

FS Operating System

Process Control

Lean/Six Sigma Methodology & FSPT Journey

12-12-18



FS Precision Tech Co., LLC

- FS Precision Tech manufactures precision investment castings for Aerospace, Defense, Automotive, and General Industry applications.
- Specialists in the manufacture of titanium investment castings.
- An independent subsidiary of Fusheng Precision Company (Taipei) since 2004.
- Globally recognized quality certifications and customer process approvals, known for:

Responsive Service & Collaboration
Accredited Quality
Process Control
Global Reach



Quick Facts

- ❑ Facility: 60,000 ft² (5574 m²)
- ❑ Los Angeles, CA; minutes from Port of Long Beach
- ❑ ~120 employees
- ❑ Aerospace & Defense Quality Accreditation
- ❑ Lockheed Martin, BAE Systems Approvals
- ❑ ITAR Registered
- ❑ Recognized Industry Innovators

Investment Casting Markets



Aerospace & Defense

- Structural aircraft & missile components, Weapons systems & Military Firearms



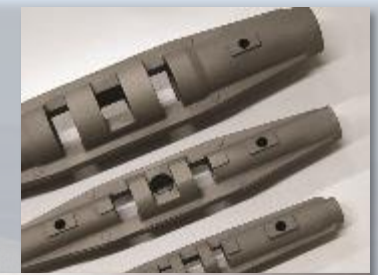
Turbomachinery

- Titanium Turbocharger Components for Automotive and Aerospace industries



Commercial & General Industry

- Energy, Subsea, Industrial instruments & tools, Firearms



In 2013 FSPT was looking to improve its predictability and profitability.

The solution?

The solution: 5 Steps

1. Goal Deployment Process – Strategic Tool
2. Functional Groups Integration – Define Roles/Responsibilities
3. Visual Factory Development - Daily Management Tool
4. Communication Flowdown Process – Accountability Tool
5. Training/Certification Process – Create CI Leaders

Achieve a Continuous Improvement **Culture** utilizing Lean/Six Sigma Methodology & Tools

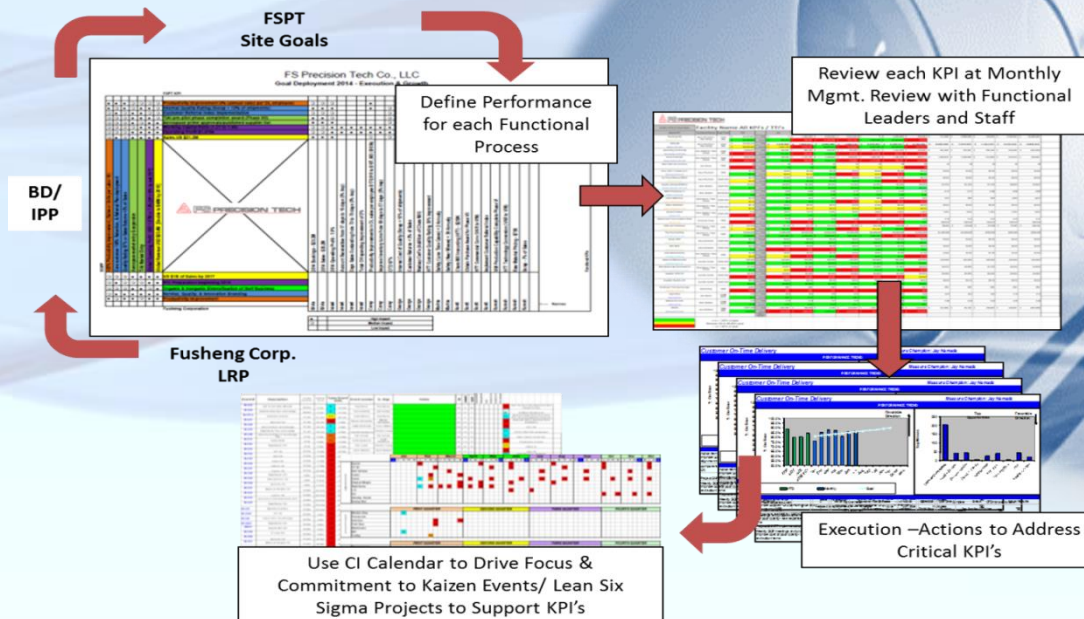
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Lean/Six Sigma Goal Deployment

1. Goal Deployment

- X-Matrix Development (Linkage)

- ✓ FUSHENG Co. LRP
- ✓ Business Development/IPP
- ✓ FS Precision Tech
- ✓ Functional Groups



Vision

Our Vision is to be recognized by our target customers as the leader in quality service and support for technically advanced titanium castings.

Mission

Deliver Quantifiable Customer Value Through Creative Casting Solutions And Supplier Service.

Guiding Principles

1. Treat everyone with dignity, respect, and professionalism.
2. Empower our employees to be creative solutions providers.
3. Make decisions which create value for all stakeholders.
4. Only make commitments that you will keep.
5. Provide extraordinary service by anticipating and responding to customer needs.

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Lean/Six Sigma Integration

2. Functional Groups Integration

- Define Strategy/Roles & Responsibility

- ✓ Sr. Leadership
- ✓ Engineering
- ✓ Operations
- ✓ Quality
- ✓ Customer Service
- ✓ Human Resources
- ✓ Accounting/Finance
- ✓ Information Technology
- ✓ Continuous Improvement
- ✓ Sales & Marketing



STRATEGIC CONTEXT

The Continuous Improvement Department Strategy is to become a business partner with all facility departments to ensuring Lean/Six Sigma processes, practices and training are in place to provide guidance and achieve a Continuous Improvement environment, meet customer requirements and facility objectives.

