



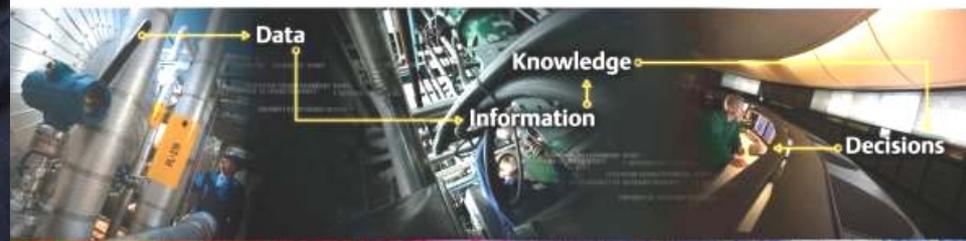
Maintenance, Reliability and Performance Services

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Director, Lifecycle Services

8th April 2016

Performance Without Compromise



EMERSON
Process Management

A Project Is not 3-8 Year Investment It is a 20-60 Year Partnership



1 to 3 years

1 to 2 years

1 to 3 years

20 to 60 years

Consult & Plan

Design & Engineer

Execute Project

Provide Support

Opportunity Assessment
Pre-FEED
Visions

FEED
Architectures
Detailed Specs

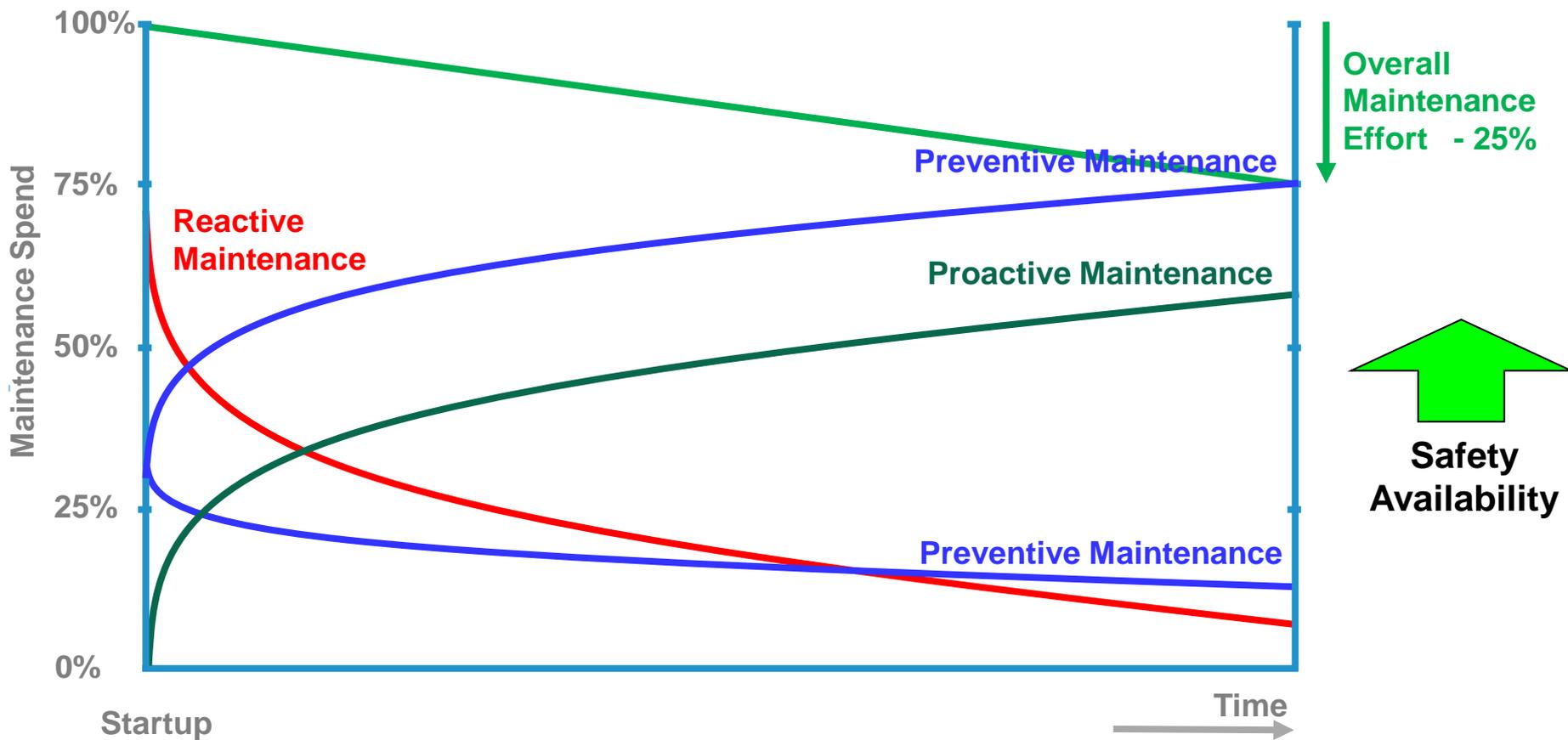
Project Management
Commissioning Delivery,
Installation & Start-up,
Site Acceptance Testing

