



Maintenance, Reliability and Performance Services

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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

Consult & Plan

Opportunity Assessment
Pre-FEED
Visions



1 to 2 years

Design & Engineer

FEED
Architectures
Detailed Specs



1 to 3 years

Execute Project

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



20 to 60 years

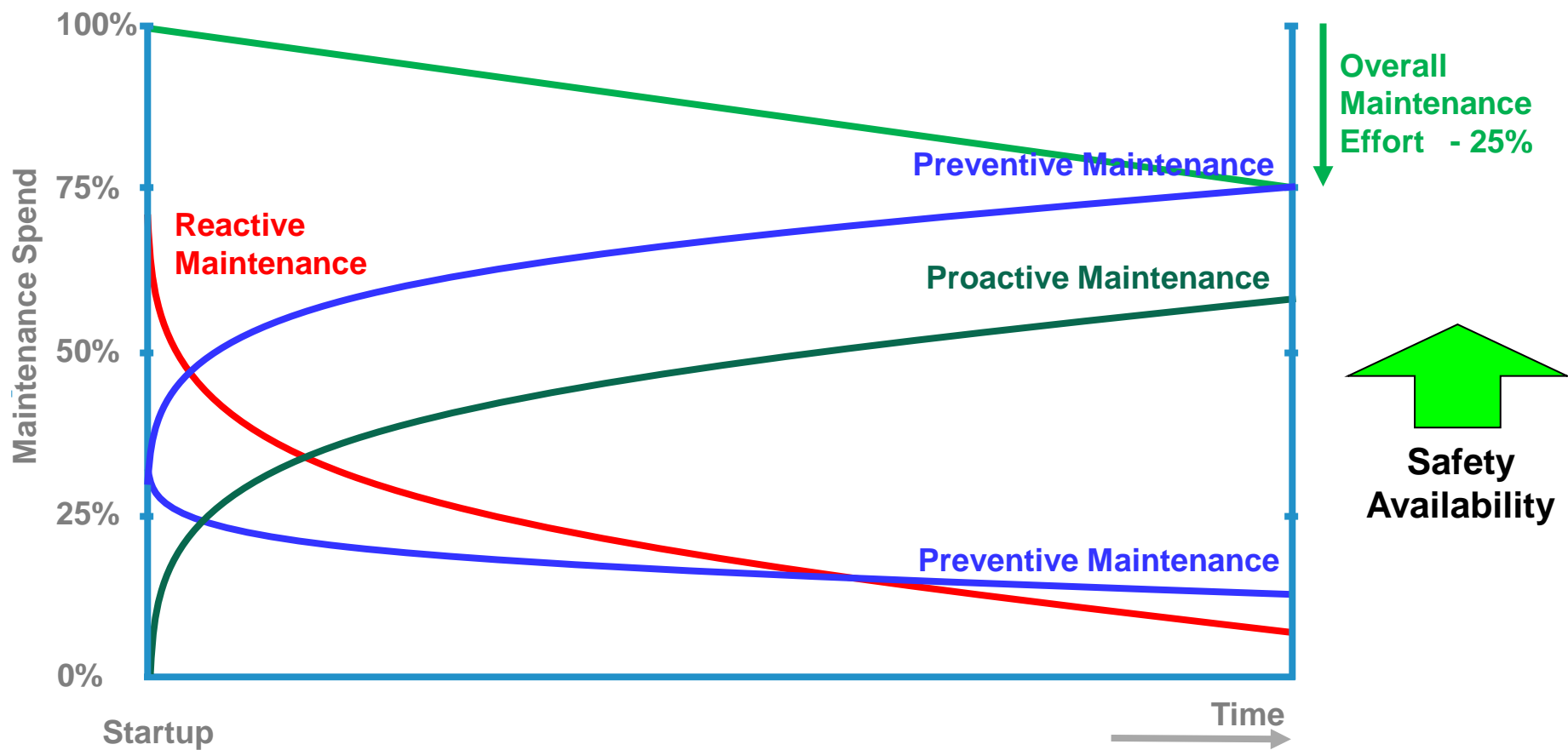
Provide Support

Operations Support
Spare Parts & Upgrades
Asset Management
LTSA & Turnarounds



Ideal Maintenance Strategy

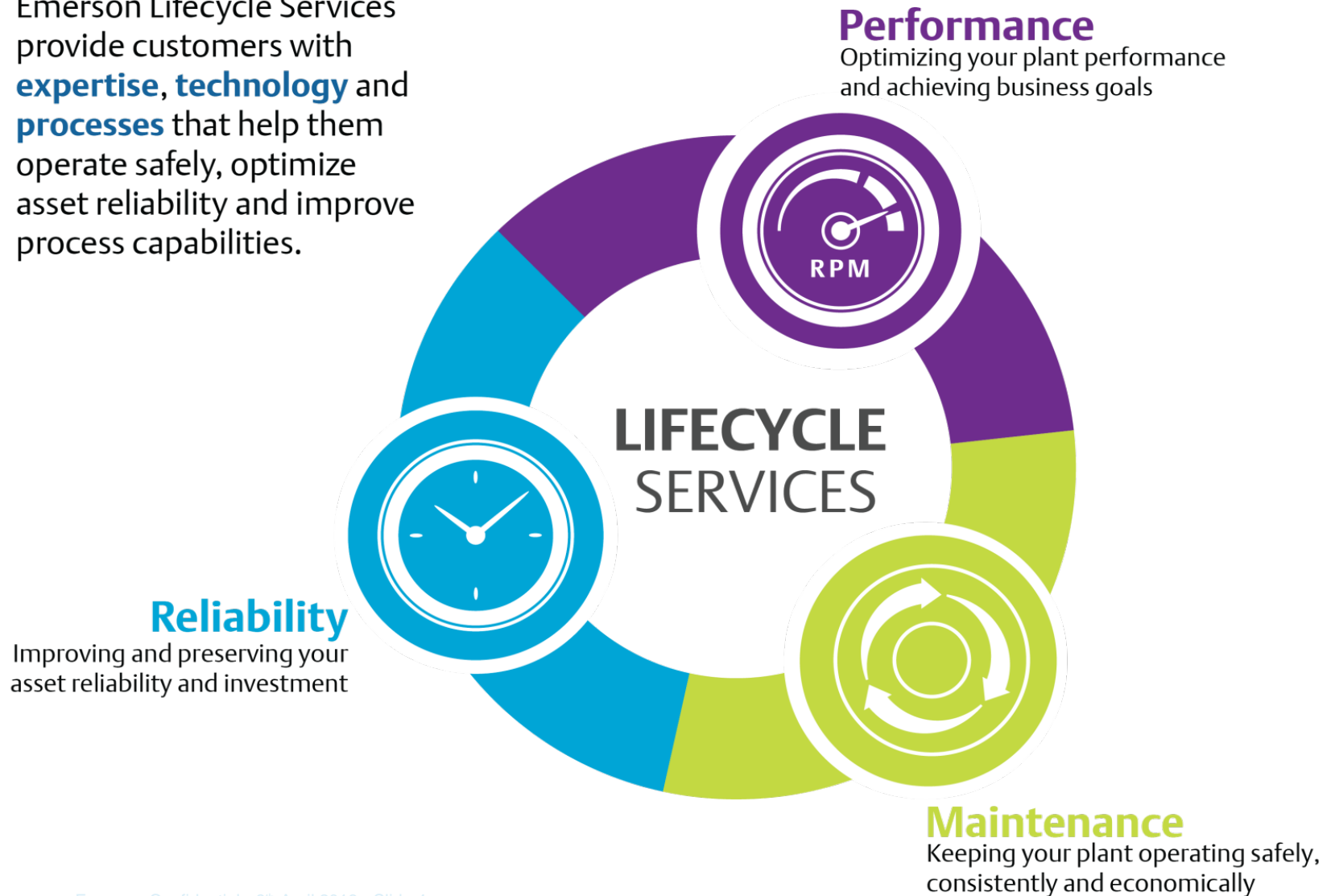
Process Control Assets



* 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.