Continuous Improvement Dep. – Strategy/Roles & Responsibility

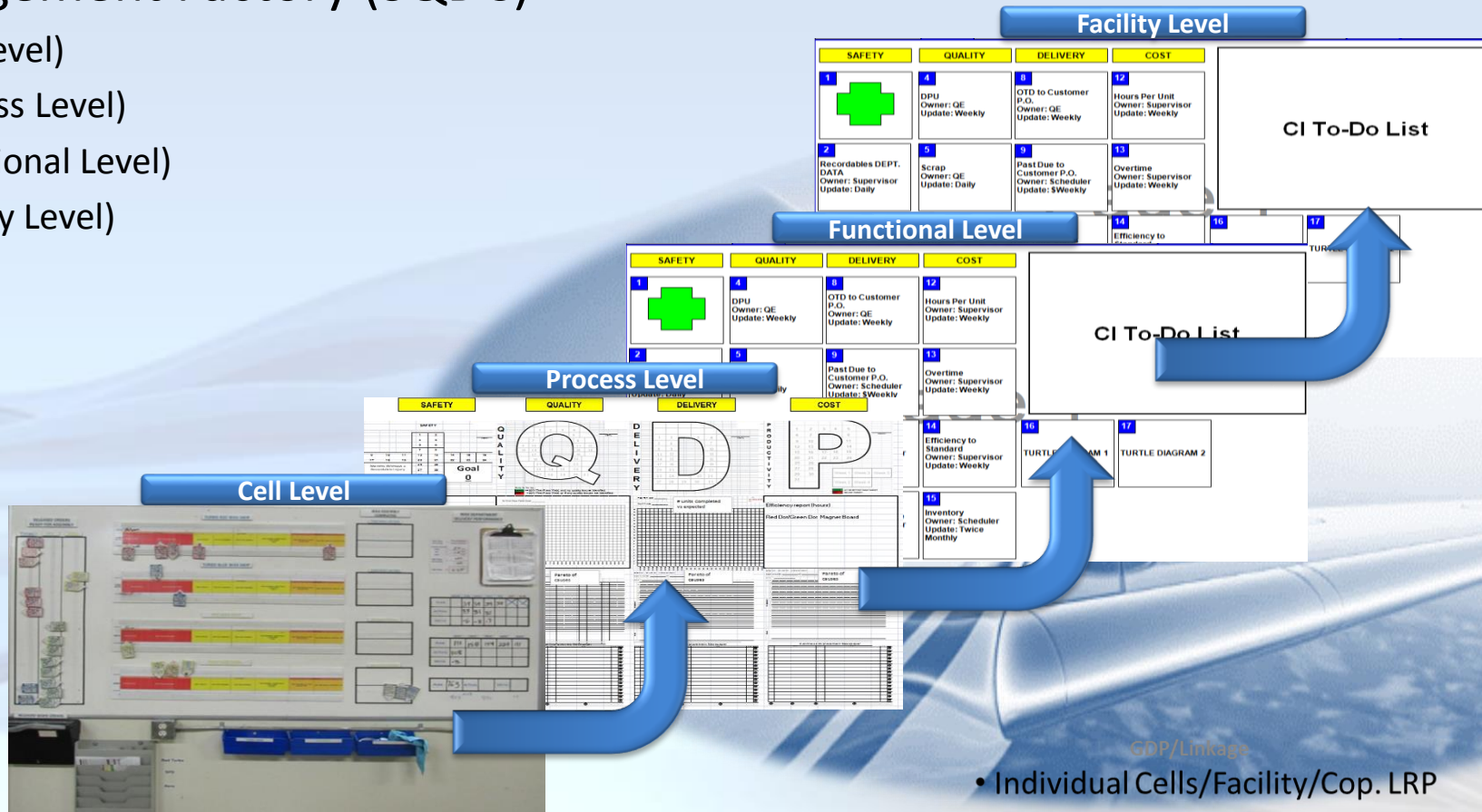
1. Develop & provide Lean / Six Sigma Training
2. Facilitate Lean / Six Sigma Kaizen events and projects
3. Facilitate development of a standardize visual management factory
4. Advocate continuous improvement for the business
5. Partner with Functional leaders to provide CI guidance based on customer requirements
6. 5S - Develop Program, Deploy & ensure training is provided
7. Deliver facility cost out objectives
8. Develop Continuous Improvement leaders within the facility
9. Work with individual teams to create repeatable processes and eliminate waste
10. Track and measure gains and benefits realized from Lean/Six Sigma Activities

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Lean/Six Sigma Visual Management

3. Visual Management Factory (SQDC)

- Tier #1 (Cell Level)
- Tier #2 (Process Level)
- Tier #3 (Functional Level)
- Tier #4 (Facility Level)



GDP/Linkage
• Individual Cells/Facility/Cop. LRP

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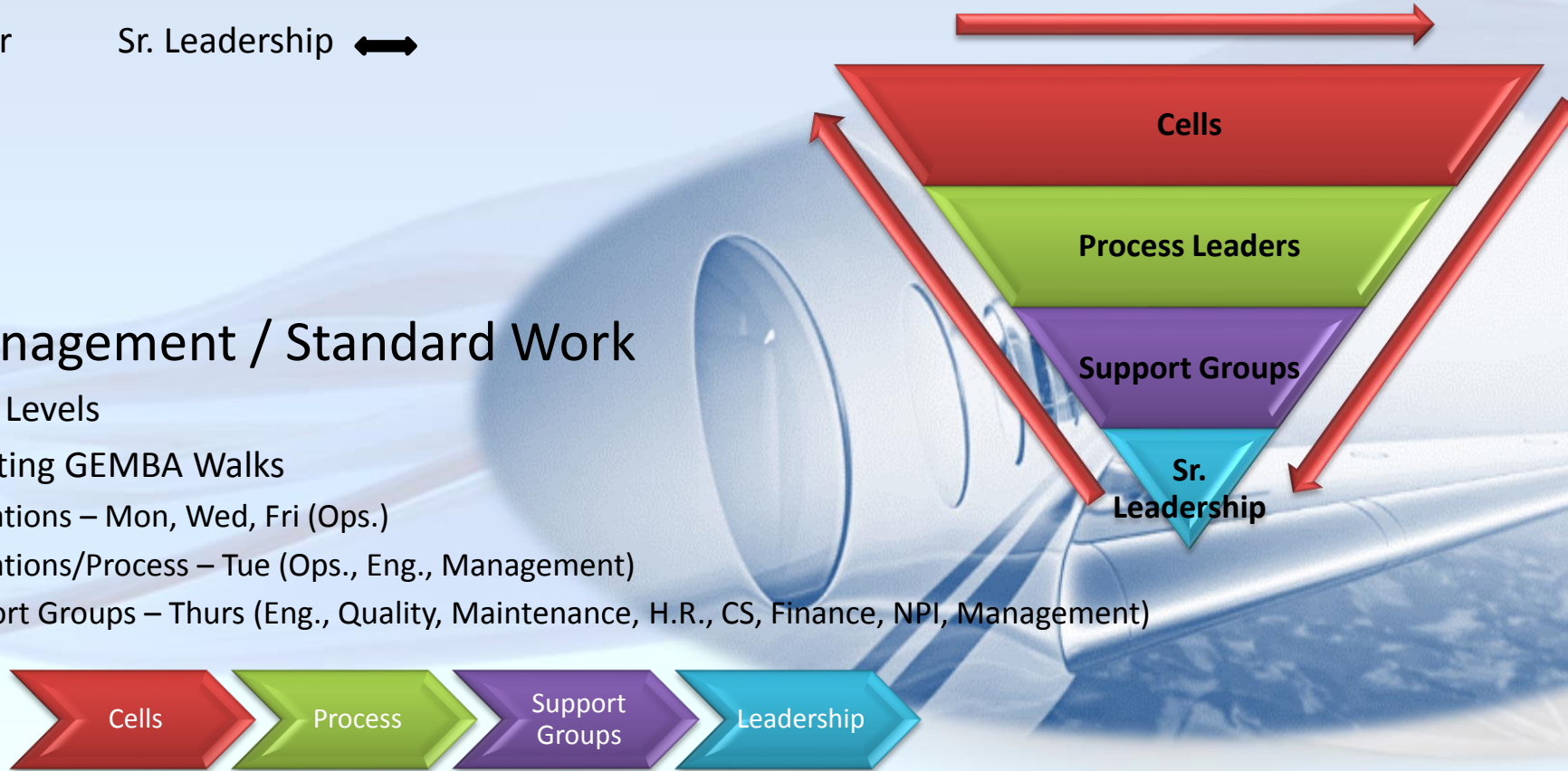
Lean/Six Sigma Communication

