Parts, People, Process: The Winning Formula for Emerson Turnarounds and Certified Services

Chris Forland, Operations Consultant

Scott Grunwald, Turnaround Business Manager

Miranda Pilrose, Marketing Manager

Where ideas become solutions.

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Presenters

- Chris Forland
- Scott Grunwald
- Miranda Pilrose

Introduction

- Turnarounds / Outage Challenges
- How can we do this differently?
- Six Step Turnaround Process
- Emerson's Complement of Services
  - Detailed Capabilities
  - Certified Services
- Program Benefits
  - Technology Integration
  - Sustained Performance
  - Continuous Improvement
  - Financial Payoff

Turnaround Objectives

- Turnarounds (TA) are planned when the cost of a TA is exceeded by the value of improved production as a result of the TA. IE: Benefits > Cost
- Goal – reduce cost & improve results (benefit)
- Cost = Value of lost production + cost of TA goods & services
- Benefits = Shorter TA period + improved production performance & reliability post TA

Turnaround Challenges

- Loss of experienced personnel to plan & execute TA
- Safety & regulatory compliance
- Unplanned work results in extra charges and delays
- Pulling equipment that does not need repair adds cost
- Latent or hidden issues not addressed affects post TA production
- Incorrect repairs result in poor performance and premature failure post TA
- Unit operation not optimized to improved capacity

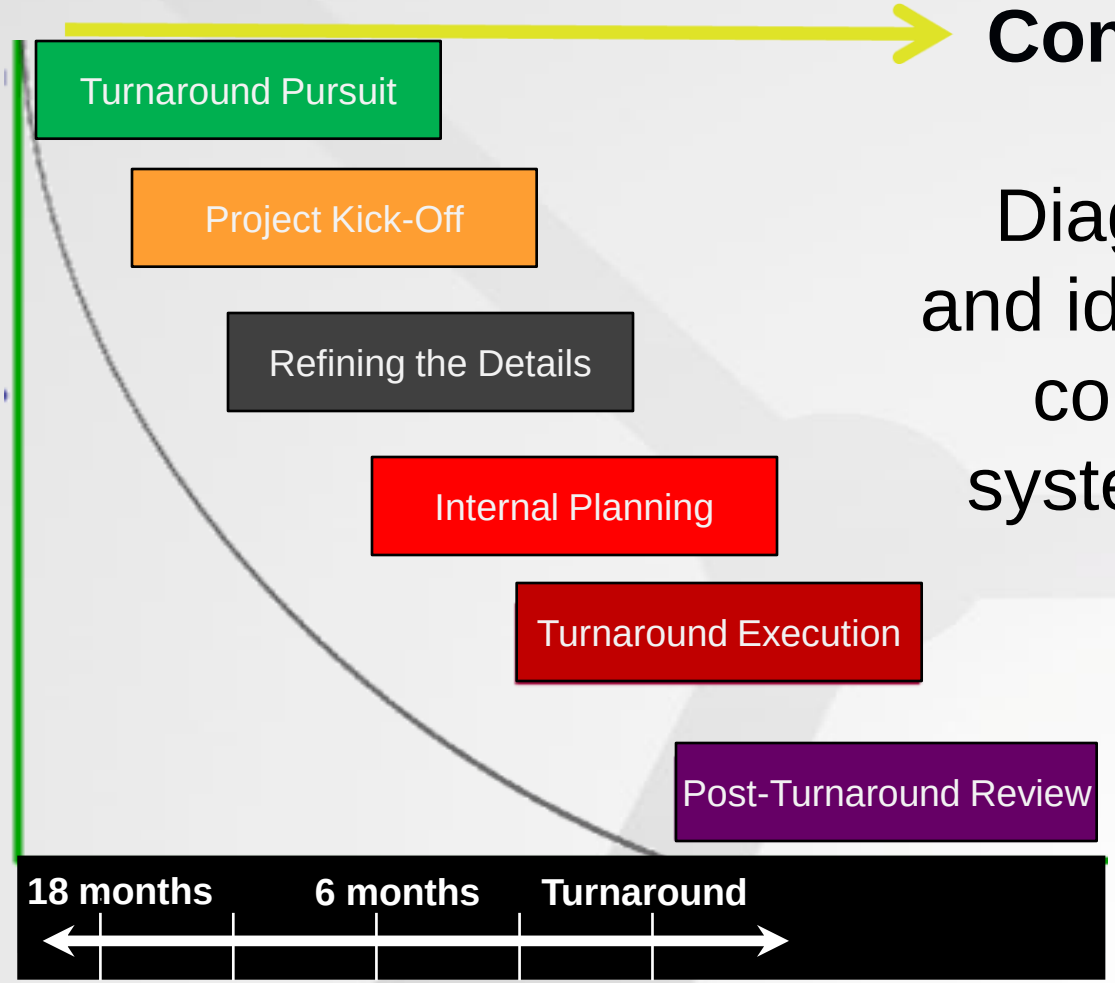
Six Step Turnaround Program

- Premise of program
  - Flexibility to adjust turnaround plan diminishes as the start date approaches
  - Investment in pre-turnaround planning and equipment analysis offset by performance improvements
  - Diagnostic technologies aid customers in pre-planning and analysis as well as post-turnaround performance levels

Six Step Turnaround Program

- By bringing together Emerson's compliment of services, we can provide a better and broader solutions
- Delivers maximum value in turnaround planning by only doing the work which is necessary

