

Lean 3P

Engaging People to Create Great Products and Operations

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SIEMENS
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Siemens Healthineers

We lead by being *lean*



Dimension®



Dimension Vista®



Syva V-Twin®



Stratus CS®



Flex Cartridges
Calibrators and Verifiers
IMT sensor Technology



Flex Cartridges
Calibrators and Verifiers
IMT sensor Technology



Reagents
Calibrators
Advia Clinical Chemistry



Test Paks
Calibrators and Diluents
Immulite Substrate

Our Goal Today . . .

. . . is to demonstrate how the 3P process encourages engagement and enables engaged people to create breakthrough designs!

Key Take-aways




**Learn
Together**



POP SURVEY

How many of you have used Lean 3P?

We lead by being lean

3P is Different than “*typical*” Lean



What is 3P?

Production, Preparation, Process

An event-driven process for developing a new **product** concurrently with the operation (**process**) that will produce it, by the **people** who will interact with it.

Breakthrough Results

Lowest Initial Capital Costs

Lowest Ongoing Cost Basis

3P takes us through a process that helps a cross-functional team ***engage*** as they ***learn together***



Why Does 3P Work?

3P is a “conversation” between people from different functional groups

3P encourages development of *many* alternative design options

After selecting the most promising ideas, we physically model the alternatives, trying, testing, adjusting

Three Common Applications

LAYOUT**PRODUCT****PROCESS**

A eureka moment!





TRUST the PROCESS

The Event “Contract”

Reawakening our 12 year-old mindset!

I _____ agree to participate openly and honestly throughout this event in order to solve the problems facing us. I will not be judgmental or critical of other participants and actively listen to their viewpoints and suggestions.

I will avoid sarcasm and conflict. I will be respectful with everyone who is on this event. I will think and act creatively and encourage creativity among the other participants by returning to my 12 year-old mindset to generate useful ideas.

I understand that our goal is to create value for our company by leveraging our combined knowledge and experience to develop the best possible product and operation within the boundary conditions outlined in our charter.

I will work with the team to ensure delivery of what is promised.

I will openly share my ideas and thoughts without fear of criticism or judgment and participate fully in every aspect of the Lean 3P process.

Trust the Process

Why Do We Need a Charter?

- Clearly the goals and the boundaries of the even.
- Sets Expectations for the need, the targets, and the schedule.
- Ensures each stakeholder within the process understands the role which they are to play:
 - Process Owners
 - Process Insiders
 - Process Outsiders
 - Judges → **Critical Evaluators**
 - Facilitators

Process Name	Start Date	End Date
The No-Diesel Diesel Engine Project	May 5, 2014	May 9, 2014
Process Boundaries	Start Time	End Time
New product to utilize alternate hydrocarbons in a diesel-style engine. Factory and shop only. Not receiving, warehousing of distribution.	7:30 AM	4:30 PM
Event Meeting Location		
South Factory		
Process Owners		
VP Operations - Ron M VP Marketing - Hal M		
Why Do We Need This Event?	Process Experts	
Existing product lines plateau. Cost of oil is skyrocketing. Hybrids and electric causing market erosion at 5% per year.	Product Mgr - John W, Design Engr - Kay M, Regulatory Mgr - Stan G, Director HSE - Jim E, Director Operations - Alex K, Supply Chain - Paula E, Production Super - Joyce W, Technical Mgr - Kim G, Procurement - George M, Quality Supr - Narda M, Finance - Pam M, Operators - Megan B and Alexandra C, Facilities - Glenn S	
Event Targets	Event Judges	
Final product cost under \$1,500 USD at rate of 30,000 units per year.	Chief Engr - Ron M, Research - Maria S, COO - Ken R, Dir. Lean Sigma - Drew L	
Capital cost limited to \$1.2 MM USD. Time to market launch 14 months or less	Process Outsiders	
	Acme Machine Tool Co - Andrew J	
	Facilitators	
	The Sensei Co. - Kit E	
	MEP - Kim K	

Quick Check

1. Find someone close to you, who you don't know
2. On an index card, write down their Name and Title

Name: _____

Title: _____

Choosing Process Design Criteria

Select *strong* Design Evaluation Criteria before any ideas are generated.

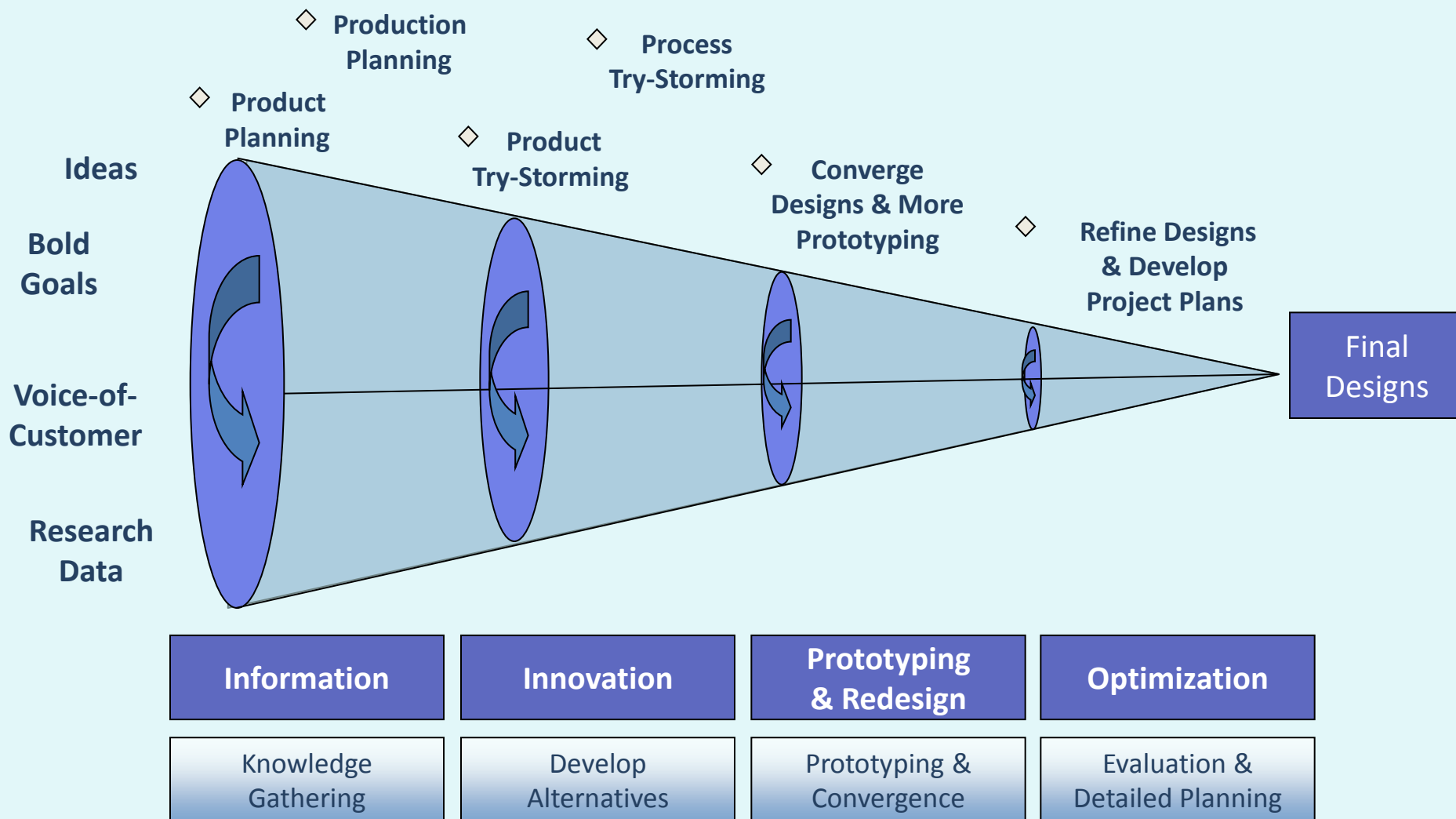
EVERYONE gets an equal vote.