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

Improving and preserving your asset reliability and investment

Calibration Services

Preventive Maintenance

Remote Monitoring

Turnaround Support

Retrofit Upgrades



Performance

Optimizing your plant performance and achieving business goals

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

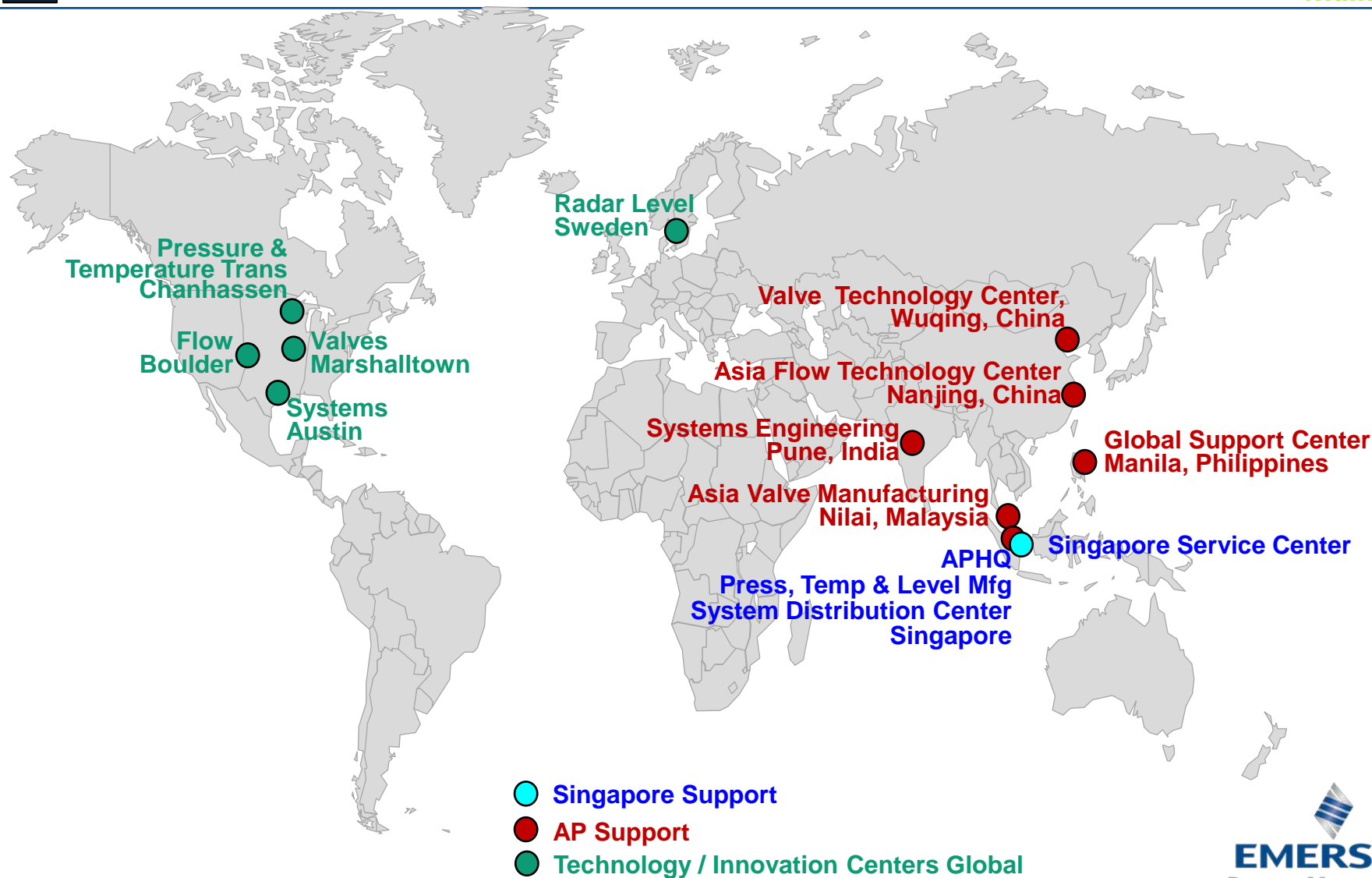


Singapore is supported by 170 Service Professionals with a
combined experience of 1054 years