Operations Support
Spare Parts & Upgrades
Asset Management
LTSA & Turnarounds



Ideal Maintenance Strategy

Process Control Assets



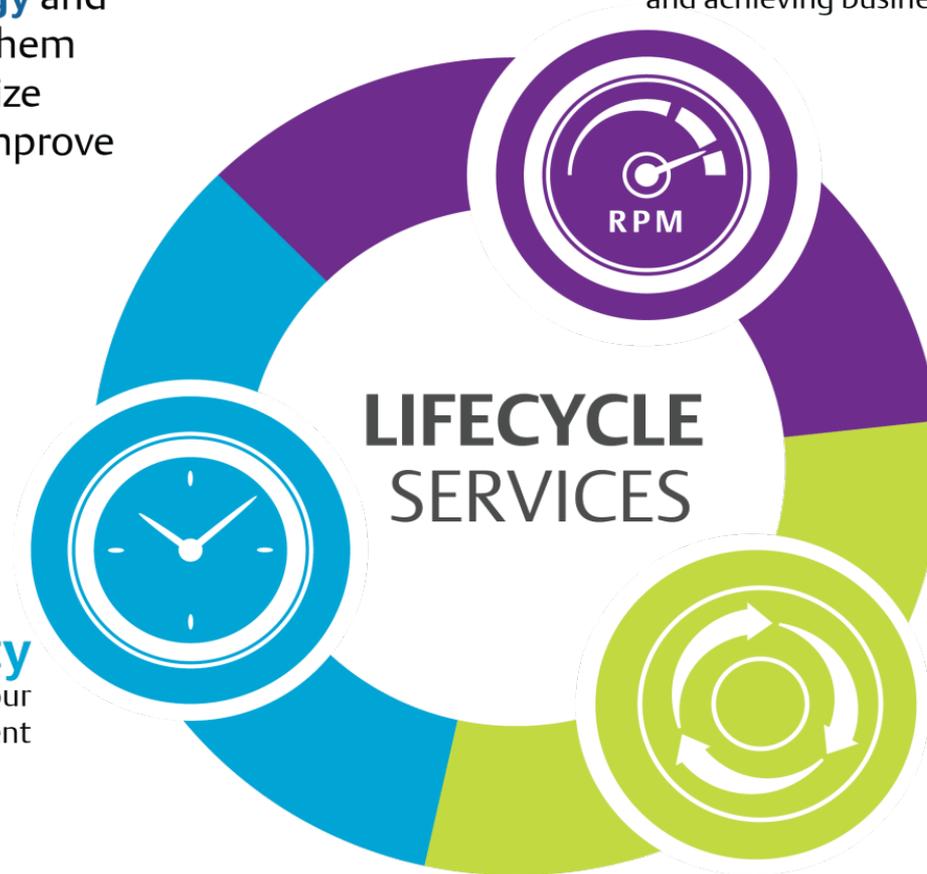
* Excludes SIS Assets Maintenance Plan

Customer Focused Service Offerings

Emerson Lifecycle Services provide customers with **expertise, technology** and **processes** that help them operate safely, optimize asset reliability and improve process capabilities.

Performance

Optimizing your plant performance and achieving business goals



Reliability

Improving and preserving your asset reliability and investment

Maintenance

Keeping your plant operating safely, consistently and economically

Emerson Lifecycle Services



Maintenance

Essential to keeping your plant operating safely, reliably, and economically

Technical Support

Emergency Assistance

Diagnostic & Troubleshooting

Repair & Overhaul

Spares & Parts Availability



Reliability

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Calibration Services

Preventive Maintenance

Remote Monitoring

Turnaround Support

Retrofit Upgrades



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Application Enrichment

Loop Tuning

Fiscal & Custody Transfer

Performance Audits

Resident Site Engineers

Educational Services

Helping customers optimize the integrity and performance of their assets safely

Emerson Service Supercenter

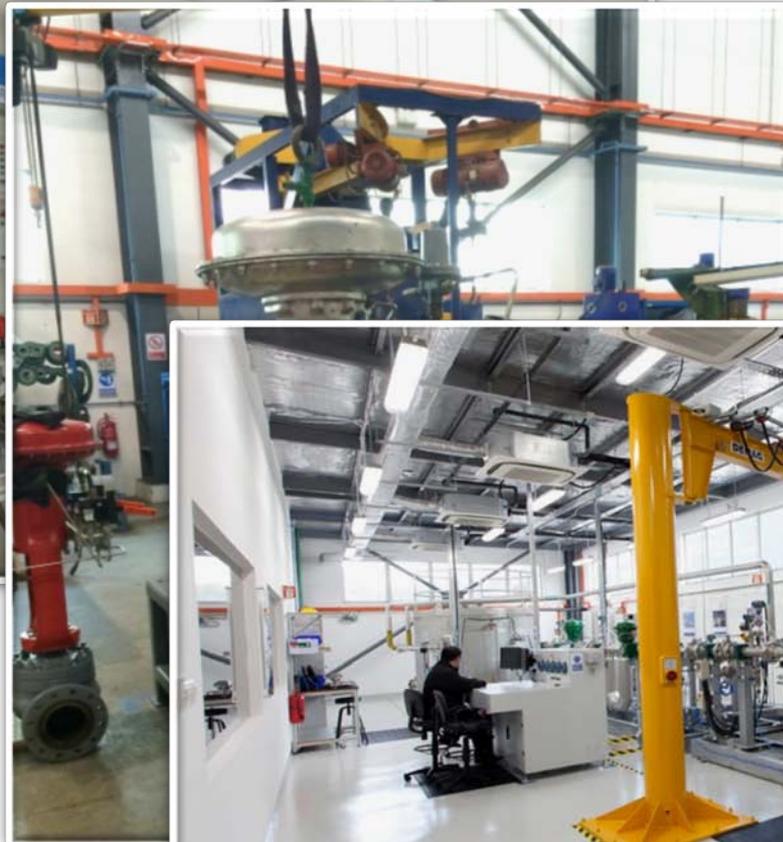
102,000 sqft, Integrated Service Facility @ Gul Road