Six Step Turnaround Program



Diagnoses the condition and identifies troublesome control loops, electrical systems, instrumentation and control valves **BEFORE** a planned turnaround

Six Step Turnaround Process

The Six Step Turnaround – BEFORE

- Ahead of the execution team
- Look at control performance issues while the plant is running
  - What makes that process application run most efficiently?
- Find what issues need to be addressed during the turnaround
- Test process dynamics online

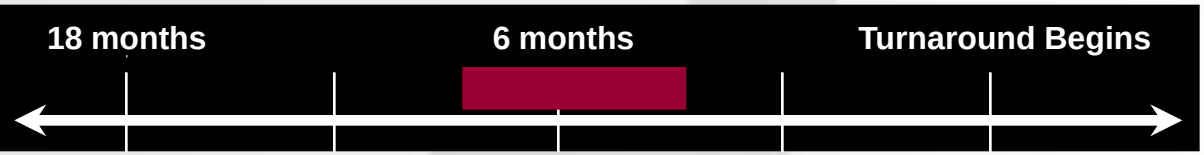
Project Kick-Off

Phase	Event	Traditional approach	Six Step Turnaround	Benefit
Kickoff	Pre-plan Kickoff > 6 months prior	Vendor not involved Vendor selected just prior to turnaround based on first cost of overhaul	Review project plan Review maintenance records	Alignment with turnaround project team Application issues identified

- Define scope of the outage, roles and mission of the Emerson Turnaround Team
- Identify key personnel
- Timing and duration, budget, schedule plant walk-down

Refining the Details

Phase	Event	Traditional approach	Six Step Turnaround	Benefit
Refine the details	Pre-plan Equipment Selection for overhaul / replacement 3 to 6 mo. prior	Actual condition of equipment not known	Early walk down Internal valve condition determined in place with Emerson proprietary technologies (FlowScanner , DVC w / bypass or outage) Unit production (on line) performance analyzed	Capture device information Avoid unnecessary overhaul & in/out costs Additional issues & opportunities identified
Refine the details	Pre-plan Review of available in-plant diagnostic technologies 3 to 6 mo. prior	Not done	Review plant's use of diagnostics in turnaround planning & maintenance Gap analysis to determine how to integrate with plant systems – SAT, CMMS, etc.	Recommendations w / ROI – tech upgrades & how to utilize diagnostics to improve future maintenance & turnarounds



- Develop turnaround scope
  - Review technical options and maintenance practices
  - Prioritize, review records and applications issues

Internal Planning

Phase	Event	Traditional approach	Six Step Turnaround	Benefit
Detailed planning	Pre-plan Critical path planning 3 months prior	Not done	Manpower, advance parts order, on-site support & portable equipment planning	Flawless execution to plan No interruption of site turnaround plan

- Resource planning, equipment and tooling review, define roles and responsibilities, develop communication plan and train employees, pre-order parts and consumables

Turnaround Execution

Phase	Event	Traditional approach	Six Step Turnaround	Benefit
Execution	Equipment removal	All valves removed and sent to vendor	Only valves needing significant work are removed Other valves repaired on site or not at all	Fewer valves repaired Avoided in / out costs
Execution	Overhaul and / or replacement	Condition determined at vendor Additional work causes delays, overtime and expediting fees, etc.	Condition known prior to turnaround for valves w / bypass or DVC w/ outage – remaining valves analyzed in place prior to removal	All parts on hand Complete repair performed on schedule & cost

- Provide status reports, document change orders and frequent communication

Turnaround Execution

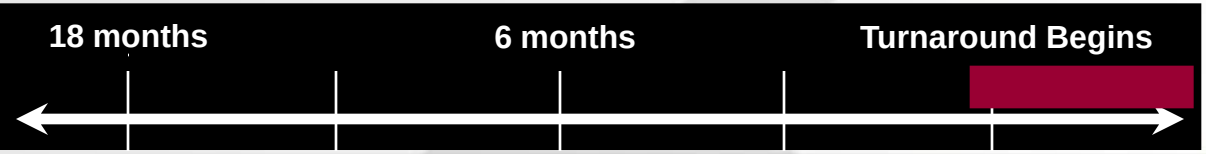
Phase	Event	Traditional approach	Six Step Turnaround	Benefit
Execution	Safety & performance certification	Performance of repaired valves unknown & not documented Impact of improper materials / repair not captured	Performance returned to OEM specifications and documented ASME Conformance and FM Approvals documented	Enhanced valve performance enables production performance improvement Improved safety and equip. life extension to extend time to next turnaround
Execution	Diagnostic technology upgrade	Not done	Predictive diagnostic technologies installed & integrated into plant systems	Enable maintenance of new levels of production over time Reduce cost of future turnaround analysis

- Complete work scope on-time, safely, and to satisfaction

Turnaround Execution

Phase	Event	Traditional approach	Six Step Turnaround	Benefit
Execution	Process unit start up	Production units brought on line with pre-turnaround control parameters	Production units brought on line and tuned to new performance levels Performance improvement documented	Additional production performance delivered and documented Planned results verified

- On plan for schedule and cost
- Ability to adjust plan as start date approaches