Singapore, Asia Pacific and Global Support



Maintenance



EMERSON
Process Management

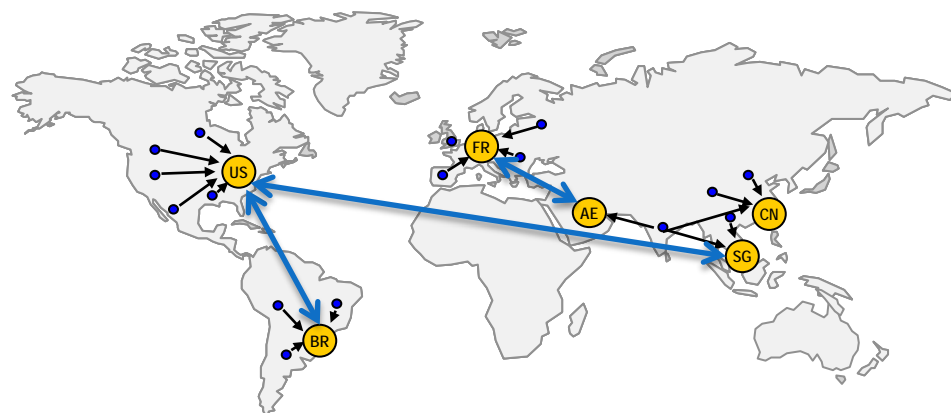
Intelligent Inventory / Spares Management

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	C6
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.

* Refers to Instrumentation Assets



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			

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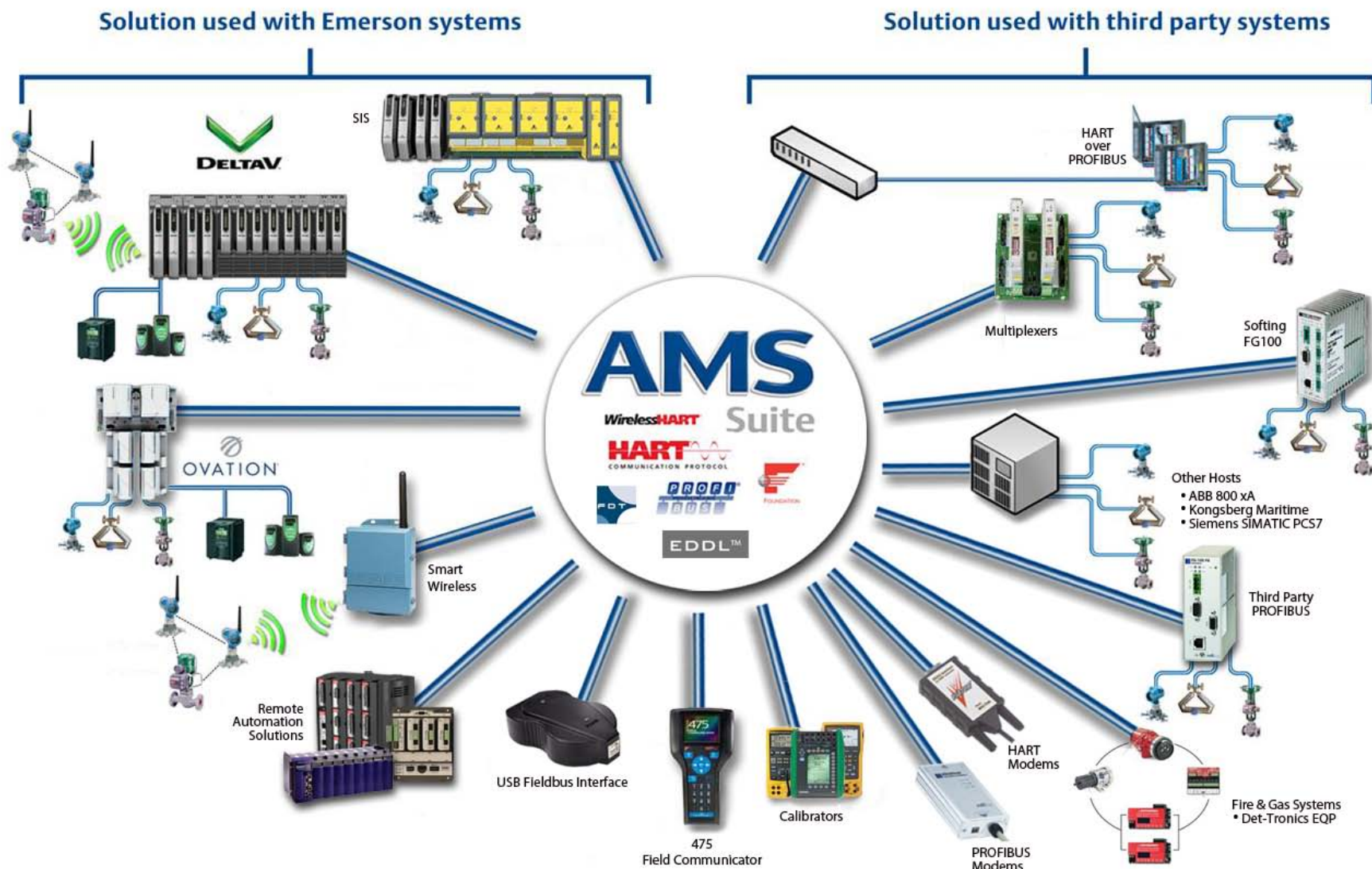
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Advance Diagnostics Enabler for Proactive Maintenance