Maintenance



Quick Ship



Certified Repair
Fast Parts

Flow Calibration Lab
ISO 17025, Singlas
4" Line , 3000Kg/M

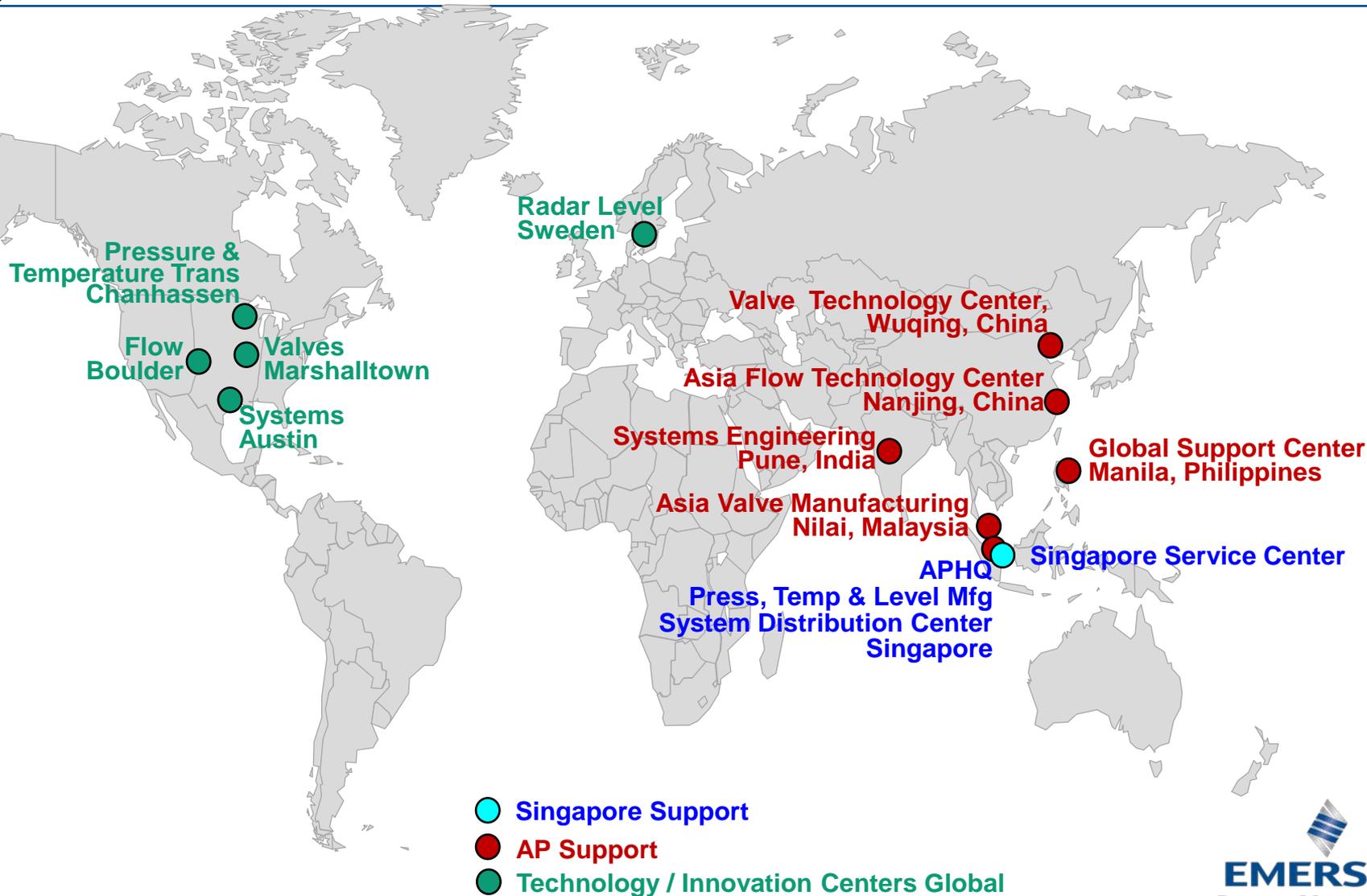


Singapore is supported by 170 Service Professionals with a combined experience of 1054 years