Post-Turnaround Review

Phase	Event	Traditional approach	Six Step Turnaround	Benefit
Ongoing production	Post turnaround review	Not done	Itemized budget reconciliation & documented improvements Valve curves / asset repair reports loaded into AMS Device Manager (paper copy if NA) for maintenance records Review lessons learned	Verification of costs & benefits Baseline for on-going maintenance Analysis to improve future turnarounds
Ongoing production	Ongoing maintenance	Performed on demand when process affected by device / asset problems Unit performance degrades over time undetected	Alerts from Emerson smart valves and devices prior to process being affected Baseline enables periodic performance analysis	Process upsets avoided Higher level of performance maintained between turnarounds

- Final documentation package and post-outage review meeting

Future Planning

Phase	Event	Traditional approach	Six Step Turnaround	Benefit
Future TA's	Multi-year program	Not done	Each plant turnaround is a step in systematically improving overall plant performance	Plant production capacity & efficiency improved over time

- Verify value delivered
- Ask for feedback

Six Step Turnaround Program

The Six Step Turnaround – AFTER

- Emerson returns to the plant to repeat tests in order to demonstrate process improvement
- The overall process most efficient; giving maximum benefit
  - Utility equipment
  - Measurement devices
  - Instrumentation
  - Final control elements
  - Process control performance

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THE OPTIMIZED PLANT

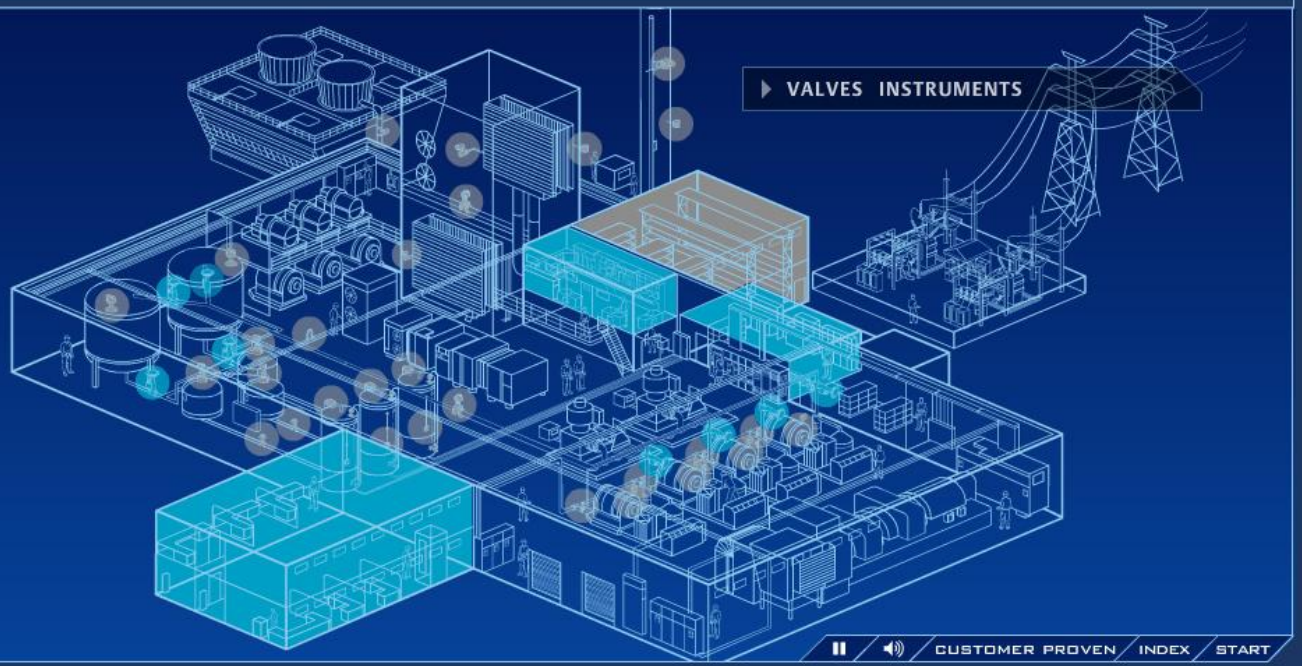
PLANT PROFITABILITY

PLANT LIFE CYCLE

LIFE CYCLE EFFICIENCY | STARTUP | MAXIMIZING OPERATIONS | TURNAROUND/OUTAGE

KEY PRODUCTION ASSETS

- Mechanical Equipment
- Electrical Systems
- Process Equipment
- Instruments
- Valves



CONTACT INFORMATION

CUSTOMER PROVEN | INDEX | START

Instrument & Valve Service Network North America

Over 800 People in 50+ locations

- Helps customers better manage their control valve and instrument assets
- Through a comprehensive network of best-in-class, reliability based services
- Provided local to or within customer plants
- Using proven maintenance work practices that are supported by PlantWeb® technologies

Instrument & Valve Services

Equipment Start-up

- Product start-up / commissioning
- Installation supervision
- On-site services
- Certified calibration

Program Management

- Turnaround management
- PlantWeb services
- 375 service programs
- Full service provider

Asset Reliability

- Asset management services
- Repair / recondition / replace
- Fisher & Rosemount Certified
- Local / on-site services
  - Field Machining
  - On-Site Service Trailers
- Emergency demand services