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

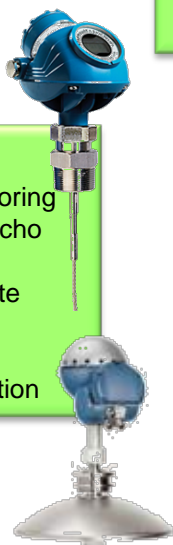
- Smart Meter Verification
- High Process Noise
- Wiring and Grounding Fault Detection
- Tunable™ Empty Pipe
- Coil Fault Detection
- Electronics Temperature



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



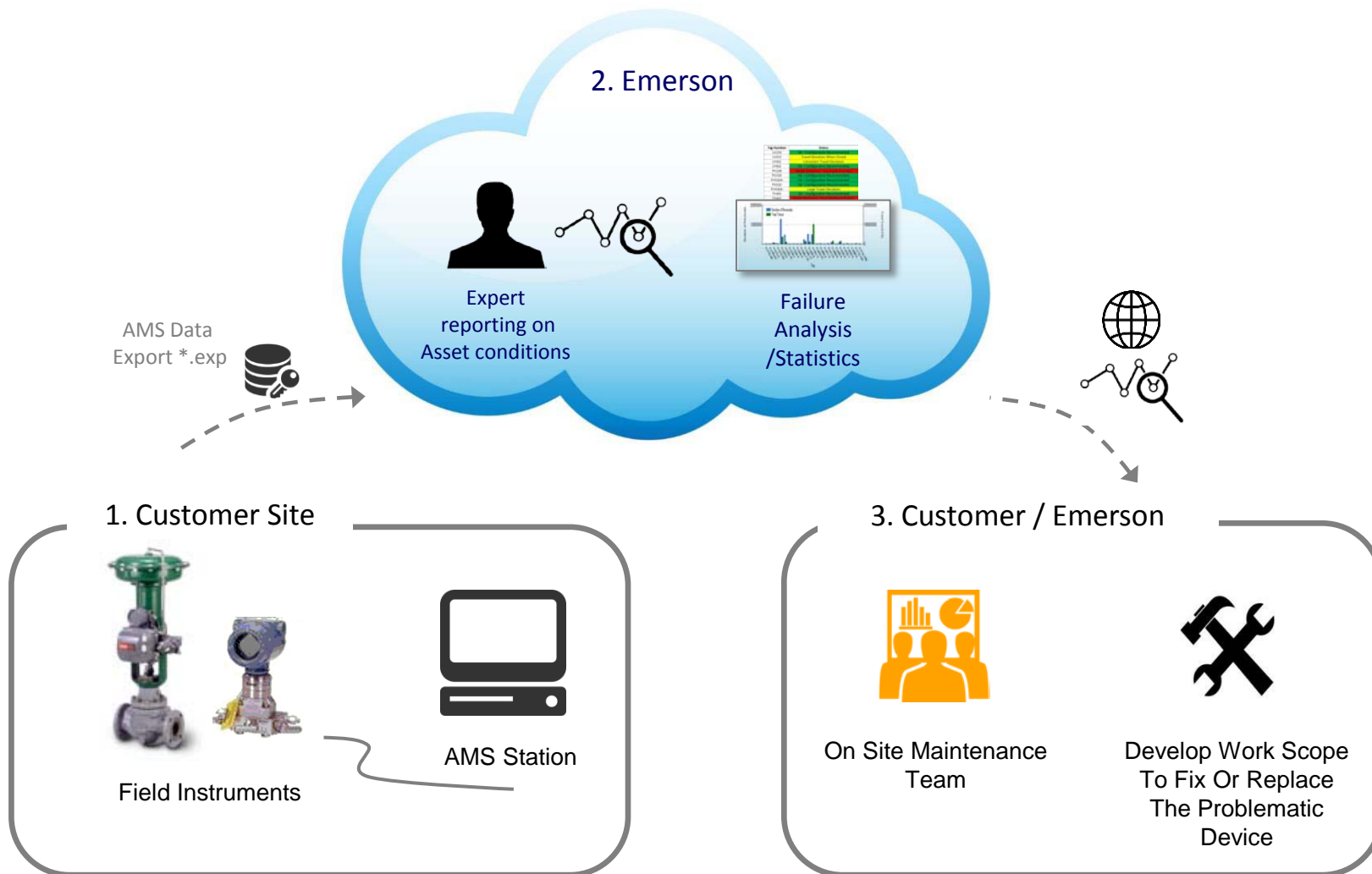