Singapore, Asia Pacific and Global Support



Maintenance



- Singapore Support
- AP Support
- Technology / Innovation Centers Global

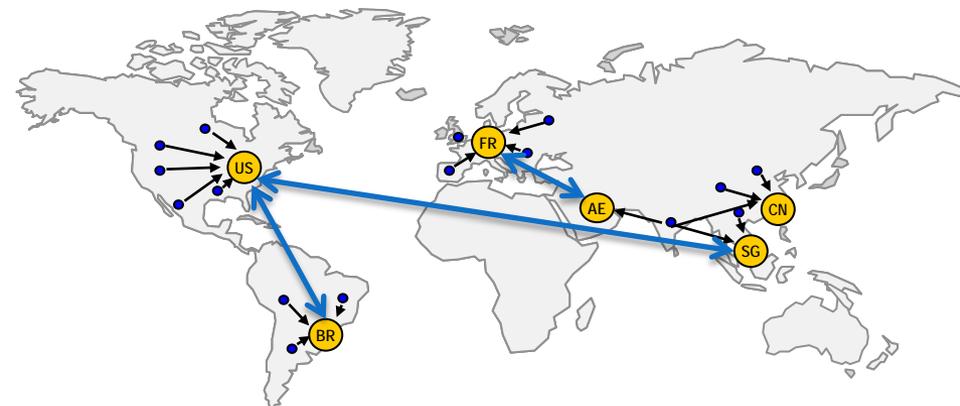


Intelligent Inventory / Spares Management



Asset* Criticality Ranking

Likelihood Category ↑ Increasing Likelihood	L6	III	II	I	I	I	I
	L5	III	III	II	I	I	I
	L4	IV	III	III	II	I	I
	L3	IV	IV	III	III	II	I
	L2	IV	IV	IV	III	III	II
	L1	IV	IV	IV	IV	III	III
			C1	C2	C3	C4	C5
		Consequence Category → Increasing Consequence					



- Align asset criticality with parts availability
- Plant walkdown as needed
- Leverage Local sales office and regional warehouse, Factory Capability
- Inventory the right parts
- Review product lifecycle
- Helps you achieve your operating goals.

Inventory / Spares Recommendation

Criticality High	C	2	1	1
Criticality Medium	B	3	2	1
Criticality Low	A	4	3	2
		S	M	L
		Stock/Short lead time	Standard lead time	Long Lead time

- 1 Critical/Emergency Spare parts- Must Stock
- 2 Critical Spare parts- Could Stock
- 3 Important Parts- Good to stock
- 4 Standard parts- Run to Fail

* Refers to Instrumentation Assets



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Educational Services

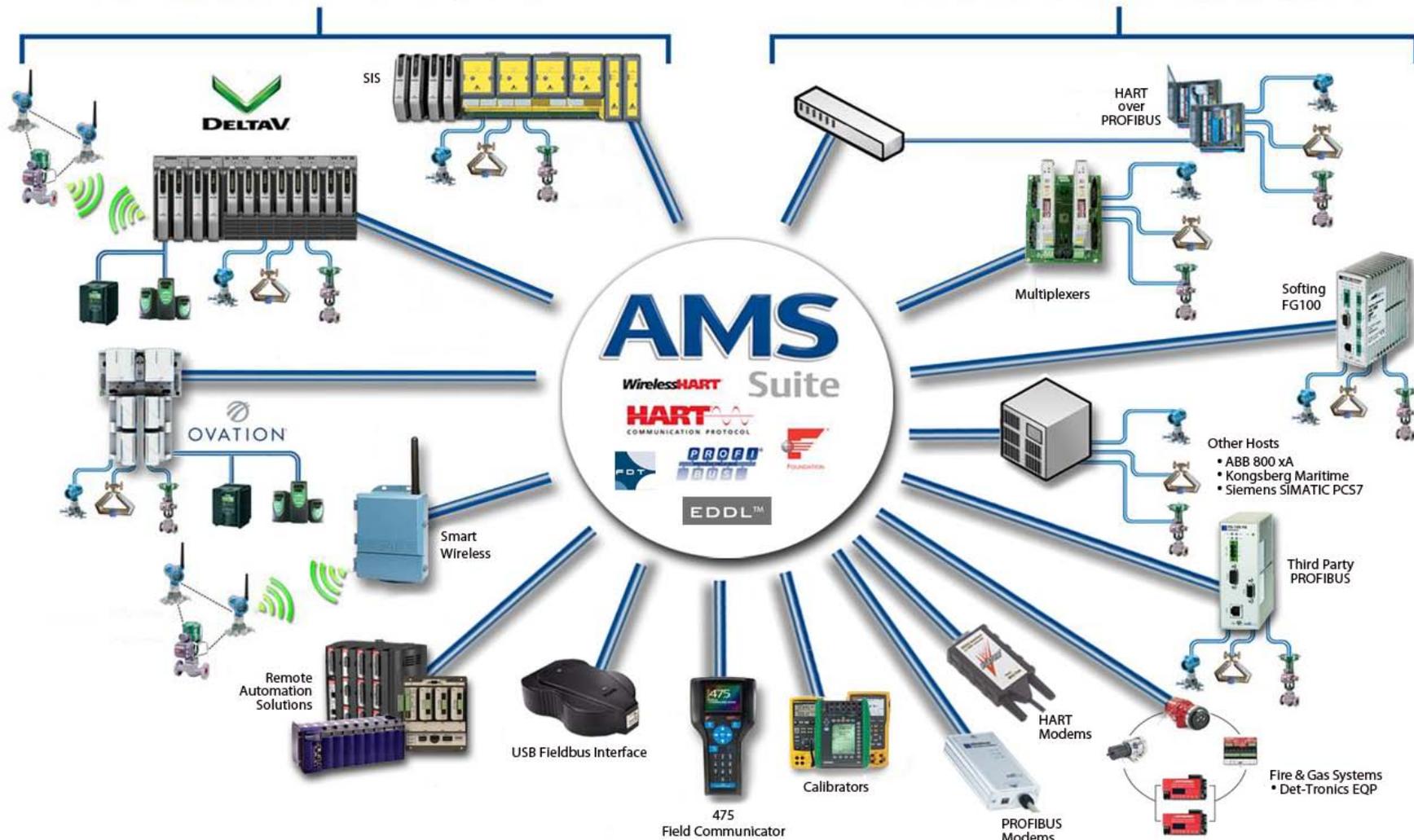
Helping customers optimize the integrity and performance of their assets safely