These Design Criteria will be used to evaluate all alternatives and prototypes during the event

	Evaluation Criteria	MUST	SHOULD	COULD
1	Takt Time	✓		✓
2	One-Piece Flow			✓
3	Pull System	✓		
4	People Involvement		✓	
5	Automatic Unloading		✓	
6	Load-Load Operations		✓	
7	Low Cost Automation	✓		✓
8	Mistake-Proof (Poka Yoke)			✓
9	Minimal Capital		✓	
10	Minimal Space Required		✓	
11	Low Motion Waste	✓		✓
12	100% Gauging			✓
13	Maximum Operator Value-Add		✓	
14	Changeover Time			
15	Tool Room Maintenance			✓
16	Tooling Quality or Tooling Cost			✓
17	Safety, Ergonomics, and Health	✓		
18	Environmental Impact			
19	Internal Waste Collection			
20	Simple as Possible			
21	Standard or Off-the-Shelf Equipment		✓	
22	Process capability (Cp)			✓
23	Known Process			✓
24	Future Challenge			
25	Maintenance Free	✓		
26	Technical Advantage		✓	
27	Autonomation			
28	Development Time or In-House Development			
29	Scalability			
30	Flexibility			

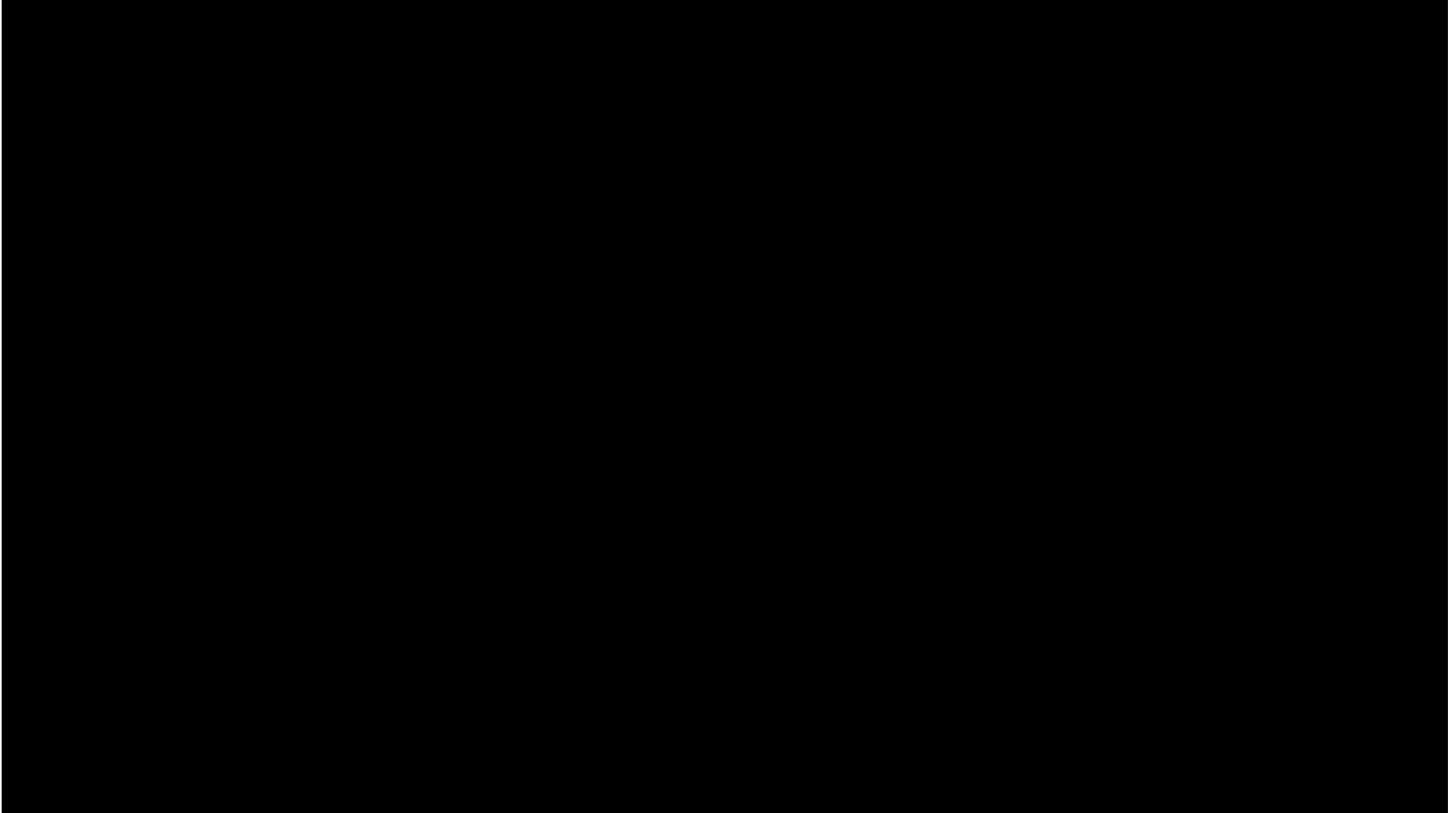
* Used with permission: Coletta, Allan. *The Lean 3P Advantage*. Boca Raton: CRC, 2012

Lean 3P Event Flow



* Used with permission: Coletta, Allan. *The Lean 3P Advantage*. Boca Raton: CRC, 2012

Trust the Process!





