Operator Standard Work Sysmex | S

Varies with the number of tubes processed

Video



Video on Standard Work Improvement

Visual Work Area Definition

A work area that is:

- Self-explaining
- Self-regulating
- Self-improving

Where what is *supposed* to happen, *does* happen, on time, every time.

Techniques that help us understand and *make visible* what's happening in our workplace so that we can *act on fact* to achieve better results.

"Management By Sight"

5S The Groundwork for Improvement

Purpose

Methodology for creating and maintaining an organized, clean and safe high performance workplace.

Steps

- Sort (Seiri)
  - Keep only what is needed
- Storage (Seiton)
  - Arrange and Identify for ease of use, organize
- Shine (Seiso)
  - Clean Daily. Clean up everything that's left
- Standardize (Seiketsu)
  - Eliminate cause, make standards obvious
- Sustain (Shitsuke)
  - Set discipline, plan, schedule, Train… AND STICK TO IT

10 Second Rule

Benefits of 5S

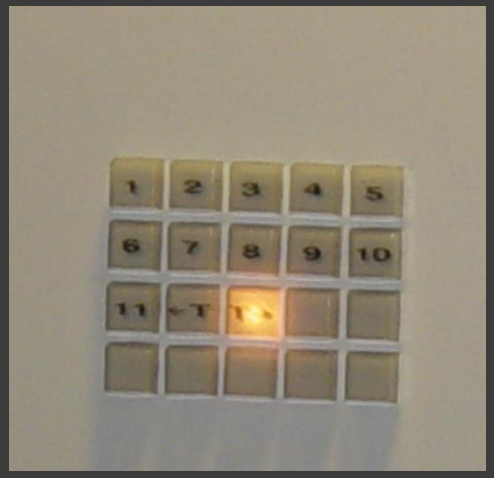
- When you clean you find problems
- A cleaner workplace is a safer workplace
- Contributes to how we feel about our product, process, our company and ourselves
- Provides a customer showcase to promote our business
- Product quality & especially contaminants will improve
- Efficiency will increase

5S programs deliver bottom line results with minimum investment

Five S Before and After

Visual Workplace

Visual Controls



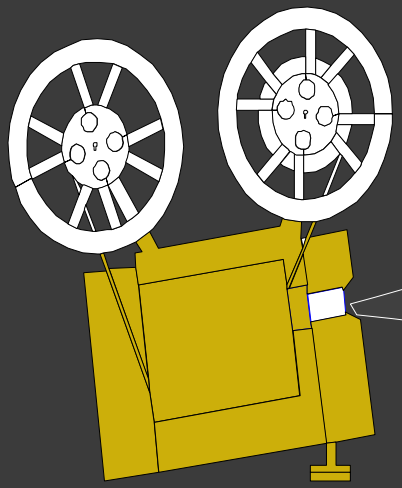
Visual Displays

Five S Hints - Take off Doors...

Good Workstation? Bad Workstation?

Good or Bad Workstation

Video



Video on Histology Embedding Batch vs. 1pc flow

Hematology Pilot Results:

PRODUCT PROCESS FLOW DETAILED ANALYSIS
Product: FLUIDS
Inpt Boundary **Receipt in Lab**
Outpt Boundary **Result**

	Initial	Pilot	Reduction	% Reduction
Total Steps	125	48	77.00	62%
Orig Seconds	4327	1711	2616.00	60%
Min	72.1	28.5	43.60	60%
Hours	1.2	0.5	0.70	58%
Days	0.1	0.02	0.08	80%
Distance	633.5	50.7	582.80	92%
Value Added	32.22%	64.12%	-0.32	99%
Non-Value Added	1.62%	0.76%	0.01	53%
Storage	59.42%	9.92%	0.50	83%
Inspect	0%	0.04%	0.00	
Transport	6.75%	1.98%	0.05	71%

- Re-Laid out area and consolidated printers for the Stago and the Atlas
- Operators Loved It
- Added muffin fan to dry slides quicker