4. Building Accountability & Communication Flowdown

- Data Driven
- Shop Floor Sr. Leadership ↔

- Visual Management / Standard Work

- At All Tier Levels
- Incorporating GEMBA Walks
 - Operations – Mon, Wed, Fri (Ops.)
 - Operations/Process – Tue (Ops., Eng., Management)
 - Support Groups – Thurs (Eng., Quality, Maintenance, H.R., CS, Finance, NPI, Management)



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Lean/Six Sigma Training & Certification

5. Training/Certification Process Development

- Leadership Training
- Direct Labor & Support Groups Training
- Development Of Lean / Six Sigma Leaders
 - ✓ Lean - Waste Elimination (Focused on TPS)
 - ✓ Six Sigma - Reduction Of Process Variation (Utilizing DMAIC Process)

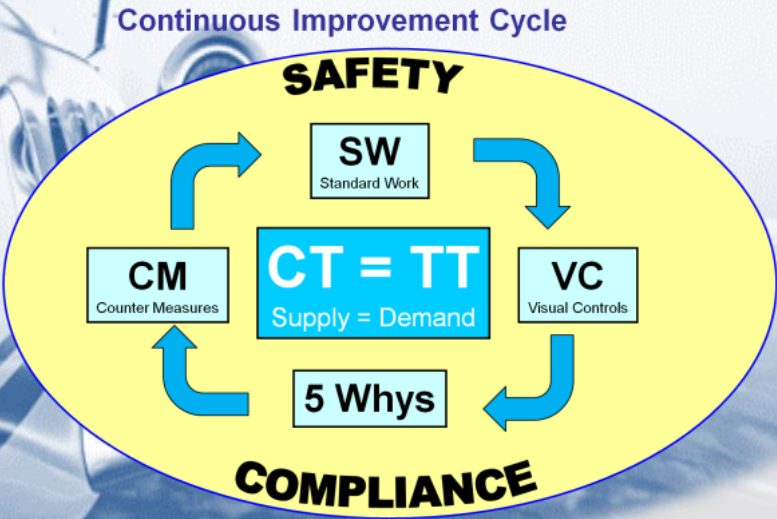
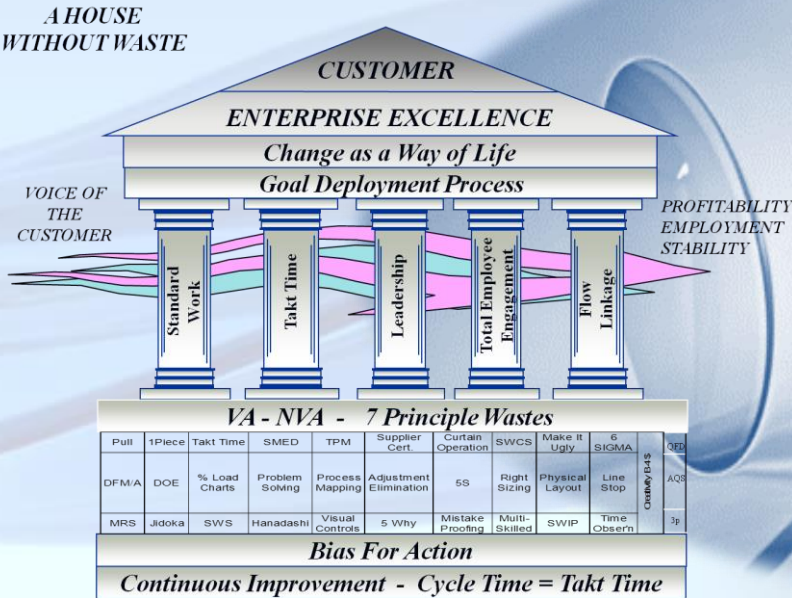


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Lean/Six Sigma Continuous Improvement Culture

6. Development of a Continuous Improvement Culture

- Culture Focused On
 - ✓ Customer Satisfaction
 - ✓ Problem Solving
 - ✓ Continuous Improvement



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Lean/Six Sigma Implementation



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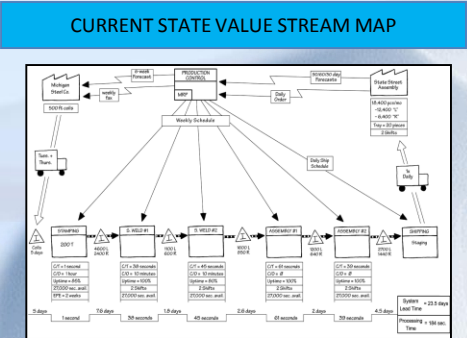
Lean/Six Sigma Goal Deployment

1. Develop The Vision For The Future

- Current State VSM vs. Future State VSM
- Alignment to FS Goal Deployment (GDP)