AMS Comprehensive Maintenance Connectivity



Solution used with Emerson systems

Solution used with third party systems



Advance Diagnostics Enabler for Proactive Maintenance



Pressure, DP Flow, Level

- Statistical Process Monitoring
- Loop Power, Wiring and Device Connection
- Variable Logging with Time Stamp
- Advanced Process Alerts



Micro Motion Coriolis Flow

- Smart Meter Verification
- Slug Flow Detection
- Process Events
- Device Data Capture



Vortex

- Internal Meter Verification
- Signal Strength
- Electronics Temperature



Temperature

- Sensor Drift Alert
- Hot Back-up®
- Statistical Process Monitoring
- Thermocouple Diagnostic
- Min/Max Tracking



Control Valves

- Friction
- Electronics Failure
- Stuck Valve
- Dirty Air
- Actuator Failure
- Travel Calibration Shift
- System Air Pressure Drop
- Online/In Service Diagnostics



Magmeter

- Smart Meter Verification
- High Process Noise
- Wiring and Grounding Fault Detection
- Tunable™ Empty Pipe
- Coil Fault Detection
- Electronics Temperature



AMS™ Suite

Radar Level

- Signal Strength Monitoring
- Measure and Learn Echo Curve
- Empty / Full Tank State Indication
- Signal Quality Metrics
- Reliable overfill detection



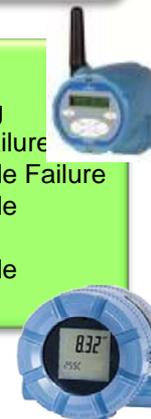
Ultrasonic Gas Flow

- AGA10 Speed of sound comparison
- Blockages Upstream
- Abnormal Flow Profile
- Dirty Meter
- Liquid Condensate Detection



Analytical

- pH Electrode Aging
- Glass Electrode Failure
- Reference Electrode Failure
- Reference Electrode Coating
- Reference Electrode Poisoning