Application of Technology

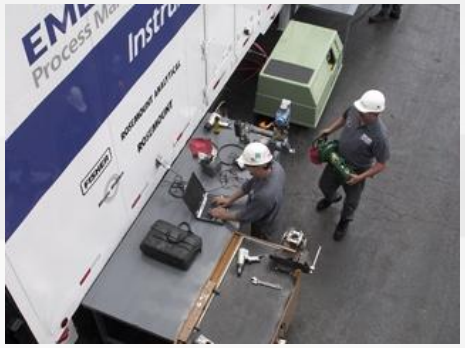
- AMS™ Suite - Diagnostic Tools
  - Instrument
  - Valve
- Remote monitoring and analysis
- Preventative maintenance services
- Training

Certified Services

- Certified repair supports:
  - Investment protection
  - Risk management
  - Productivity
- Formula for success:
  - Support technicians
  - Proven OEM processes
  - Emerson technology
- Reliable performance:
  - Products
  - Warranty
  - Factory authorized

Certified Services

- OEM service protects:
  - Plant safety
  - FM & CSA marks
  - Regulatory exposure
- Consistent service quality:
  - At your site
  - At our service centers
- Benefits:
  - Reduced risk
  - Longer process life
  - Regulatory compliance



- Consistent quality
- On site or at service center
- 24/7/365 Availability

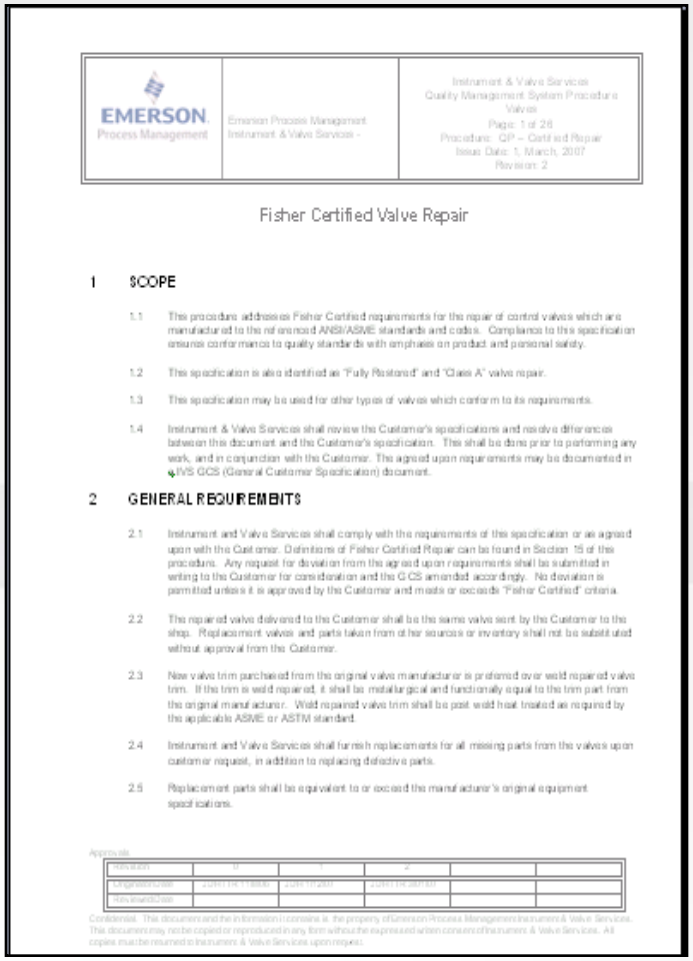
Rosemount Certified Services

ROSEMOUNT CERTIFIED

- **Joint program between Rosemount and Instrument & Valve Services**
  - Ensures that all Instrument & Valve Services Service Centers operate to the same quality standards as the Rosemount Factory
- **Operational changes to service centers**
  - Auditing of all Instrument & Valve Services facilities to ensure standards
  - Implementation of new equipment to meet gaps identified
  - On March 31st, 2008 all Instrument & Valve Services service centers received the Rosemount Certified stamp of approval.
- **What does this mean for you**
  - ONLY repair program guaranteed to return instruments to Rosemount standards
  - ONLY repair program to insure compliance with FM standards
  - Local Inventory is tracked and included in Rosemount quality communications
  - Technicians trained and updated on Rosemount product enhancements
- **How to recognize Rosemount Certified equipment**
  - Each device will be tagged with Rosemount Certified Approval

Fisher Certified Services

- Designed to ensure that all Fisher brand valves are repaired to OEM specifications and maintain all markings on valves and the associated instrumentation
  - Preserve North America Electrical Classification markings for instruments in hazardous service (FM/CSA)
  - Ensure body wall and other dimensional requirements are to OEM print
- Quality Repair procedure for all control valve repair business in Instrument & Valve Services
- Provides formalized use of General Customer Specifications for all outages.
- Provide standard final inspection criteria for all of Instrument & Valve Services
- Provides an auditable process which is included as part of the QESH audit protocol



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Fisher Certified Valve Repair

1 SCOPE

1.1 This procedure addresses Fisher Certified requirements for the repair of control valves which are manufactured to the referenced ANSI/ASME standards and codes. Compliance to this specification ensures conformance to quality standards with emphasis on product and personal safety.

1.2 This specification is also identified as "Fully Restored" and "Class A" valve repair.

1.3 This specification may be used for other types of valves which conform to its requirements.

1.4 Instrument & Valve Services shall review the Customer's specifications and resolve differences between this document and the Customer's specification. This shall be done prior to performing any work, and in conjunction with the Customer. The agreed upon requirements may be documented in IVS GCS (General Customer Specification) document.