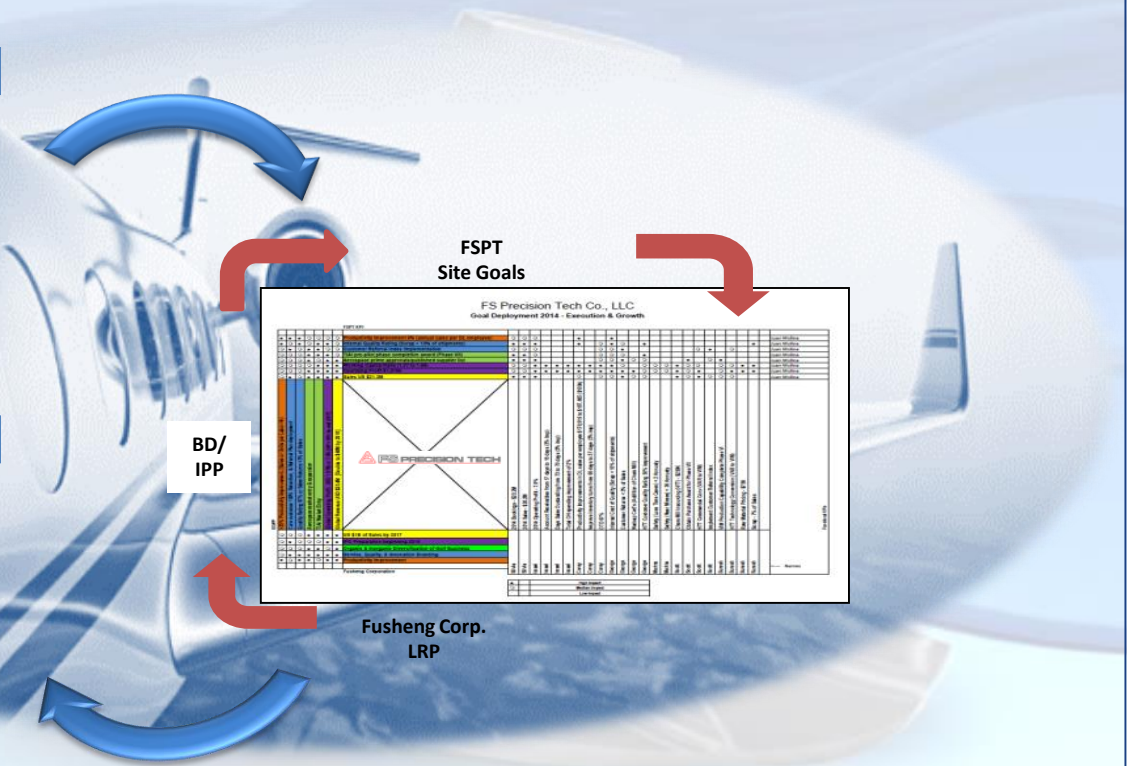
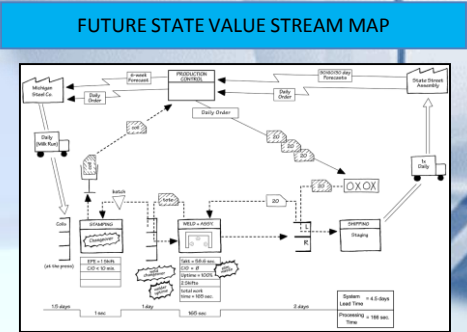
- Current manufacturing/process flow representative of the facility value stream, displaying:
 - Inventory
 - Cycle Time
 - Queue Time
 - Lead Time

Results



- Future manufacturing/process flow representative of the facility value stream improvements in:
 - Inventory
 - Cycle Time
 - Queue Time
 - Lead time

Results

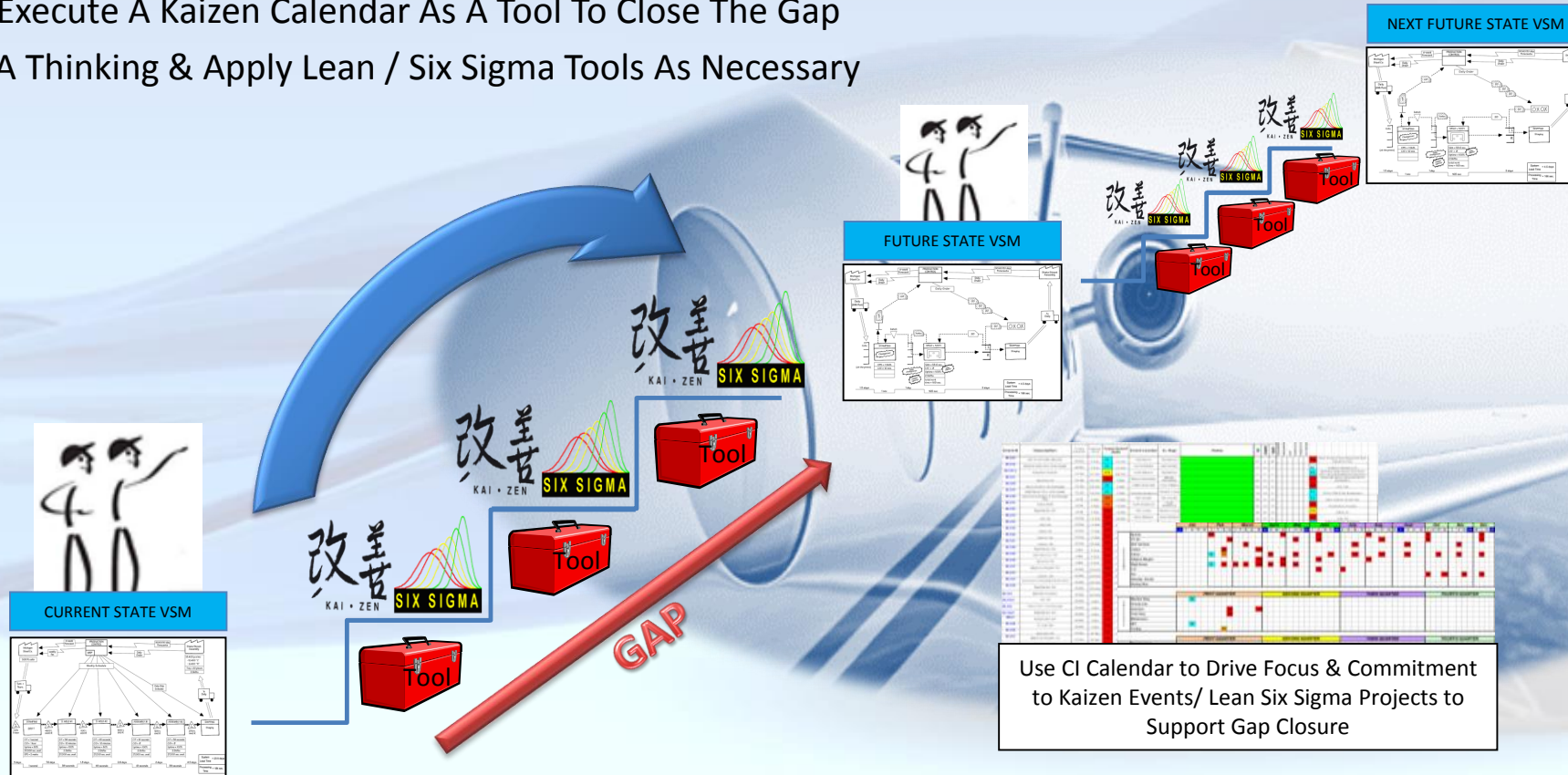


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Lean/Six Sigma Strategy

2. Develop A Gap Closure Strategy

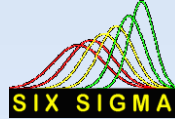
- Define The Gap Between The Vision and The Current State
- Develop & Execute A Kaizen Calendar As A Tool To Close The Gap
- Utilize PDCA Thinking & Apply Lean / Six Sigma Tools As Necessary



Basic Lean Six Sigma Training

Focus of Lean/Six Sigma

SIX SIGMA
VARIATION REDUCTION



LEAN MANUFACTURING
WASTE ELIMINATION



SIX SIGMA

GOAL : Improve Process Performance Through Process Control and Reduction of Process Variation "DEFECTS"