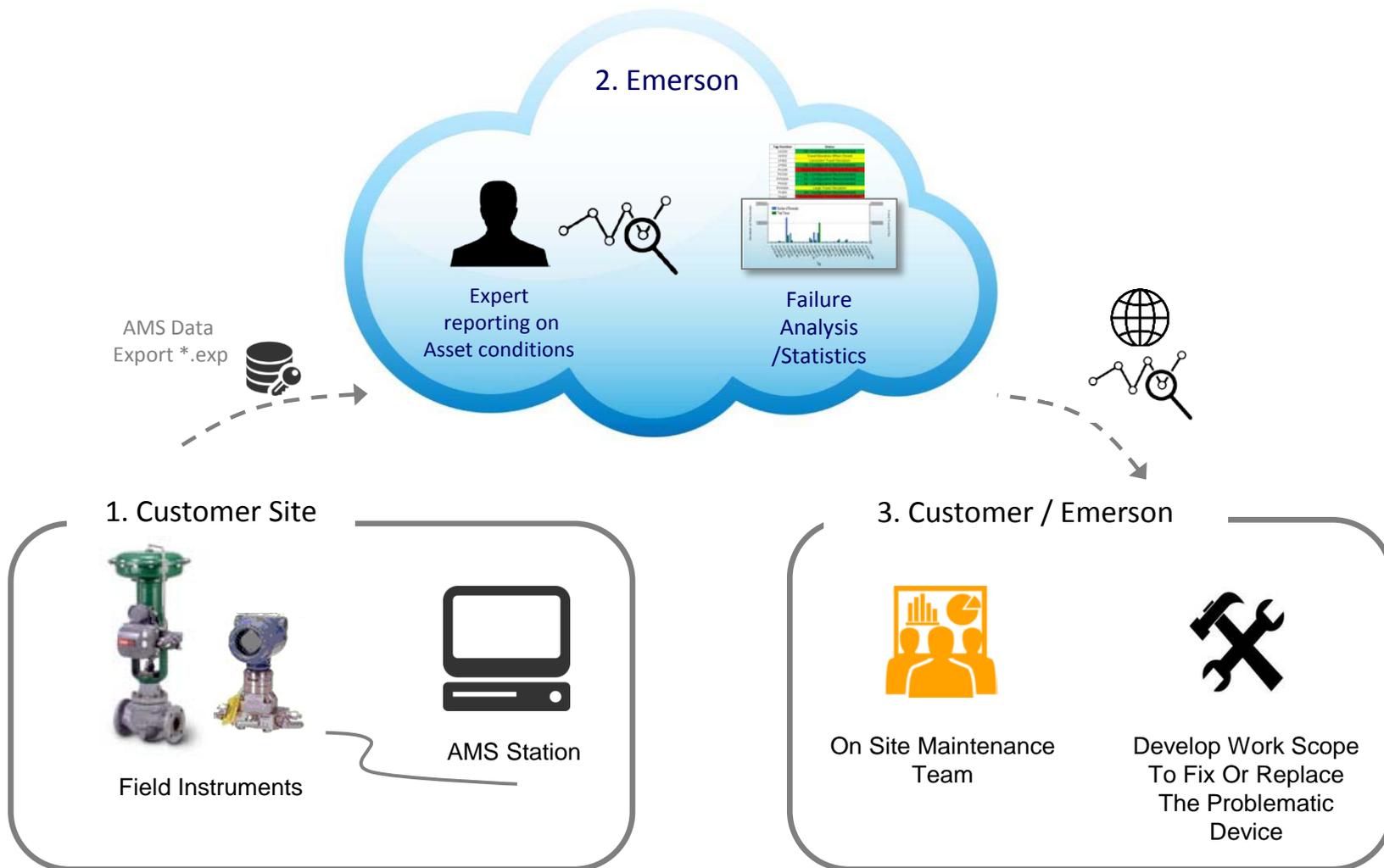
Machinery Health

- Pump Cavitation
- Motor Overheating / Defects
- Severe Bearing Faults
- Rotational Faults
- Bearing Lubrication



Remote / Condition Based Monitoring

Proactive maintenance



Shutdown / Turnaround / Outages (STO)

Six-Steps to “No Surprise Turnaround”



1) Define : Early engagement - reduce unnecessary customer spend

2) Initial Planning : Scope, schedules, budget, plant walk-down, Diagnostics, Audits, Consulting

3) Refining Scope : Review technical options and maintenance practices, prioritize instrument list, General Customer specification document (GCS), etc

4) Resource Planning : Roles, plan required resources, review equipment / tooling needs, responsibilities, communication

5) Execute: to specification, status reports, documentation, communication

6) Post-outage meeting: present Final documentation package

12 – 18 Months

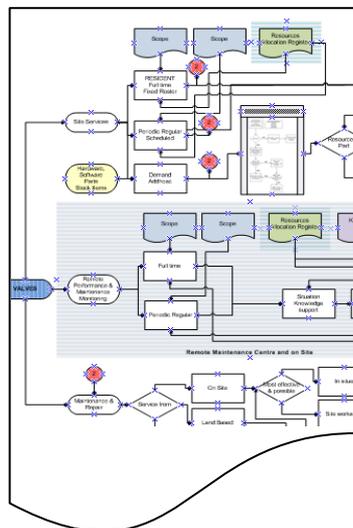
Emerson Process Management Executed 196 Turnarounds in Asia Pacific Region in 2015

STO - Planning for Perfect Execution

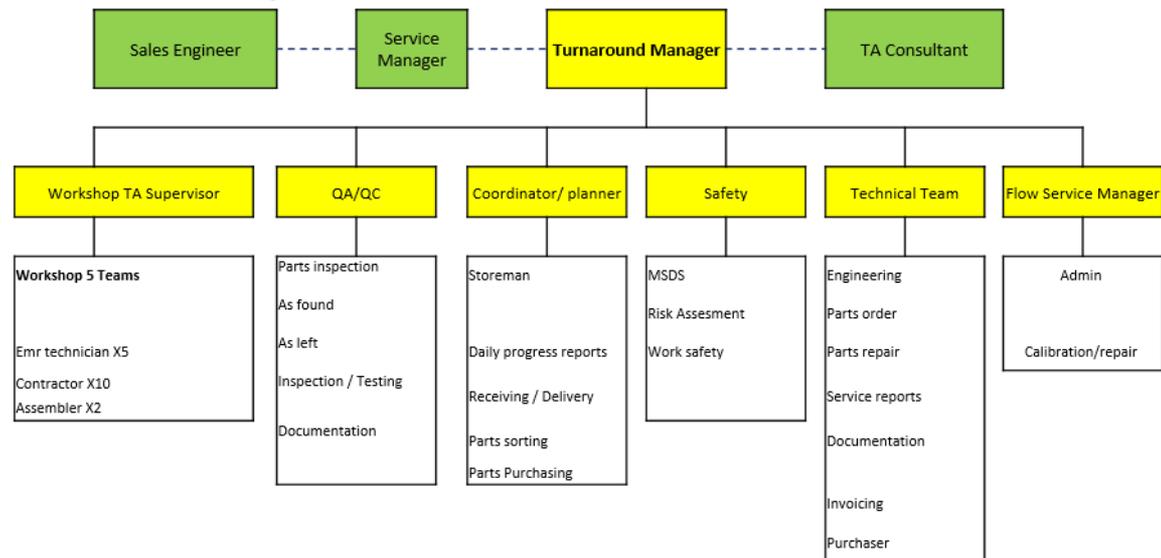


Customized Organization and Work Flow imperative for a successful Turnaround

Process Flow



Turnaround Organization



Holding Area for Valves during Turnaround



10 Tonne Crane in Building 2 for heavier Valves





• Final Control

- Audits / Plant walk through
- Diagnostic services
- Valve signature tests
- Prioritized planning
- Certified repair
- Quick ship parts and assemblies