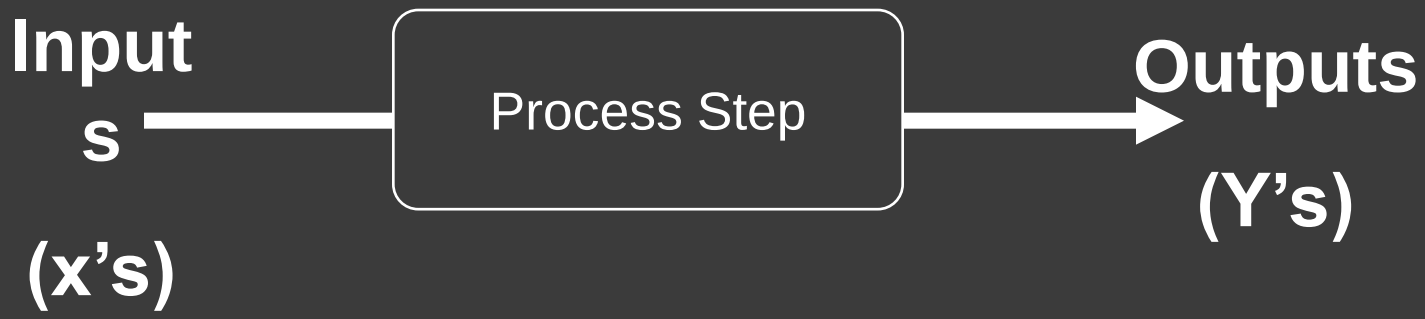
Six Sigma

There are a lot of pieces…

The KEY is to build a culture that integrates all of them!

Inputs & Outputs

- The basic foundation of process improvement.



  - Y's are the results of completing the process step.
  - x's are the inputs that impact the ability to achieve the Y's of that process step.

(A Y from one process can be an x for a later process)

Do you know your BIG Y?

Root Causes Drivers

We separate variation into common cause & special cause

- Common Cause is global: system, process, product design, machine
- Special Cause is local: time, conditions, operator

Can You Distinguish Between Special Cause vs. Common Cause?

Practical Meaning of 99%

Three Sigma equals:

- 20,000 lost articles of mail per hour
- More than 300,000 babies accidentally dropped by doctors and nurses each year
- If your heart is 99.9% perfect, it means you're in cardiac arrest nine (9) hours each year
- Unsafe drinking water nearly 15 minutes per day or four whole days each year
- 5,000 incorrect surgical operations per week
- 2 short or long landings at most major airports each day
- 200,000 incorrectly filled prescriptions every year
- No electricity for almost 7 hours each month