Traditional Process Step	Description of Function
1 Wash Apples	Accumulate
2 Sort Apples	Separate
3 Spray Apples	Remove Contaminates
4 Blow Off Water	Dry
5 Core Apple	Remove Material
6 Insert Sugar & Butter Mix	Fill Hole
7 Bake	Heat
8 Flash Cool	Cool
9 Package in Clamshell & Weld	Protect
10 Label	Identify
11 Package	Group

* Used with permission: Coletta, Allan. *The Lean 3P Advantage*. Boca Raton: CRC, 2012

Make Flow as Visual as Possible



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Developing 7 Alternatives

Look for examples of keywords in nature



Fill

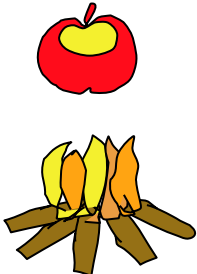
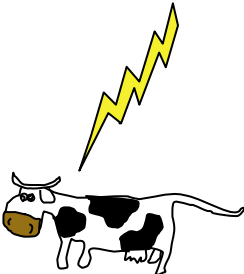
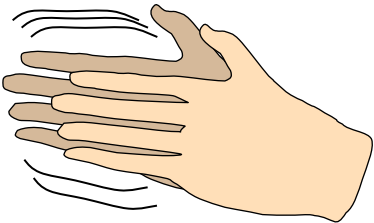
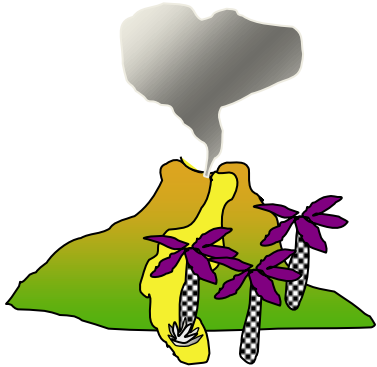
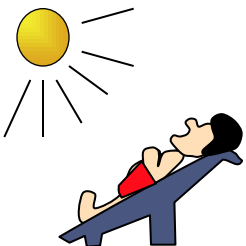
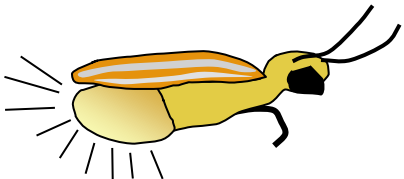
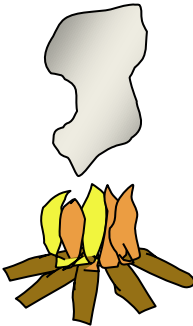
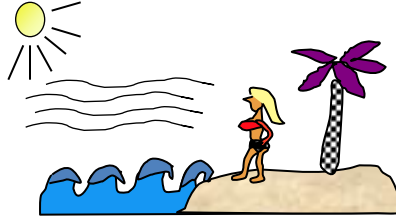


Identify



Protect

7 Alternatives From Nature for HEAT

<p>HEAT</p> 	<p>1. Electricity</p> 	<p>2. Rub Hands Friction</p> 	<p>3. Lava Conducts</p> 
<p>4. Sun Radiates</p> 	<p>5. Lightning Bug Chemical Reaction</p> 	<p>6. Fire</p> 	<p>7. Warm Wind Convection</p> 

* Used with permission: Coletta, Allan. *The Lean 3P Advantage*. Boca Raton: CRC, 2012

Let's try it!

1. Get together with the person you met earlier
2. Work together to come up with 7 Ways to "REMOVE MATERIAL" as they happen in Nature.
3. Use the paper provided to sketch your ideas. You will have 5 minutes!

Times Up!

1. How many of you came up with 7 ways from nature? 6? 5?
2. When you first met the person you worked with and wrote down their title, how many of you of you had a much smaller job? How did that make you feel?
3. As you were working together to develop your 7 Ways – how did those feelings change?

Product 3P

Knowledge Gathering

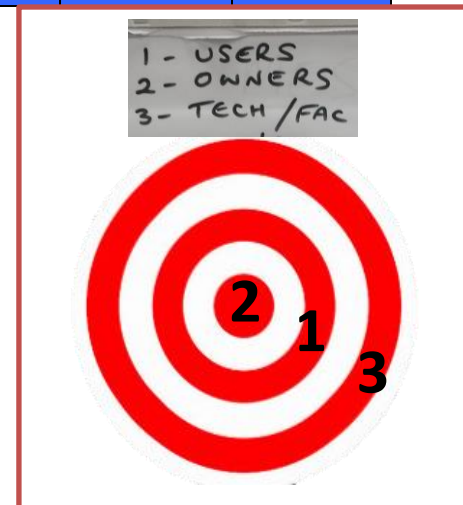
Voice of the Customer Data

VOC Summary									
What are the important qualities of the squeeze machine to the user?	How Important (1 Low to 5 High)	Machine Functional Areas that influence or delivers the desired qualities							
		Frame	Squeezer Pads	Head Support	User Control Box	Power System	Data Collection		
Deep Squeeze Therapeutic Value	5		✓			✓			
User Control	5				✓				
Pressure Consistency	4		✓			✓			
Simple to use / maintain	4	✓	✓	✓	✓	✓			
Safe	5	✓	✓	✓	✓	✓			
Durable	4	✓	✓	✓	✓	✓			
Affordable Cost	3	✓	✓	✓	✓	✓			
Data Collection	2						✓		
Quiet/no sudden noises	3					✓			17

Change Management	Traceability/Audit Trail	Online Configuration Change	User Permissions	Change Management Software (development environment)	Device/Alarm Configuration Change Management
Traceability/Audit Trail		2	1	1	1
Online Configuration Change			2	2	2
User Permissions				3	5
Change Management Software (development environment)					5
Device/Alarm Configuration Change Management					

Customer Interests and Categories Are:

- Clearly Defined
- Prioritized within category and across category by importance to customer to become Design Evaluation Criteria
- Mapped to the Product Functional Area/ Feature
- Who's in the Bulls-Eye*?