Focus : Bias For Analysis

Method : DMAIC, Control Chart, MSA, Process Capability, Process Control Plan

Defect Prevention

LEAN

GOAL : Improve Process Performance Through "WASTE" Elimination & Cycle Time Reduction

Focus : Bias For Action

Method : TPS, Kaizen, VSM, 5S, TPM, Kanban, Standardize Work

Speed, Flow

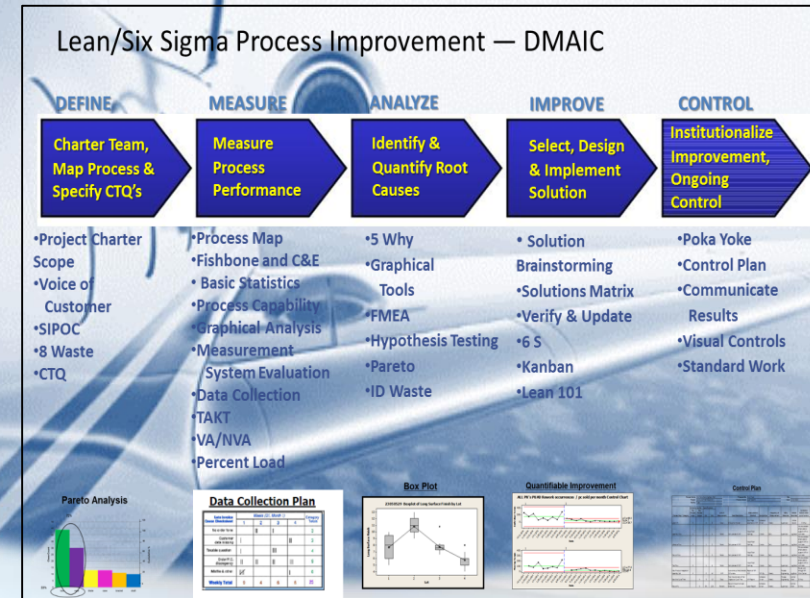
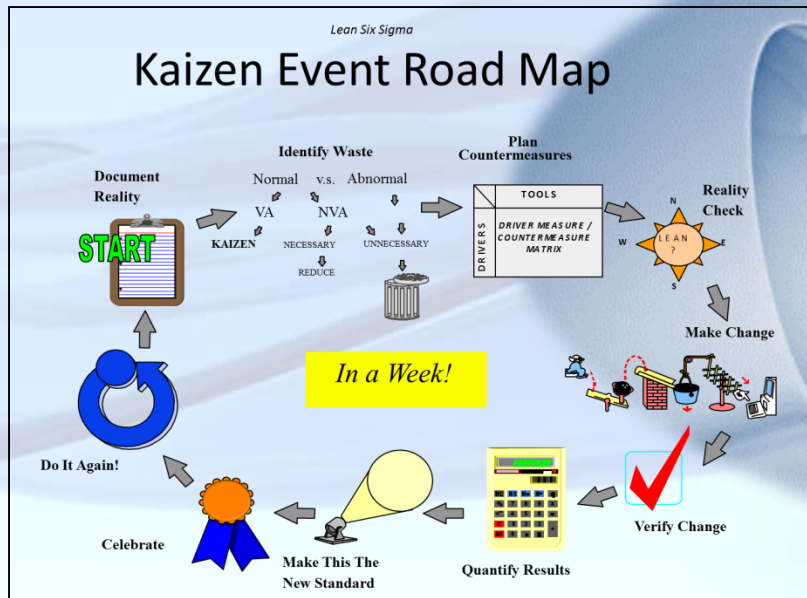
Less Defects & Less Waste Means Process Improvement!!

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Lean/Six Sigma Roadmaps

3. Lean / Six Sigma Process Development (Standard Work)

- Utilize The Lean Manufacturing Roadmap
 - ✓ Waste Elimination (Utilizing TPS)
- Utilize The Six Sigma Roadmap
 - ✓ Reduction Of Process Variation (Utilizing DMAIC Process)



4. Standardize Statistical Process Control (Defect Prevention) Development

- Statistical Process Control Process
 - Process KIV's (Key Input Variables) Identification/Coloration
 - Process Controls Plan Implementation