Sigma ppms and percents*

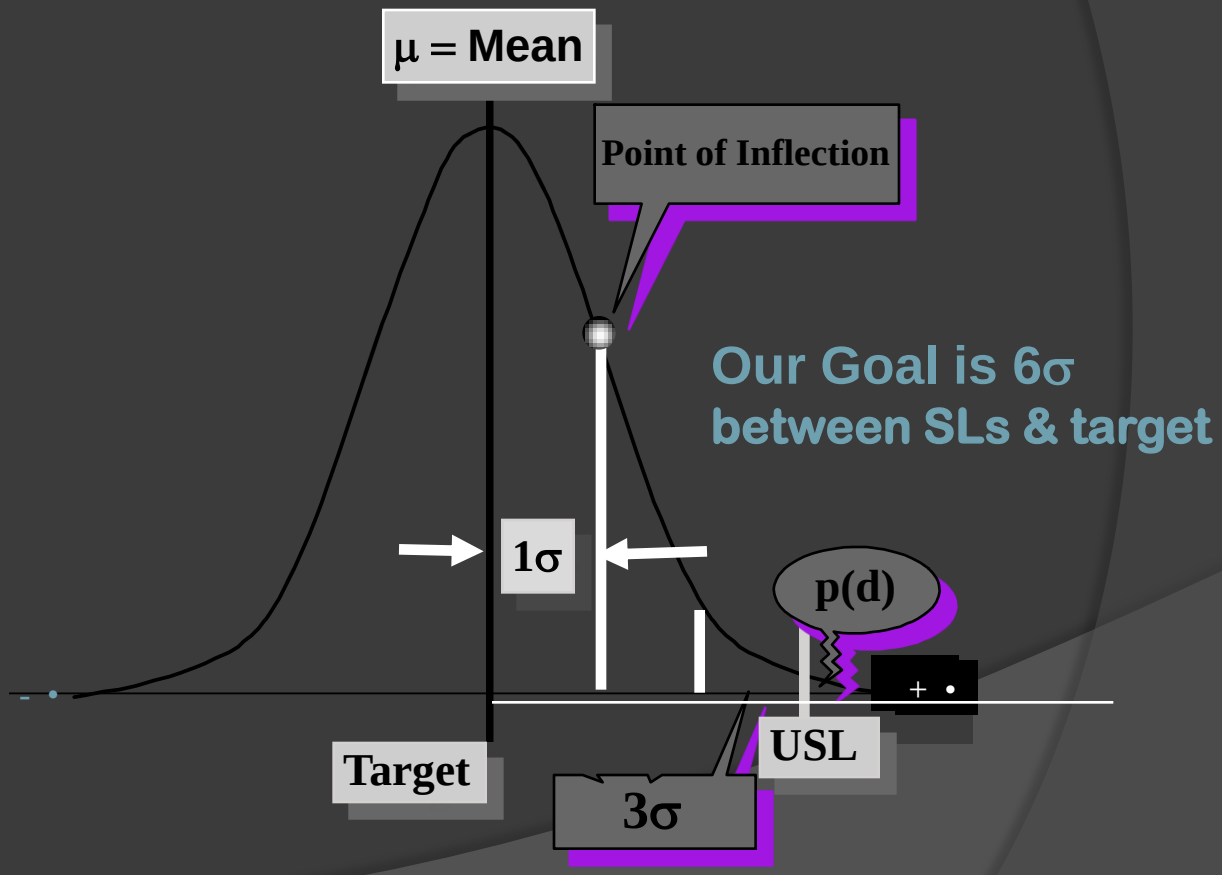
Six Sigma is equal to 3.4ppm or 99.99966 %)
Three Sigma (average) equals 6,210 - 66,810 ppm, 99.7 %
One Sigma equals 88% (our heights) within standard deviation

***(with 1.5 sigma shift)**

Variation: Common & Special Cause

- We separate variation into common cause & special cause
- Common Cause is global: system, process, product design, machine
- Special Cause is local: time, conditions, operator

- Control charts can separate common from special cause



Special vs. Common Cause

- "A fault in the interpretation of observations, seen everywhere, is to suppose that every event (defect, mistake, accident) is attributable to someone (usually the nearest at hand), or is related to some special event. The fact is that ***most*** troubles with service and production ***lie in the system***. Sometimes the fault is indeed local, attributable to someone on the job or not on the job when he should be.
- We speak of faults of the system as common causes of trouble, and faults from fleeting events as special causes."
- W. Edwards Deming