2 GENERAL REQUIREMENTS

2.1 Instrument and Valve Services shall comply with the requirements of this specification or as agreed upon with the Customer. Definitions of Fisher Certified Repair can be found in Section 15 of this procedure. Any request for deviation from the agreed upon requirements shall be submitted in writing to the Customer for consideration and the GCS amended accordingly. No deviation is permitted unless it is approved by the Customer and meets or exceeds "Fisher Certified" criteria.

2.2 The repaired valve delivered to the Customer shall be the same valve sent by the Customer to the shop. Replacement valves and parts taken from other sources or inventory shall not be substituted without approval from the Customer.

2.3 New valve trim purchased from the original valve manufacturer is preferred over weld repaired valve trim. If the trim is weld repaired, it shall be metallurgical and functionally equal to the trim part from the original manufacturer. Weld repaired valve trim shall be post weld heat treated as required by the applicable ASME or ASTM standard.

2.4 Instrument and Valve Services shall furnish replacements for all missing parts from the valves upon customer request, in addition to replacing defective parts.

2.5 Replacement parts shall be equivalent to or exceed the manufacturer's original equipment specifications.

Approvals

Revision	0	1	2		
Engineering Lead	[illegible]	[illegible]	[illegible]		
IVS Lead/Quality					

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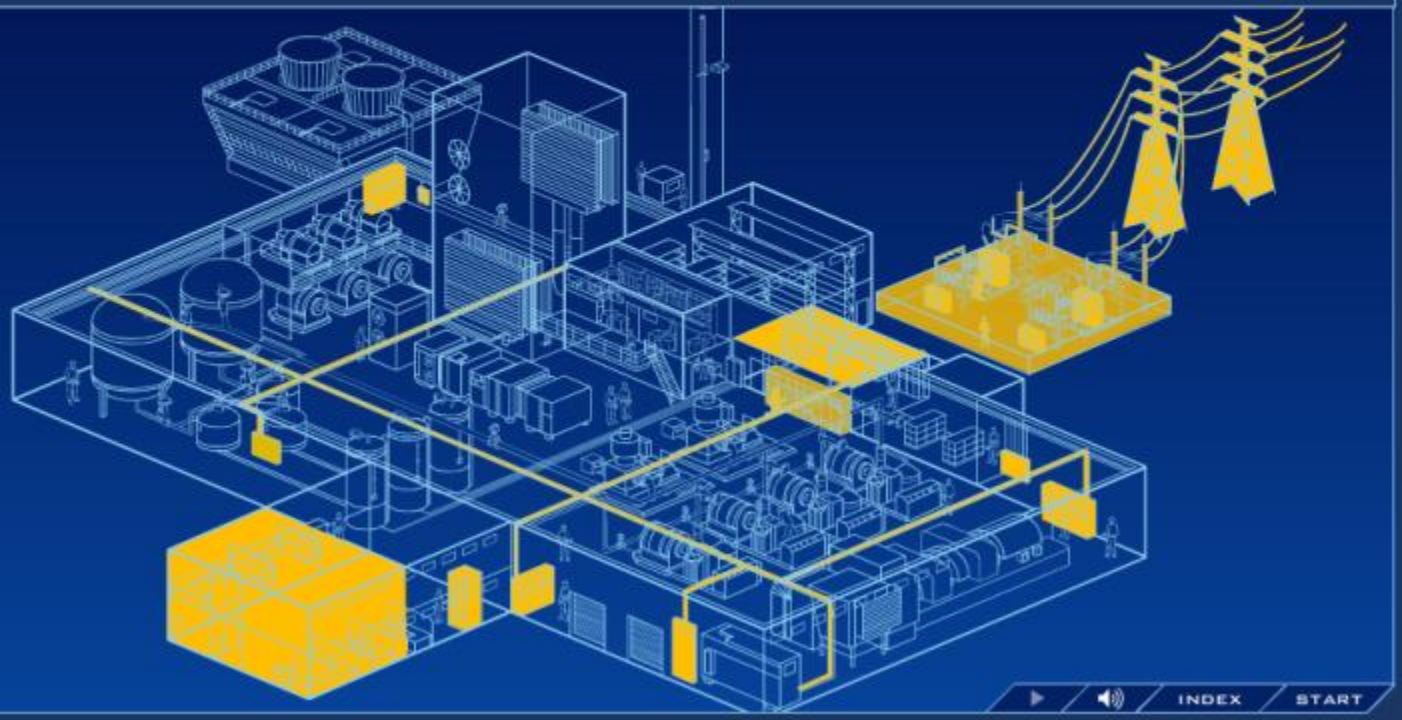

CONTACT INFORMATION

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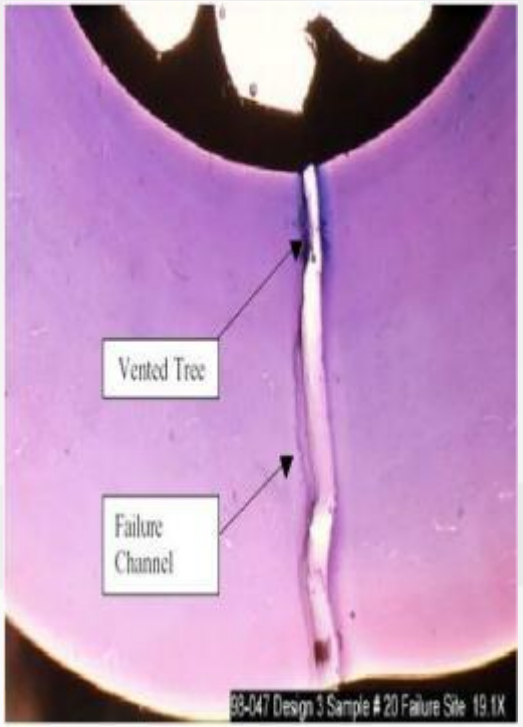
Pre-Turnaround Diagnostics