• Measurement Devices

- Audits
- Loop checks
- On site repair
- Calibration and Startup
- Quick ship, parts and spares

• Control Systems

- DeltaV evergreen system upgrade
- Legacy system modernization
- Criticality ranking (AMS Suite)
- Backup and Recovery
- Segment Check (Ff)

• Rotating Equipment

- Vibration analysis
- Oil analysis
- Infrared thermography
- Ultrasonic testing
- Condition based monitoring
- Data trend analysis

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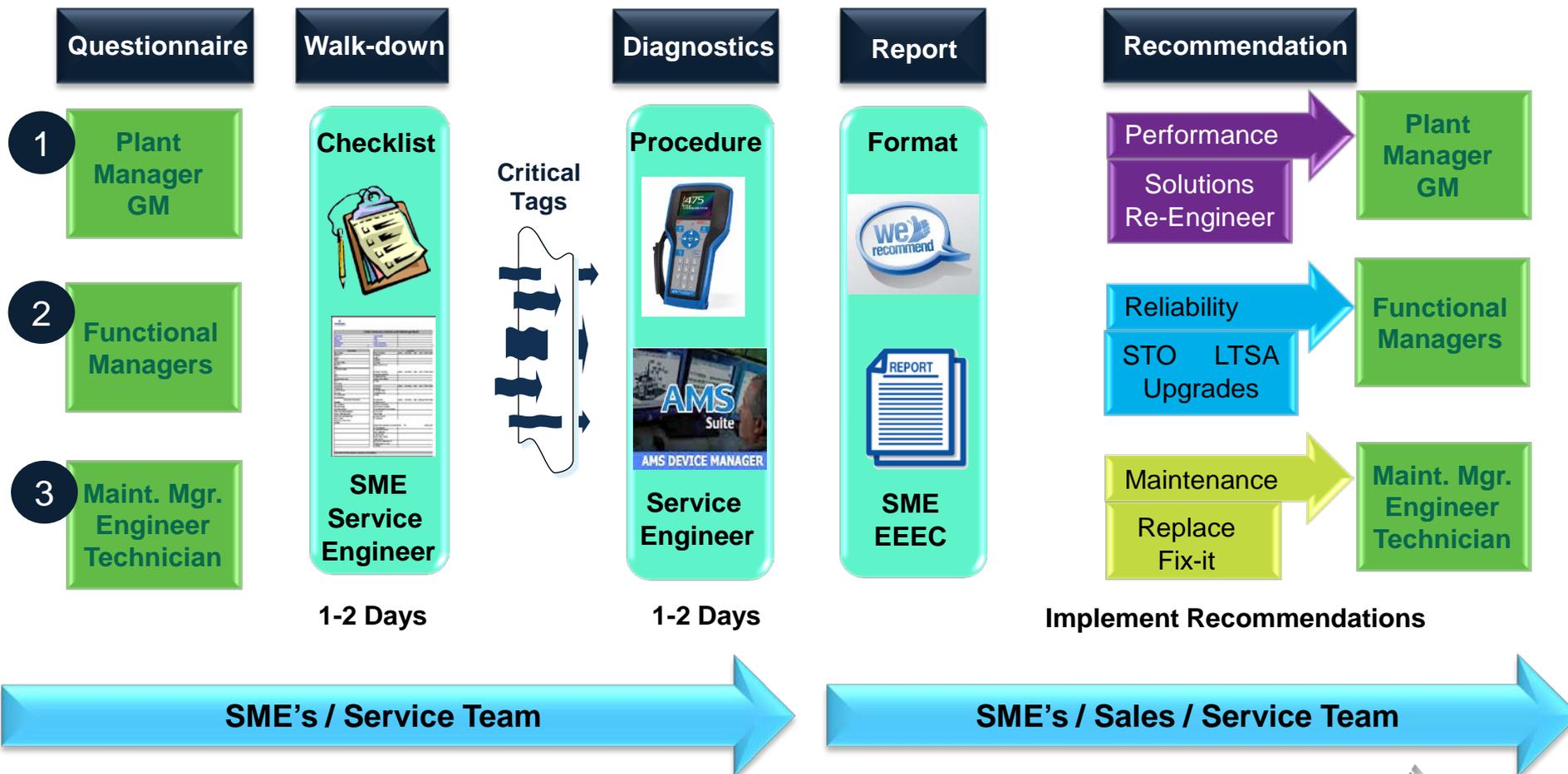
Educational Services

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Site Walk-down / Consult for A Day Identifies Opportunities for Improvement