Wax

Wax Process Flow

Wax Control Plan

Shell

Shell Process Flow

Shell Control Plan

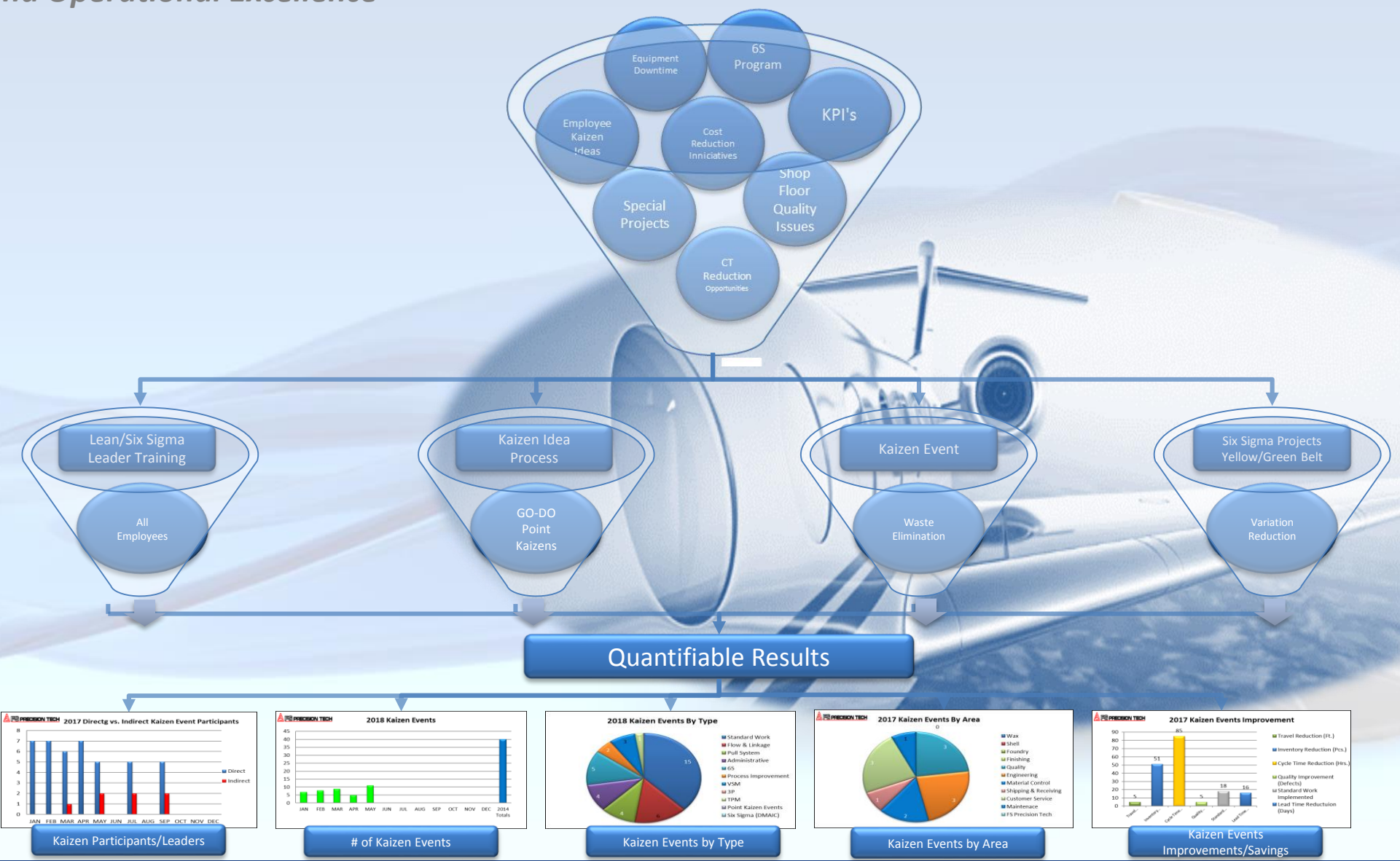
Foundry

Foundry Process Flow

Foundry Control Plan

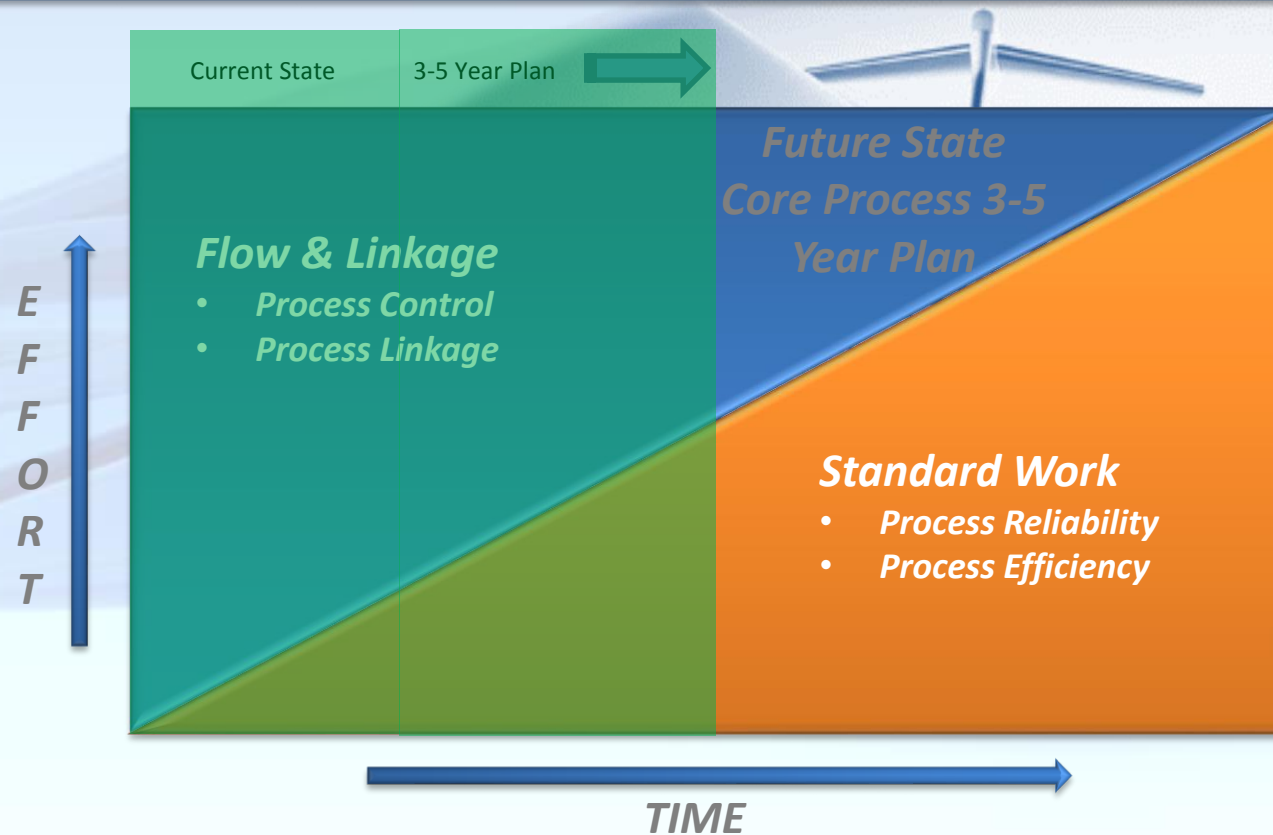
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Lean/Six Sigma Operational Excellence



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Future State Core Process 3-5 Year Plan (Operational Excellence Focus)