Conduct pre-turnaround testing to assess and prioritize work tasks

- Inspect Liquid-filled Transformers for leaks and other abnormalities
  - Perform corona detection test, oil analysis and nitrogen gas tests to determine if major maintenance is required
- Conduct infrared inspections to detect weak / hot spots in electrical equipment
- On Line Digital Low Resistance Ohmmeter to detect poor contact in absence of temperature rise

Pre-Turnaround Diagnostics

Conduct pre-turnaround testing to assess and prioritize work tasks



- Conduct online partial discharge testing on cables to detect degrading insulation
- Partial discharge is also exhibited in improperly installed splices and terminations, leading failure modes of cable systems
- Test is online and non-destructive vs traditional High-pot offline tests

Pre-Turnaround Diagnostics

Retrofit existing equipment during TA to improve overall system performance

- Low & medium voltage circuit breaker retrofits (air, vacuum and SF6)
- Modernization of outdated and underrated equipment
- Solid state protective relay retrofits
- Emergency circuit breaker rental and loans
- Replacement parts

Electrical Reliability Services

- Independent electrical testing, maintenance and engineering service company
- Turnaround Services
  - Power and Grounding
  - Infrared Scanning
  - Online Partial Discharge Testing
  - Transformer Services
  - Electrical Preventive Maintenance

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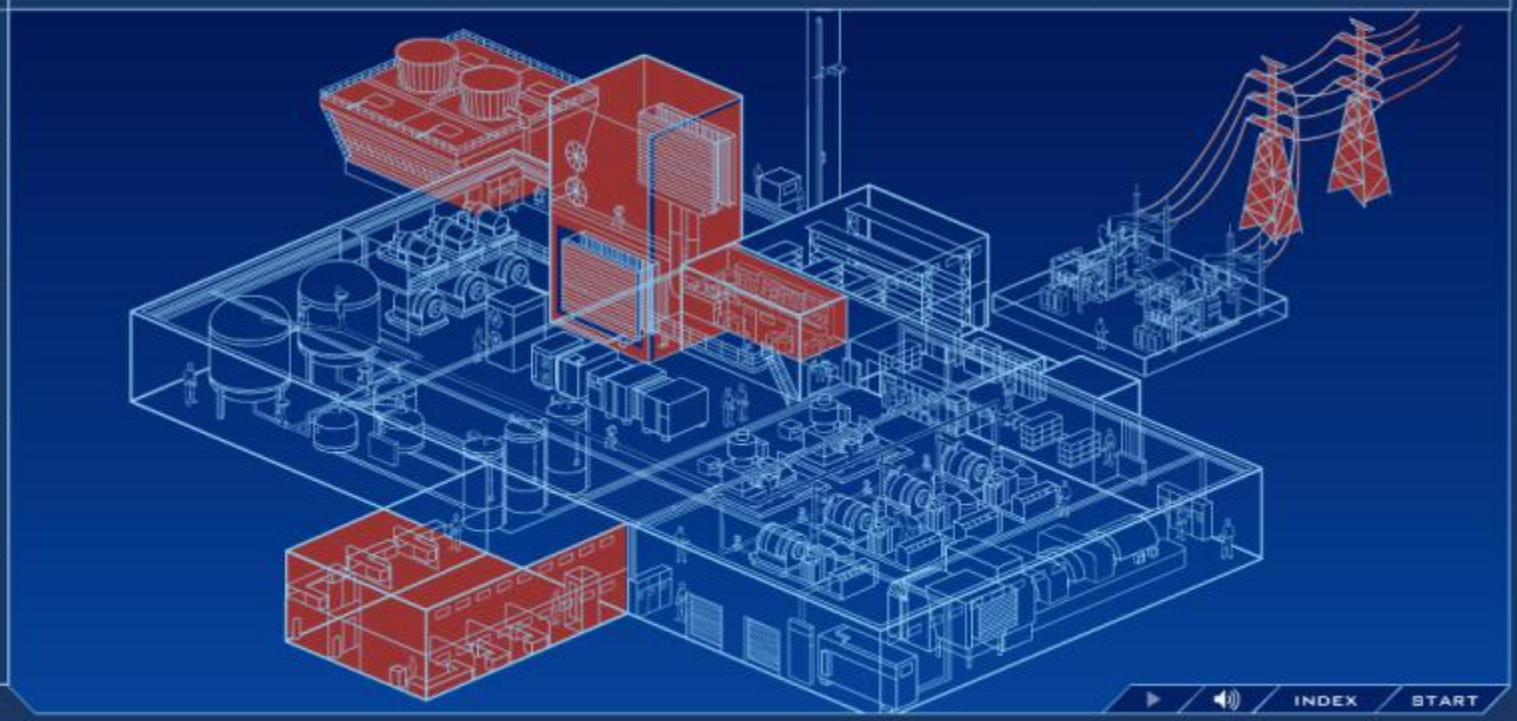


INDEX START

Control System Performance

- Pre turnaround – Identify process control performance problems/constraints and improvement opportunities that require a shutdown (TA) for part or all of the implementation
  - Final control element (FCE) application
  - Instrument application and/or new instrumentation/FCE
  - Control scheme, equipment, or piping addition/changes
- Post turnaround process control improvement projects achieve high ROI
  - Re-tune unit control system to maximize production performance once constraints are addressed

Final Control Element Application

- Control valve performance vs. requirements
  - Trim size, characteristic
  - Deadband, resolution, response time (ANSI/ISA 75.25)
- Variable Speed Drive
  - Dynamic response (braking, tuning, etc.)
- Turbine Speed Control
  - Dynamic response, resolution, etc.
- Fan Dampers
  - Deadband, resolution, response time, etc.