Customer Interest Knowledge Brief

Background statement: why this is important to customer.

Facts:

Factual information about your target customer

Pain:

State the problem your target customers have that require solutions

Conclusions from what we have learned that designers should know.

What we have learned from observing customers experience.

Behavior:

Existing behavior they exhibit now because they do not have your solution

Goals:

What are the customers trying to do through the behavior that your solution will do better.

What the new design should address and actions we need to take before the design work.

The Process

Task 1

Dimension the Opportunity

Task 2

Develop Action States or Diagrams of Product

Task 3

Identify Key Words (Value Creation)

Go back to Nature to develop 7 Alternatives

Task 4

Review each alternative with team

Task 5

Combine similar ideas to create alternative product designs.

Task 6

Evaluate alternatives based on design criteria.

Select Top Three Alternatives

Task 7

Build real mock-up of product design

Use Trystorming to fail fast and fail cheap!

Task 8

Demonstrate each product design

Evaluate mock-ups based on design criteria.

Task 9

Select and combine best design option

Integrate higher scoring features from alternatives

Key Characteristics of Major Project Categories				
	Project categories			
	Tailoring	Limited Innovation	Strategic Breakthrough	Research
Technology & limits	Use Existing	Use Existing	Create new or shift existing	Create new or shift existing
Product profitability	Required	Required	Required	Not expected
Manufacturing approach	Use existing	Use existing	Process innovations required	Varies by project
Component Innovation Timing	Precedes Development Project	Precedes Development Project	Simultaneous	Follows project
Product family	Within existing	Within Existing	Creates New	Crosses boundaries
Project breadth	Small	Moderately Broad	Broad	Driven by data and project need
Focus	Target market differentiation	Speed to market leveraging prior work	Vigorous product or process innovation	Good technology trade-off curves





Zeiss is a world leader in optics and microscopy. In these pictures Daniel Aldridge's Cambridge, England team applies Lean 3P in development of a new electron microscope!

This is a 3P example for product development in parallel with the process development.

The production processes are built into the design before the 'real' design work starts.



Littelfuse 3P Team – Wuxi, China



Problem – desired a functional improvement and a cost target

Approach – First conduct a **Design 3P**, followed by a **Production 3P**

This team was trained in 3P by Corporate Lean. Now Wuxi is fully capable of conducting 3P events on their own and have used 3P to solve a number of long term problems

Results

Original design could not be easily manufactured

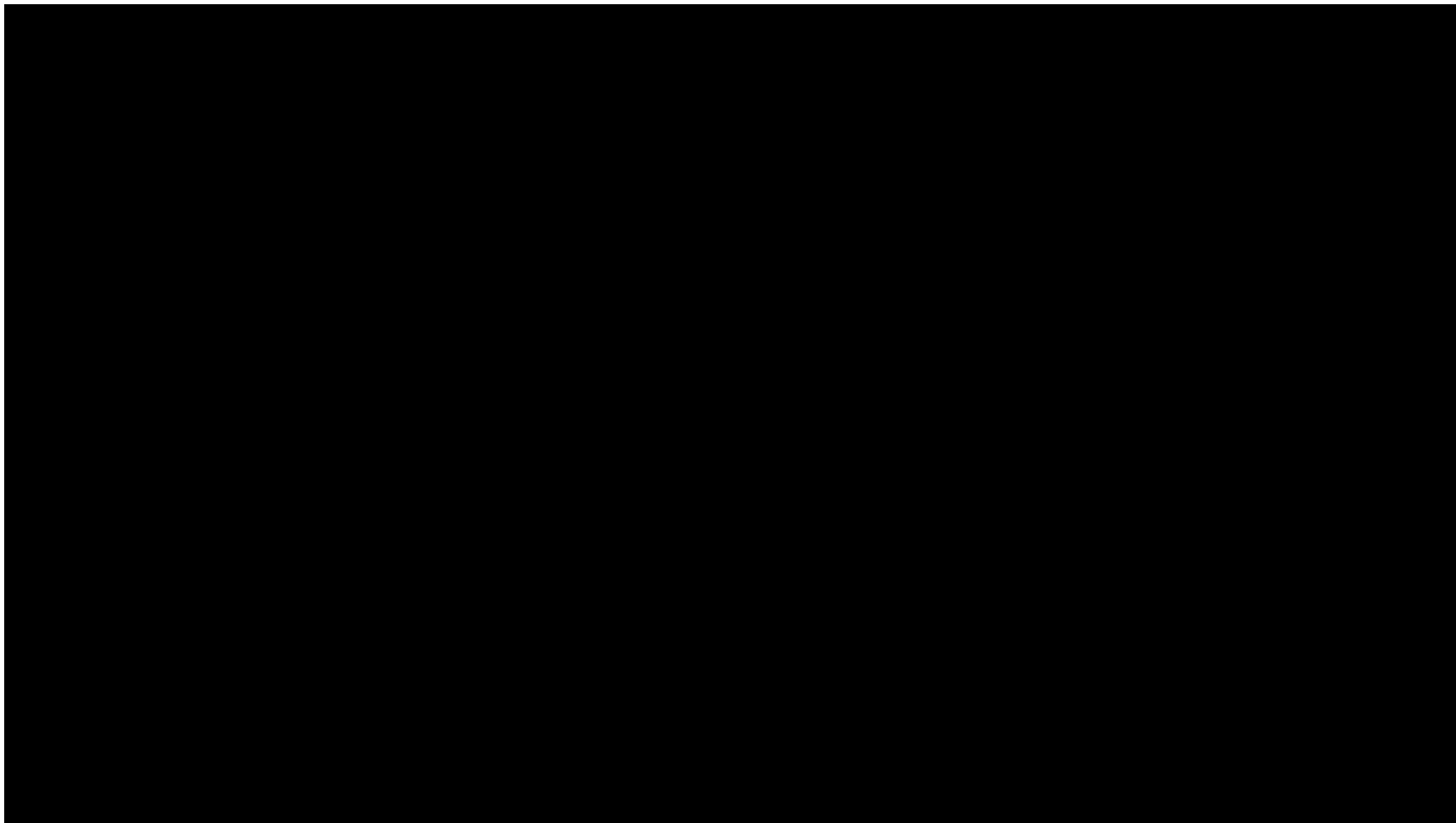
The final design came in at 41% of \$X

The final design built on a retooled line versus a new line
(no large capital investment and simple process flow!)