Blaming Just Hides the Problems

Quality Myths

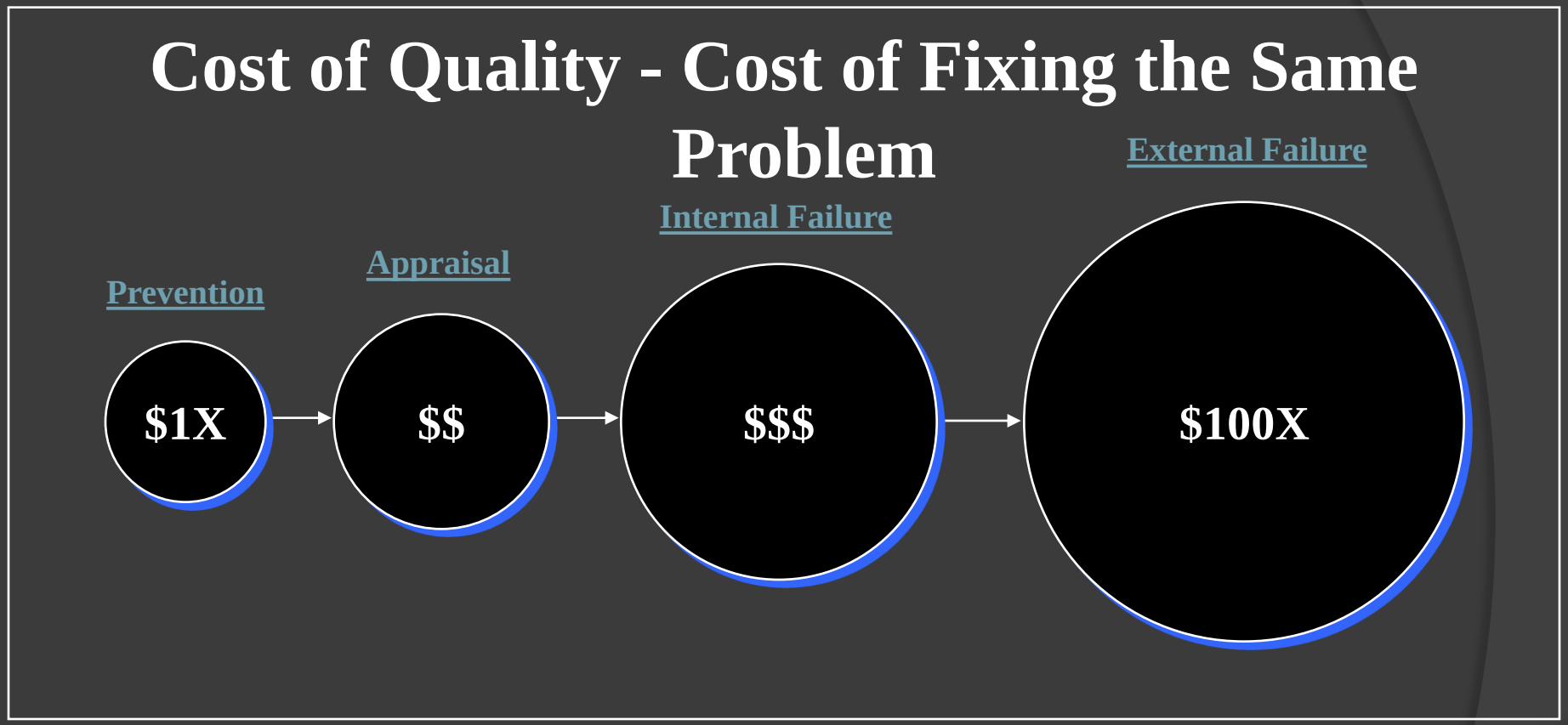
- Taking longer makes it better
- Shorter cycles require more resources
- The more steps in the process the better
- If it's not working, throw more people and materials at it
- More people and time will make it just right
- If it ain't broke, don't fix it.

Quality Truths

- Reduced steps represent less opportunities for defects
- Shorter cycle times improve quality
- Shorter cycle times increase our effectiveness
- Shorter cycle times increase our feedback time opportunity.
- You can not inspect quality into a system; it must be designed into the system
- People are at best 2 to 3 sigma… people make mistakes
- Less people are less opportunities for errors
- We are victims of our existing quality “SYTEMs” - Deming

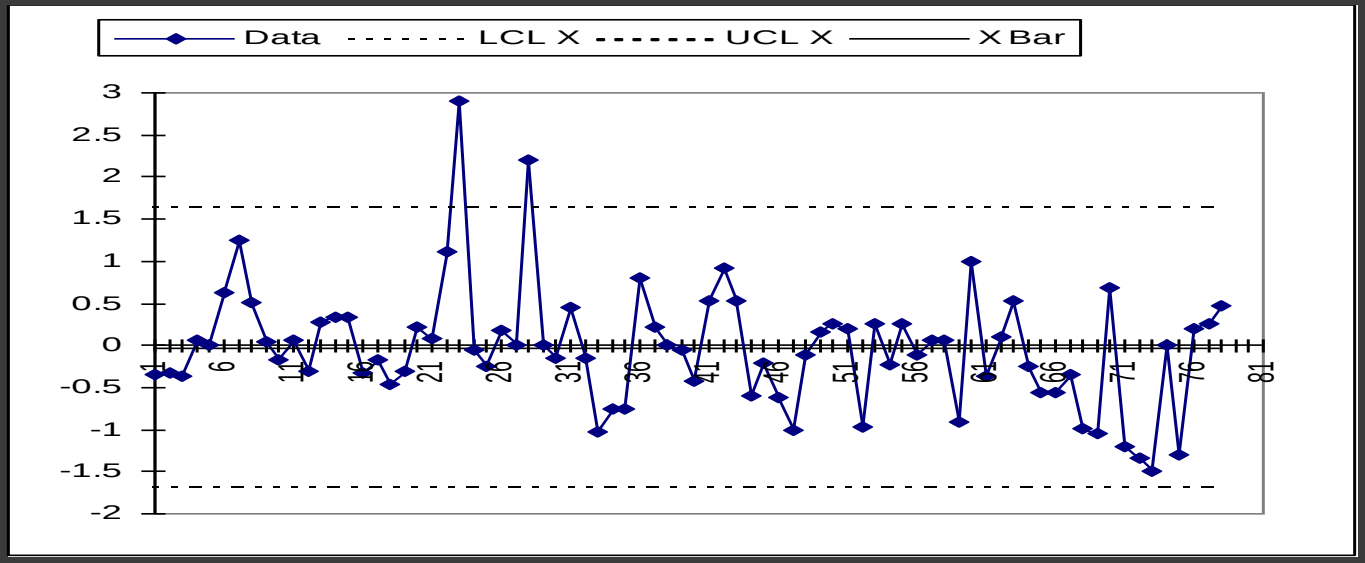
Systems can be 100% mistake proofed. Zero defects is possible but not with sampling inspection. 100% inspection combined with processes “under control”, and preventing defects at the source are the only ways to attain zero defects