Instrument Application / New FCE

- Instrument application
  - Maintenance required
  - Location change required
  - Different technology required
    - Dynamic response
    - Accuracy requirements
- New instrumentation or FCE
  - An additional instrument is required
  - An additional final control element is required
  - Location change for an existing instrument or final control element

Control / Equipment / Piping Changes

- New control schemes may require a shutdown
  - Split range valves (new or change)
  - Valve travel characterizations
  - Additional instrumentation
  - Changes in wiring
- New taps for instrumentation
- Change process piping
- Add process equipment

Post Turnaround Projected ROI

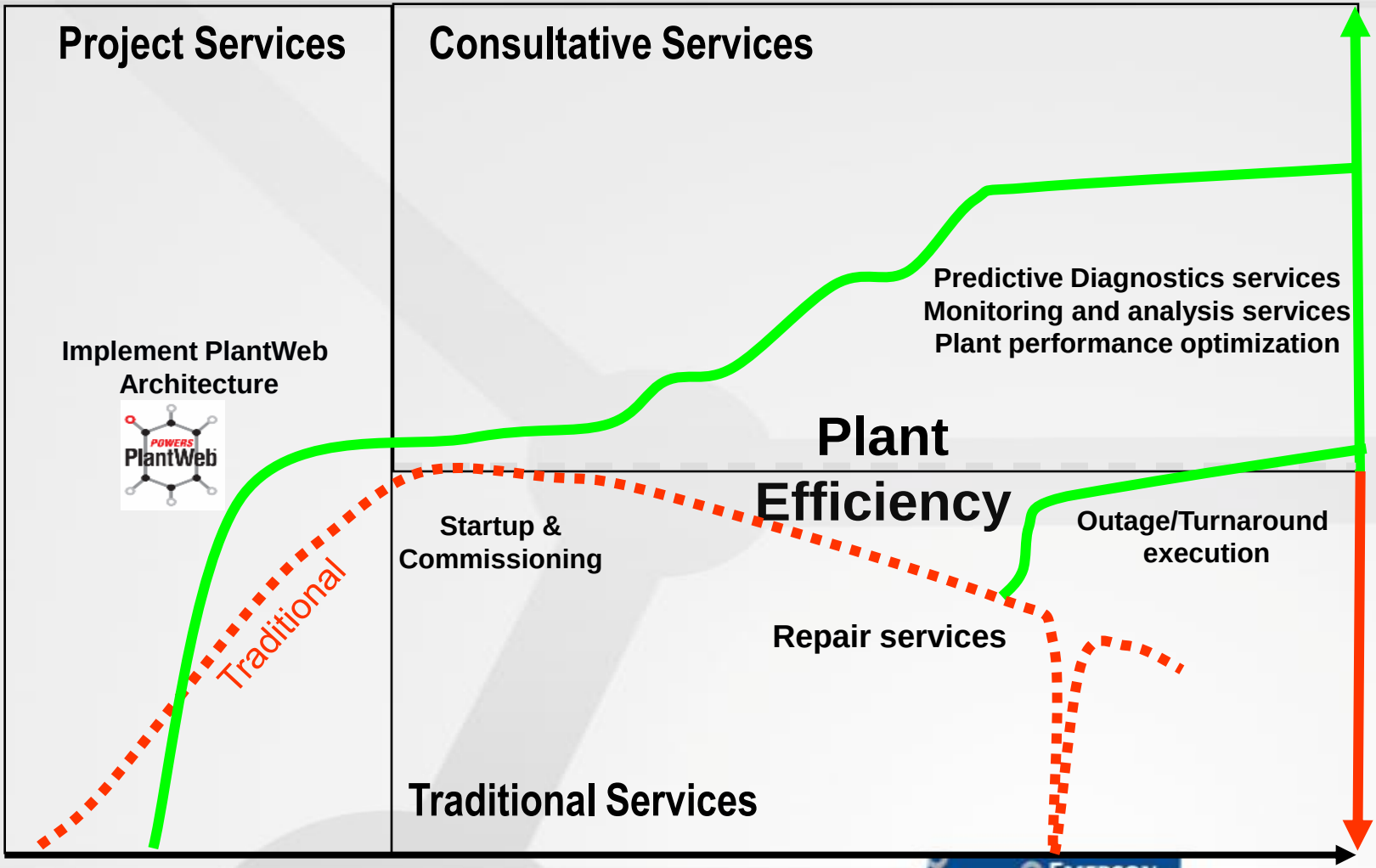
- Complete recommendations from the Pre-Turnaround services
- Foundation established for benefits from additional process control improvement projects
- 200KBPD Refinery benefits in the range of $5 to $10 Mil per year net margin