Team Lessons Learned

- Cross-function teamwork is best (3P!)
- 3P added great value (41% of the low Marketing target cost)
- Mock-up visualized and brought to light a production issue
- Good time management using 3P - highly efficient process
- Hand-shake between NPD & Manufacturing with 3P
- Important to involve wide team (consider both chip & assembly!)
- Next effort will focus on obtaining more input from customers and requirements at the device level. (Continuous Improvement!)

Example of Product 3P

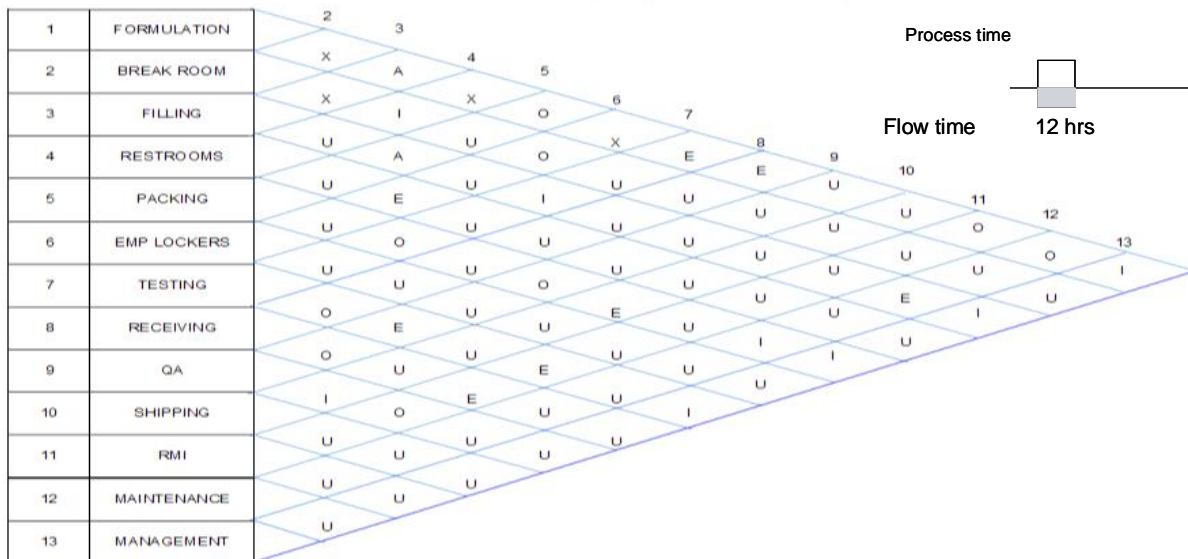
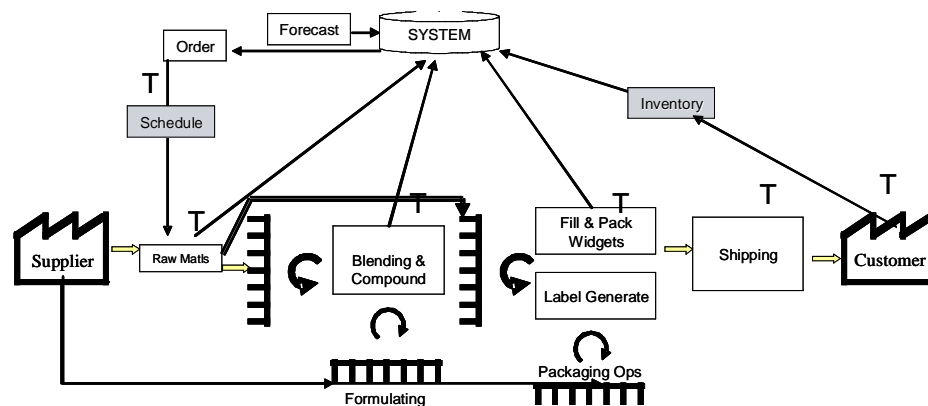


Layout 3P

Knowledge Gathering

Lean 3P Success Criteria

Lean Tools such as Value Stream Mapping and Adjacency Diagrams help to define evaluation criteria



The Process

Task 1

Review Demand Data

Task 2

Define Departments/Functions

Task 3

Develop 7 Alternatives for Layout on paper (2D)

Task 4

Review each alternative with team

Combine similar ideas.

Task 6

Evaluate alternatives based on design criteria.

Select Top Three Alternatives

Task 7

Build scale mock-up of Layout (3D)

Task 8

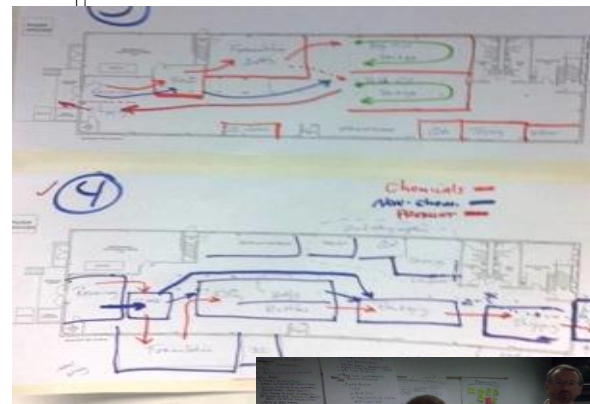
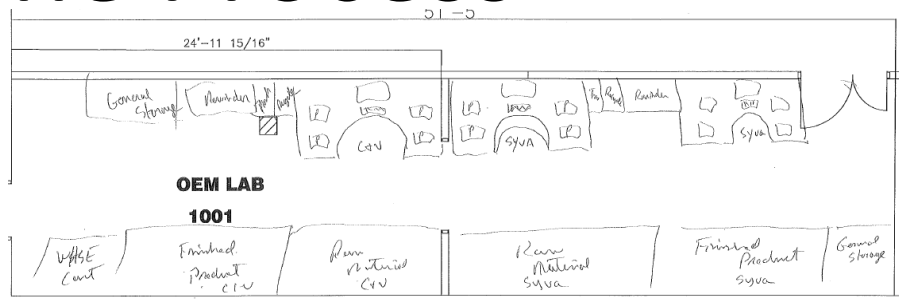
Demonstrate each design

Evaluate mock-ups based on design criteria.