ABM Highlights The Cost Of Quality



The Earlier we Catch the Problem the Better! Remember… Waste is like a Virus. The longer it festers the more of a toll it takes on you.

Control Chart Example



Separates Common & Special Cause

- Real Time/Operator Owned SPC/Pareto charts
- Eliminates line down time due to common cause
- Frees OE Resources to work common cause improvements

Control Plans Dictates
Special or Common Cause Actions

Can you identify the special cause variation ?

How much is common cause variation ?

When did the process change ?

Should you have to look at control charts to know when the process has changed ?

Questions Most Asked

How do we Integrate the Six Sigma and Lean Manufacturing Tools?

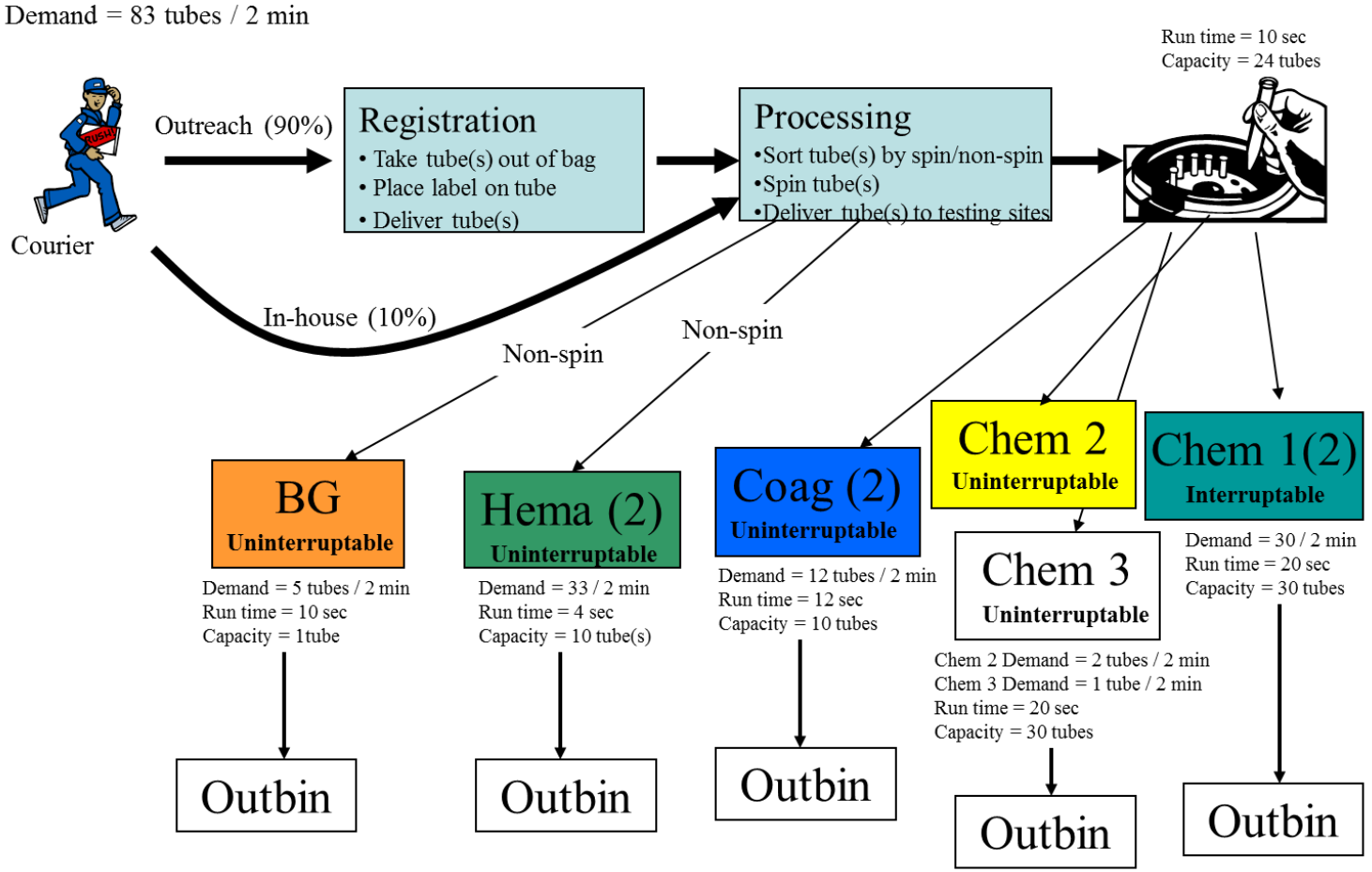
How do we Best Utilize our Black Belt and Lean Manufacturing Specialists with Integrated Projects?