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6S Process

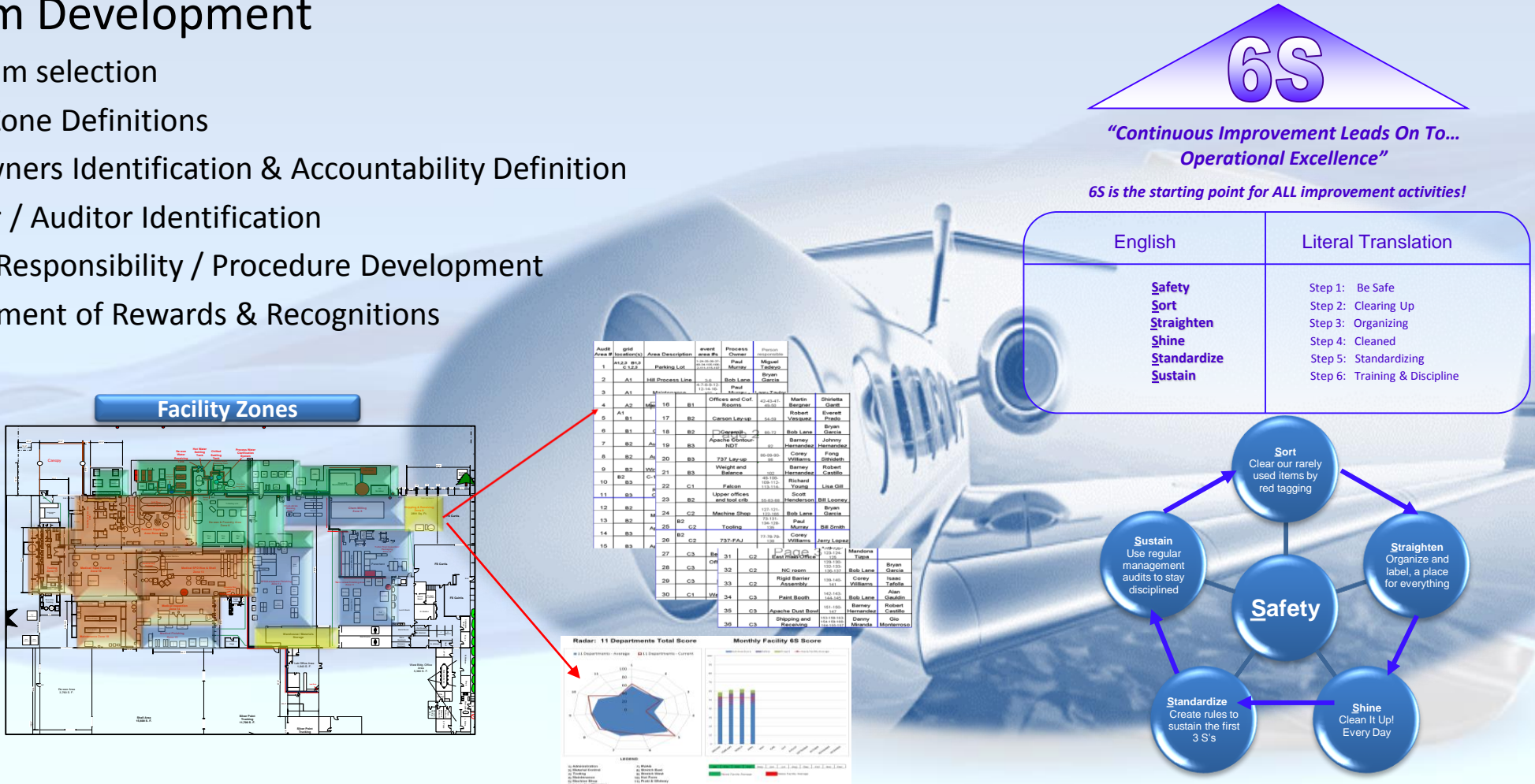


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Lean/Six Sigma 6S Process

1. 6S Program Development

- Core Team selection
- Facility Zone Definitions
- Zone Owners Identification & Accountability Definition
- Assessor / Auditor Identification
- Roles & Responsibility / Procedure Development
- Development of Rewards & Recognitions



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FSPT Lean/Six Sigma Journey



In 2013 FSPT was looking to improve its predictability and profitability.

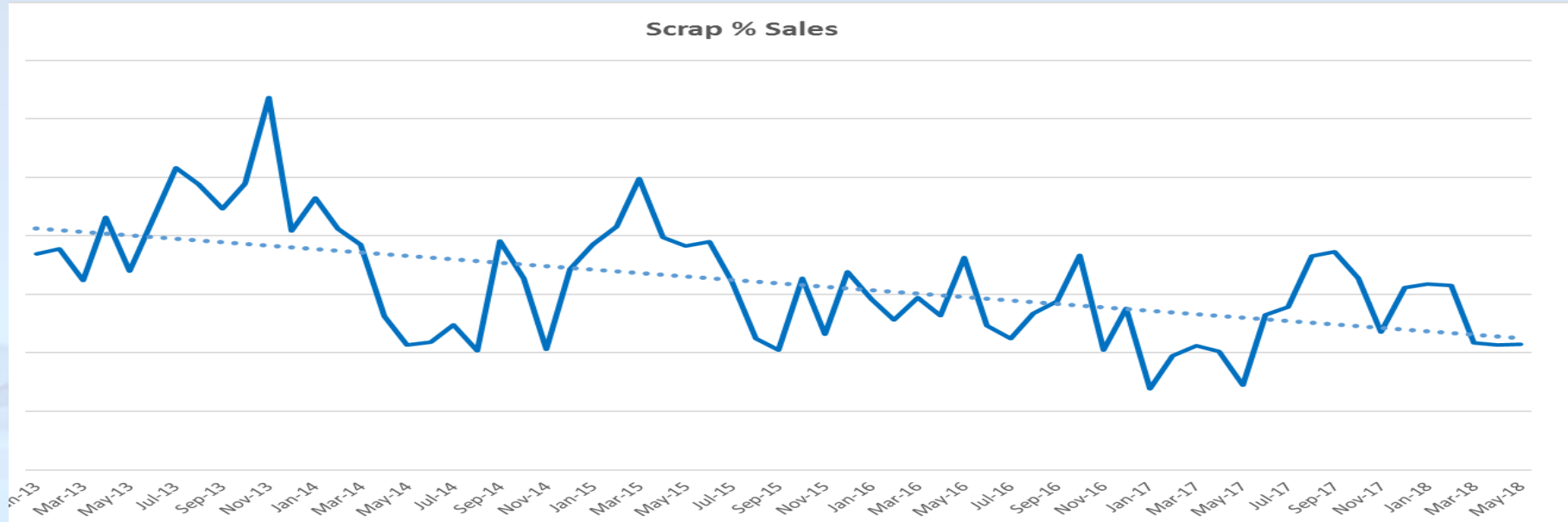
The solution?