Task 9

Select and combine best design option

Integrate higher scoring features from alternatives



Layout 3P IS/IS NOT

IS

- Quick
- Creative
- Uses crude scale models or Legos to convey concepts

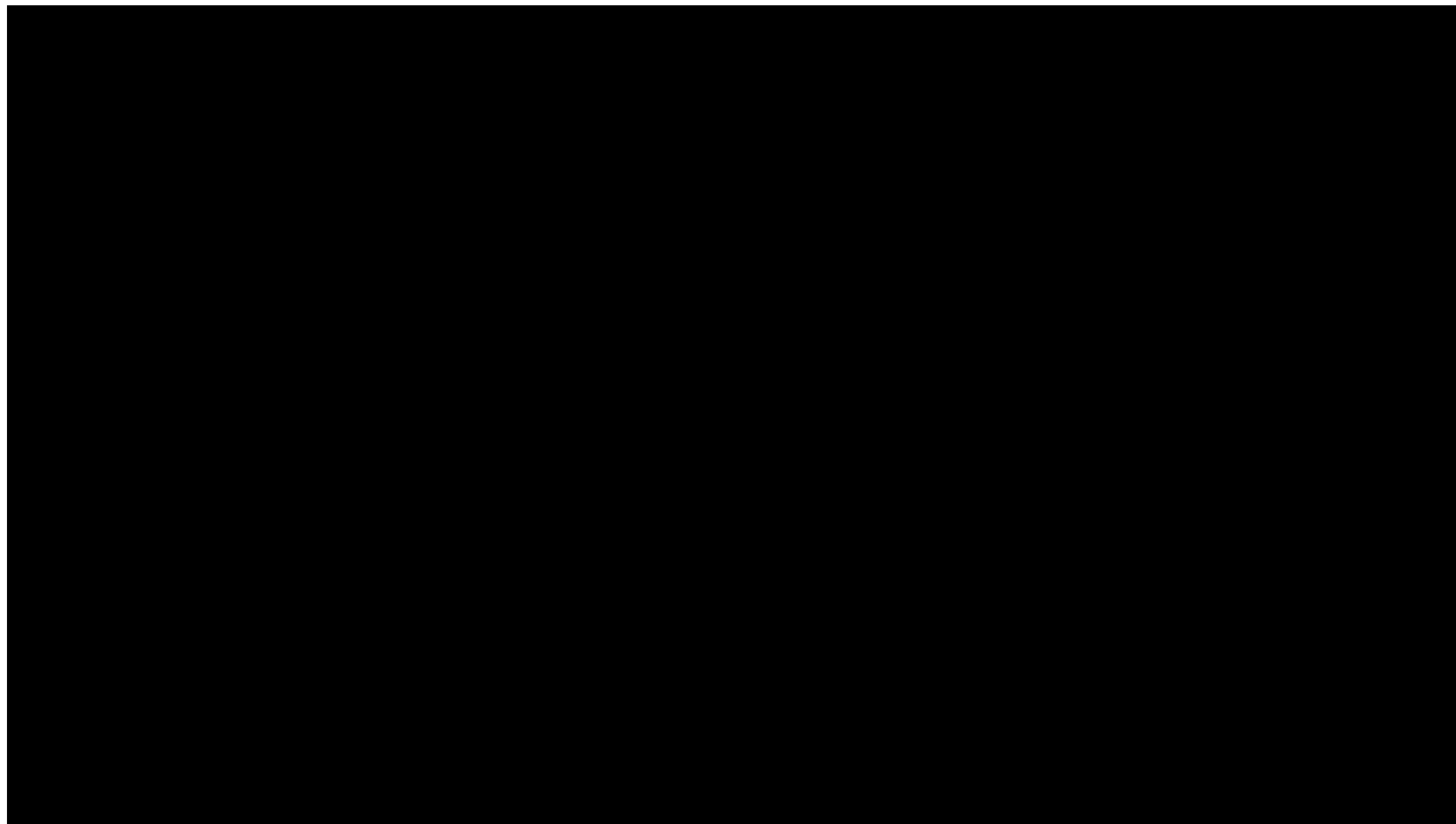


IS NOT

- Detailed Design
- CAD Modeling or Drafting
- Engineering or Time Intensive



Example of Layout 3P



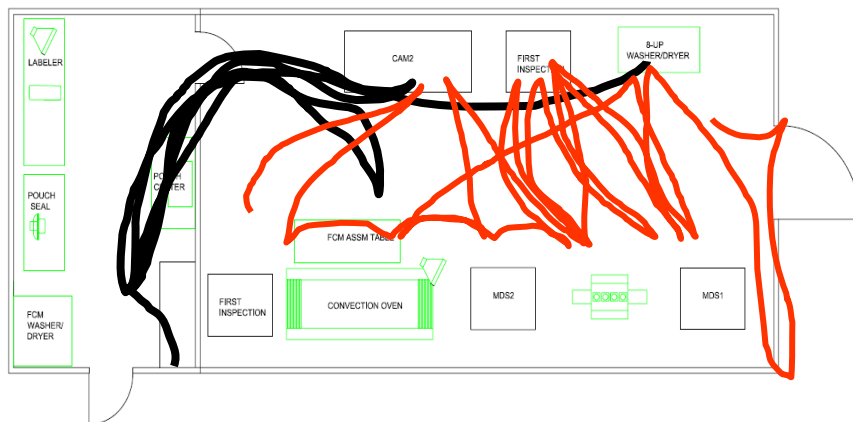
Process 3P

Knowledge Gathering

Lean 3P Success Criteria

Inputs to the Process 3P Event

- Design features from Product 3P event
- Design features from Layout 3P event
- Customer Demand Forecasts
- Operational Boundaries
- Stretch Goals



The Process

Task 1

Dimension the Opportunity

Task 2

Develop Transformation Steps of Product as it moves through the Process

Task 3

Identify Key Words (Value Creation)

Go back to Nature to develop 7 Alternatives

Task 4

Review each alternative with team.