Lean	Six Sigma
Flow & Improvement	Continuous Quality
Waste Elimination	Lean = Zero Defects

We implement Lean first which stabilizes the area and highlights six sigma projects to reduce variation

Lean Exercise

Lab Game Process



Additional Lean Pieces

- Cell Design
- Lean Materials
  - Kanban & Lean Supply Chain
- Lean Organizations – Functional Impact
  - Sales and Marketing,
- TPM
- Mistake Proofing (Poka Yoke)
- Six Sigma
- Lean Accounting
- New Reward and Recognition Systems

You Can't Just Implement One Piece and Expect to be Successful

10 Keys to Lean Success

1. Top-management commitment
2. Communication
3. Dedicated resources
4. Training
5. Get people involved
6. Maintain intensity – Compelling Need to Change
7. No layoffs due to Continuous Improvement
8. Share the wealth
9. Frequent review of progress
10. Track performance

Drive Lean Through the Line Organization – Support with *Dedicated Resources*

To Implement Lean Takes:

- Great courage
- Conviction
- Faith
- Unwavering commitment
- Innovation (Today's Problems Came From Yesterday's Solutions)
- Patience and Impatience
- Resources (preferably dedicated)
- Some financial investment
- Someone to walk you through it the first time
- Strong, committed senior leadership team

Imagine The Pioneers Crossing This Great Continent!

You have to provide the "Compelling Reason" to Change!

What Can I Do When I Go Back

- Make an Improvement… 1/10th of 1% is just fine!
  - Identify your Customers Value Added Proposition
  - Baseline Your Metrics (are thy the right ones?) and Take Baseline Video and Pictures
  - Figure Out Your Customer Demand and Takt Time
  - Practice the Three As
  - Process Map Every Step Your Patient or Product Takes
  - Make a List of All the "Dissatisfiers" in Your Area or Steps You can Eliminate Simplify or Combine
  - Develop a Vision For Your Area and Set Continuous Improvement Goals
  - Identify The Gaps
  - Make a Top Ten List of Improvements You Would Like to Make
  - Develop a Quick Wins List and Implement It

Pull on Any Available Lean Resources For Help But Don't Necessarily Wait For Them

Questions?

Business Improvement Group LLC

- Contact us
  - Website
    - www.biglean.com
  - Charlie Protzman
    - CharlieProtzman@comcast.net
  - Daniel Protzman
    - DanProtzman@biglean.com