- Chicago refinery $2.4 Mil per year on only two units

Process Systems & Solutions

- Combination of superior products and technology with industry-specific engineering, consulting, and project management, and maintenance services to help customers achieve the potential of their operations
- Turnaround Services
  - Pre-Turnaround Automation Services
  - Operational improvement
  - Control performance improvement recommendations
  - Online performance analysis
- Sets the basis for future control improvements

Benefits: Improved Efficiency



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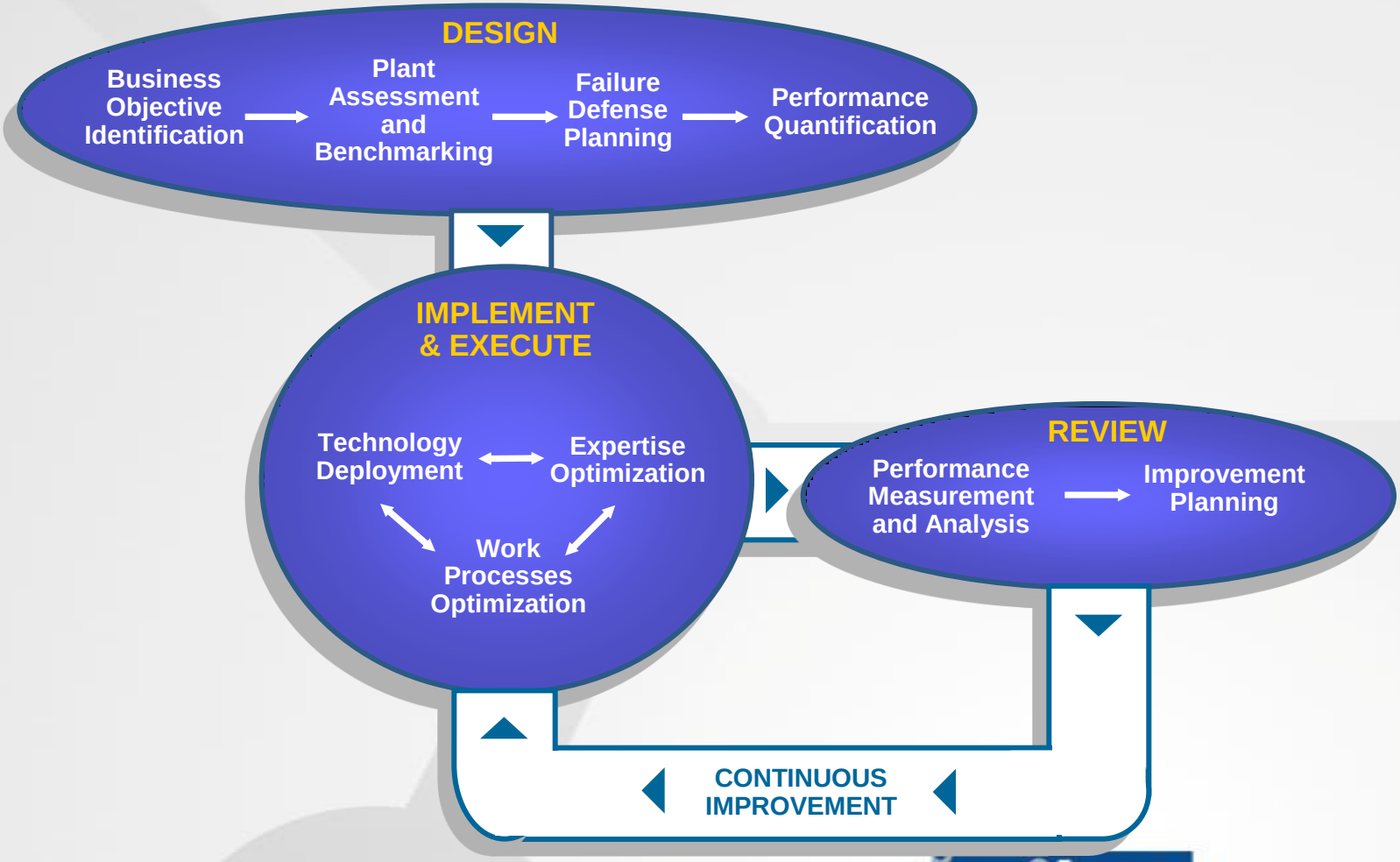
Benefits: Improved Technology



Benefits: Financial Payoff

- This process produces a known, quantifiable scope of work **BEFORE** the start of the turnaround; resulting in savings and improved production **POST** turnaround
- Up to **30%** turnaround **cost reduction**
  (200KBPD plant w/1000 valves - $1 Mil estimated savings)
- Plant **performance improved** over time as a result of the Six Step Turnaround Program
  ($11 Mil / yr for 200KBPD Refinery potential)
- **Safety** – ASME conformance and FM Approvals

Future Planning

- Review of the last and preview of the next turnaround
- Start well in advance with a preliminary evaluation and rough estimate of investment costs and potential benefits
- Target turnarounds more that 6 months away
  - Gather data on control valves
  - Knowledge / history of unit operational problems
- Create a continuum




Summary

With Emerson on your team, your turnaround will execute smoothly; ensuring your processes run right and on time - and stay that way.

Where to Get More Information

- Asset Optimization Booth #100
  - www.assetweb.com
- Plant Web® Diagnostic Technologies and Services
  - www.emersonprocess.com/education
- Advanced Applied Technologies Booth
- Control Performance Booth

Questions?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