Machinery Health

- 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

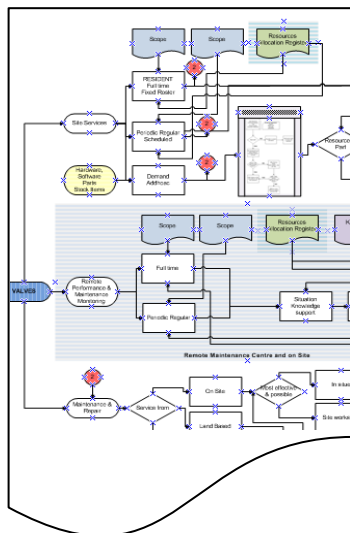
6) Post-outage meeting: present Final documentation package

12 – 18 Months

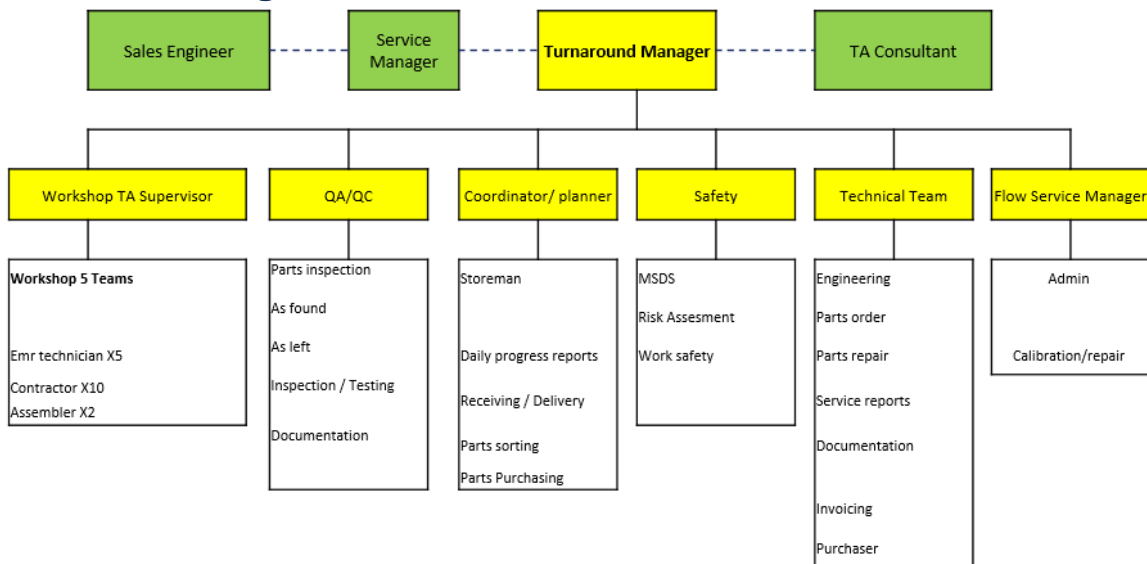
Emerson Process Management Executed 196 Turnarounds in Asia Pacific Region in 2015