Combine similar ideas to create alternative process designs.

Task 6

Evaluate alternatives based on design criteria.

Select Top Three Alternatives for each step

Task 7

Build real mock-up of process design

Use Trystorming to fail fast and fail cheap!

Task 8

Demonstrate each process design

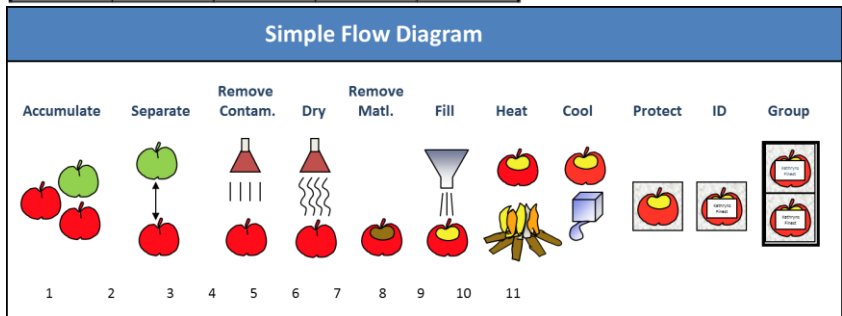
Evaluate mock-ups based on design criteria.

Task 9

Select and combine best design option

Integrate higher scoring features from alternatives

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Project breadth	Small	Moderately Broad	Broad	Driven by data and project need
Focus	Target market differentiation	Speed to market leveraging prior work	Vigorous product or process innovation	Good technology trade-off curves