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FSPT Lean/Six Sigma Journey

Scrap

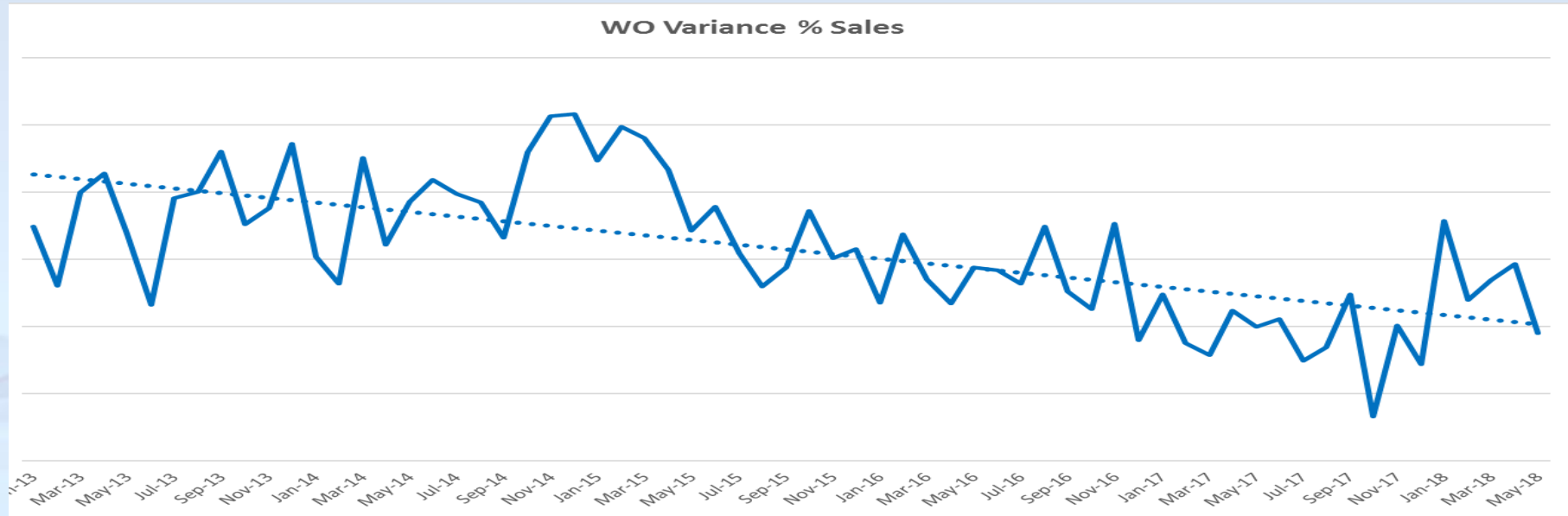


- **4 Year Scrap % of Sales:** Scrap has been improved X% since 2014.
- Scrap improvement attributed to application of Six Sigma tools in Engineering & Manufacturing for continuous improvement with quantitative results:
 - Detailed control planning for critical processes
 - Run chart data, capability analysis, and failure analysis techniques
- Increase in scrap starting July is a result of special cause variation.

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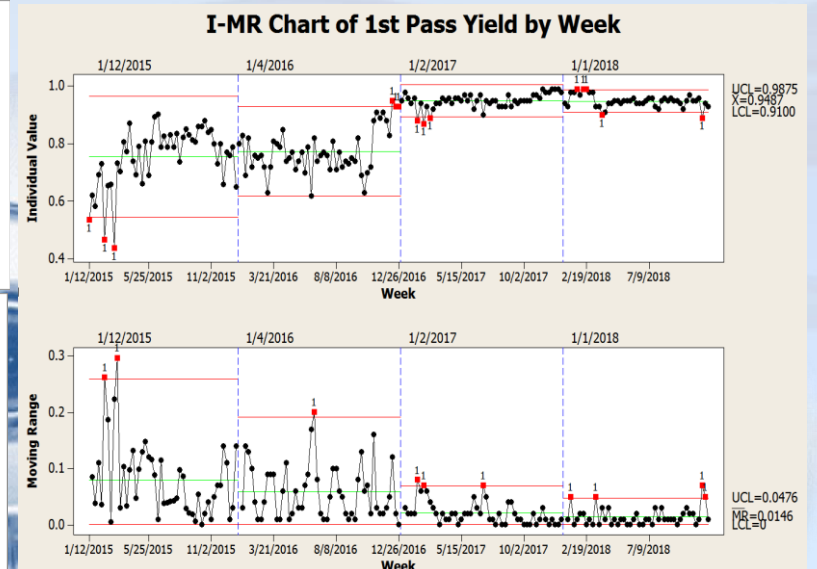
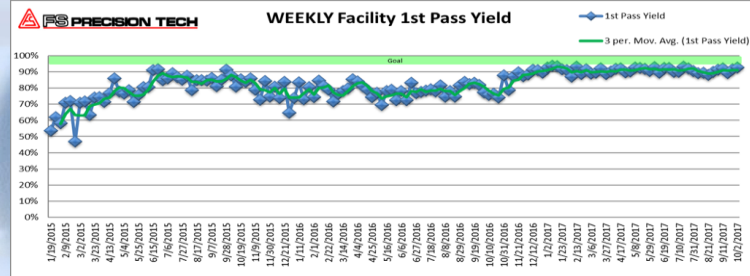
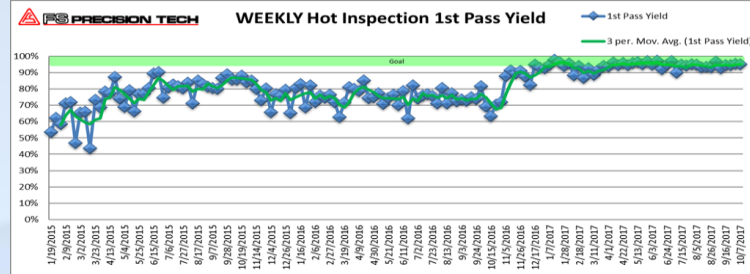
FSPT Lean/Six Sigma Journey

Work Order Variance



- **3 Year Work Order % of Sales:** Variance reduction has improved from a high of 8% of sales in 2015 to near breakeven levels in 2017.
- Continuous improvement techniques have generated favorable variances including:
 - Implementation of Standard Work & Flow and Linkage
 - Cellular Manufacturing
 - Lean/Six Sigma DMAIC Projects
- More work is needed to mitigate variation based on product mix, such as product relaunches.

FSPT Lean/Six Sigma Journey

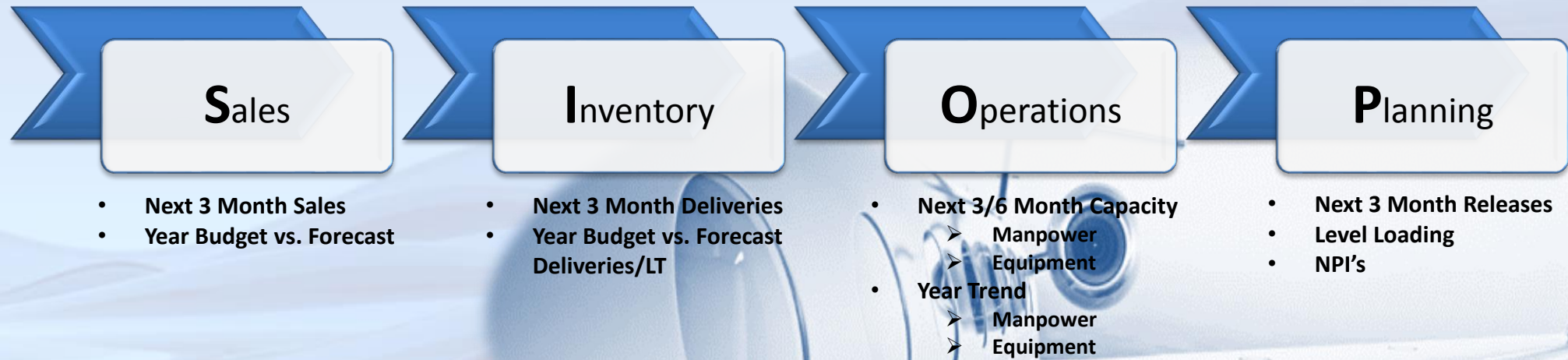
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Process Control Plans: Identifies Key Process Inputs, how to control them, how to react to “Out of Control” situations, and how to prevent them from re-occurring.

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FSPT Lean/Six Sigma Journey

Business Process Control (SIOP)



SIOP Process: Monthly critical business process for FSPT, allowing us to predict, react & control cost due to sales fluctuation, manpower, equipment and Inventory requirements. This process is key prior to the actual manufacturing and new product development process.

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FSPT Lean/Six Sigma Journey

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