Performance



E.g. Plant Unit Walk down's or Flow Uncertainty Studies



Site Walk-down / Consult for A Day Reports are Comprehensive

Cost Benefit Analysis Provided

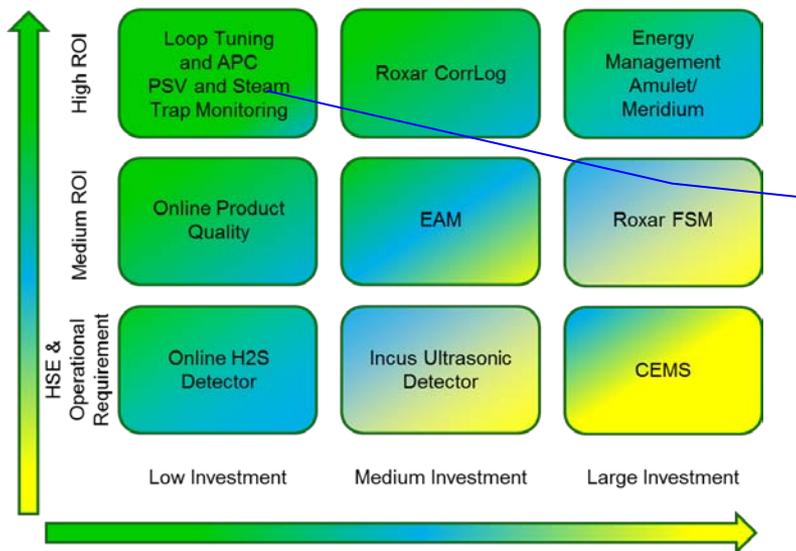


Table 2-2 Process control loop performance improvement – Cost Benefit Summary

S.No.	Cost	Benefit
1	4000 USD*	Immediate benefits with payback of < 2 months

* Per Week Cost for Control loop performance evaluation, T&L costs will be charged at actual

Typically, 20 loops may be evaluated in a week depending on availability of DCS system and process conditions at site

Tag-wise Picture and details captured in report

1	
Site Area	CPU
Tag No	PCV-2030C
Service	
Criticality Rating	
Brand / Model / Sr	SR2978
Observations	<ul style="list-style-type: none"> - High noise noted. - Water condensed on exterior downstream piping observed
Proposed action	<ul style="list-style-type: none"> - To verify suitability of existing valve selection - Requires updated process conditions
Benefits	



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E- Learning



Self Paced

Virtual CLASSROOM



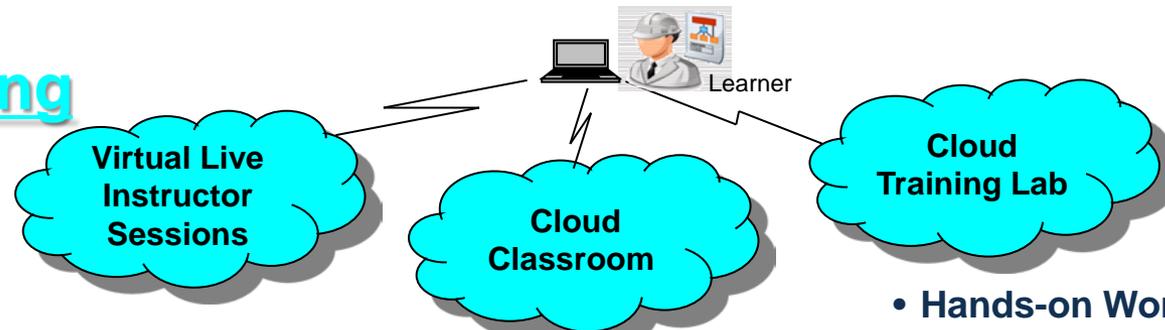
Collaborative Hub

On-Site / Classroom



Face to Face

Blended Learning

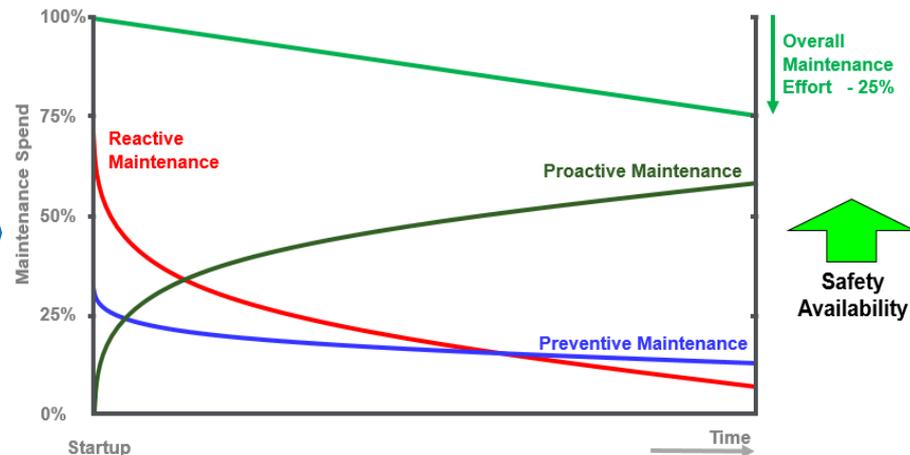


- “Kick-Off” with Students
- Scheduled Q&A Sessions

- Knowledge Assessments
- Student Tracking & Status Reporting
- Emerson Learning Management System

- Hands-on Workshops
- Workshops performed on a Virtual System
- Course database

Emerson Lifecycle Services helps you reach your Ideal Maintenance Strategy



Lifecycle Service @ Singapore

- 25 Turnarounds completed in 2015
- 43 Long Term Service Agreements in Execution
- 31 Resident Engineers at various sites





Maintenance



Reliability



Performance

Emerson enables you to achieve Top Quartile Performance



**EMERSON
CONSIDER IT
SOLVED™**