Develop 7 Natural Alternatives

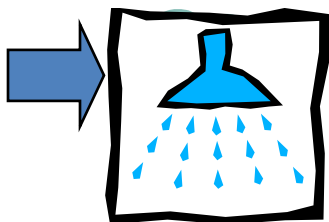


Converting Natural to Technical Solutions

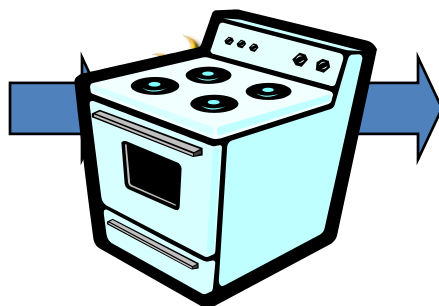
Accumul



Wash



Dry



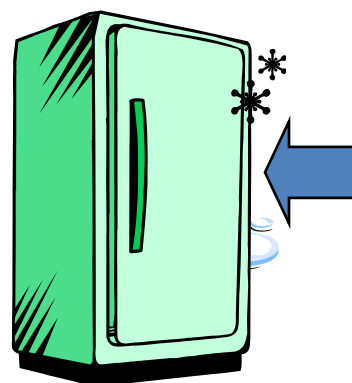
Make Hole



Fill



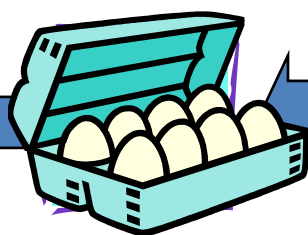
Heat



Cool



Identify



Group



Protect

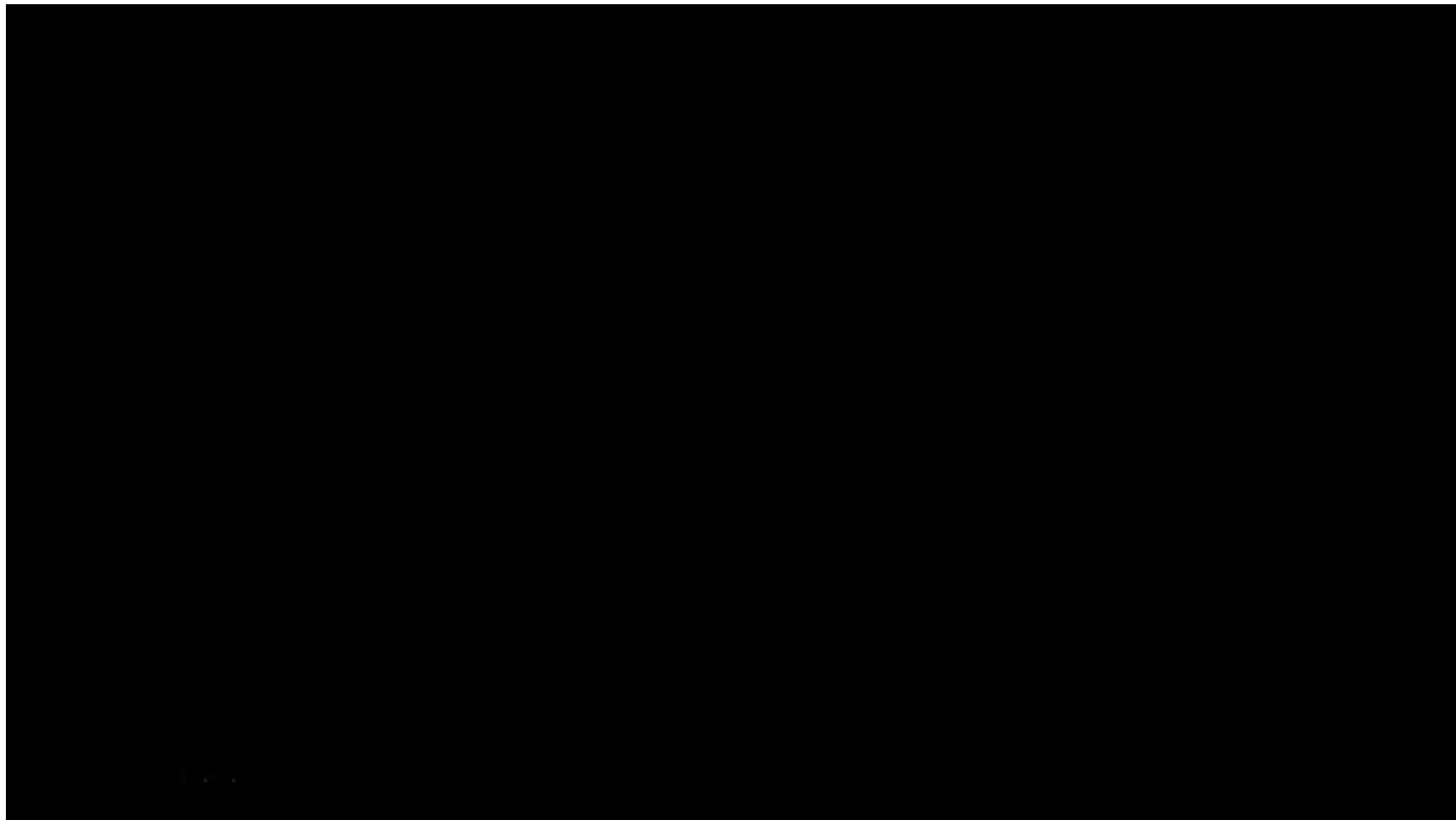
Prototypes and Try-Storming



Process at a Glance

FINAL BAKED APPLE 3P PROCESS AT A GLANCE																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Process Step	Accumulate	Wash	Dry	Separate	Make Hole	Heat	Cool	Protect	Fill	Identify	Group							
Operation Step	Load Bulk Bags	Move to Washer	Move to Operator Station	Operator place in future	Knife Cuts	Operator place in basket	Deep Fry	Flash Cool	Move from Flash Cool to Packing	Load into Cleanshell Container	Clean and Seal Cleanshell	Auto-Unload to Packaging						
Material	Bulk Bags	Bulk Bags	Apples	Submersible Water Wash	Forced Air	Clean/Dry Apples	Knife Cuts	Operator place in basket	Deep Fry	Flash Cool	Basket on Truify System	Clear Clean Shell	Operator using vacuum lift	Pick and Place	Conveyor with Cleanshell guide	Printed Label	Conveyor with collection buffer	Collapsed Shipping Carton
Method	Overhead Hoist System	Bag Dumper and Filler	Conveyor Belt	Barrel Washer (2 units)	Air Knife System (2 units)	Conveyor Belt	Manual separation and placement	Pottery Knife with Scoop	Manual placement of apples in basket	Custom Deep Frying Equipment	Liquid Nitrogen Flash Cooling	Trolley lifts and indexes baskets	Clean Shell Packing System	Vacuum assist placement	Pick and Place Freedom Blend	Automatic Filler and Trip-seal	Print and Apply System	Conveyor Belt
Gauge	Mark Floor For Apple Bulk Bag						Human Inspection	Limit Switch on Knife	Human Inspection	Temp Monitor & Control	Temp Monitor & Control			Vacuum Gauge	Vacuum Gauge	Limit Switch	Bar Code Scanner	Line Clear Sensor
Tool		Height Adjustment Bar			Barrel Clearing Basket		Sung Tool		Magnifying Glass	Temp Gauge for Verification	Oxygenic Apple Grabber			Manual Operated Suction Lift	Manual Operated Suction Lift			Manual Operated Suction Lift
Fixture or Jig						Yes	Yes - top plate support	Fry Basket	Fry Basket	Fry Basket	Fry Basket	Indexing Conveyor	None	Frozen Butter Cartridge				
Machine	Safety Halls to Block Hoist Path	Start Stop Button	Overhead & Purified Water	Noise Insulation & Filtered Air	e-Stop Button	Recycle Bin for Rejected Apples	Easy Access to Clean Main	e-Stop Button	Overhead & Clean-out System	Oxygen Sensor Safety System				e-Stop Button	Guarding	Labeling System Access to Main		OR-Line Shipper Label Machine
TAKE TIME (31 apples/hr)	300	75	35	40	40	35	35	32	35	40	40	33	35	32	34	32	40	40
COST \$ (000)	25	10	5	120	50	5	2	35	5	100	40	48	40	5	15	15	50	15
Evaluation Criteria																		
Test Time	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Material Capital	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
PLU System	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
People Requirement	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Automatic Unloading	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Lean Line Operations	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Material Flow (Pick and Place)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Material Space Required	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Utility Gauging	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Safety Engineering	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Material Waste Collection	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Simple to Produce	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Standard 1 (Off the Shelf)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Process Capability	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Maintenance Free	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Automation	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Scalability	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
TOTAL	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
SAVING TOTAL	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Engaging the Supply Chain!



Final Thoughts - Potholes & Stumbling Blocks

- Choose optimists vs pessimists
- Judges: influential “critical evaluators”
- Let the process breathe . . .
- Time management to keep things moving
- Leadership through the event highs and lows
- **Believe in and trust the 3P process**

Our Goal Today . . .

. . . is to demonstrate how the 3P process encourages engagement and enables engaged people to create breakthrough designs!

Key Take-aways

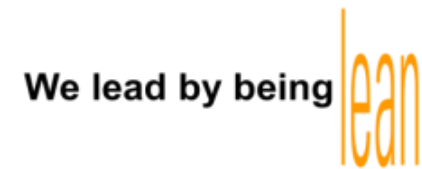


**Learn
Together**



TRY-STORM

Questions?



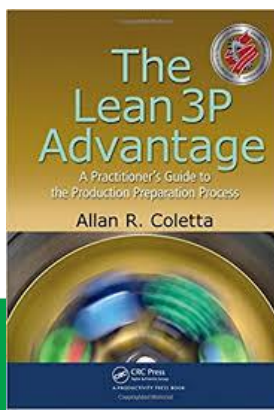
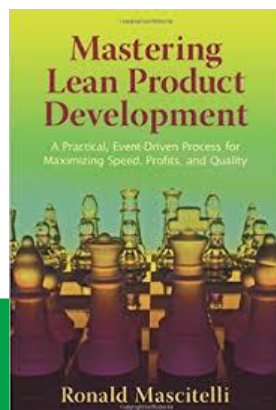
Credits, Acknowledgements and Resources

3P was developed by **Mr. Chihiro Nakao**, a former Senior Manager at Toyota and founder of Shingijutsu.

Sincere thanks to:

- **Littelfuse**: Matt Swain, *Director Enterprise Lean Six Sigma*
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- **KDR Associates** - Ken Rolfes, *President and AME Board*

3P Resources:





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Lean 3P Engaging People to Create
Great Products and Operations**

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