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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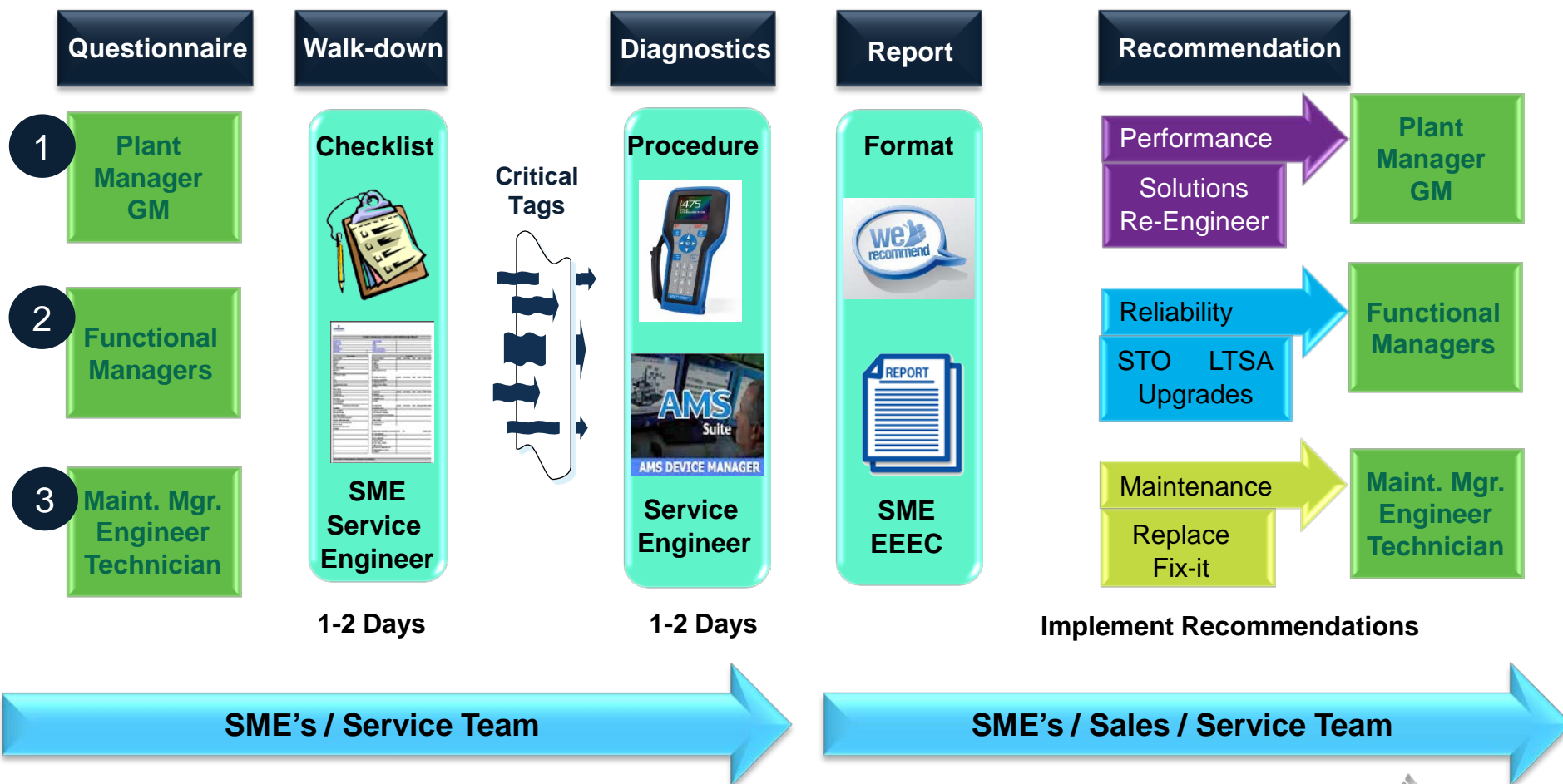
Performance Audits

Resident Site Engineers

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



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

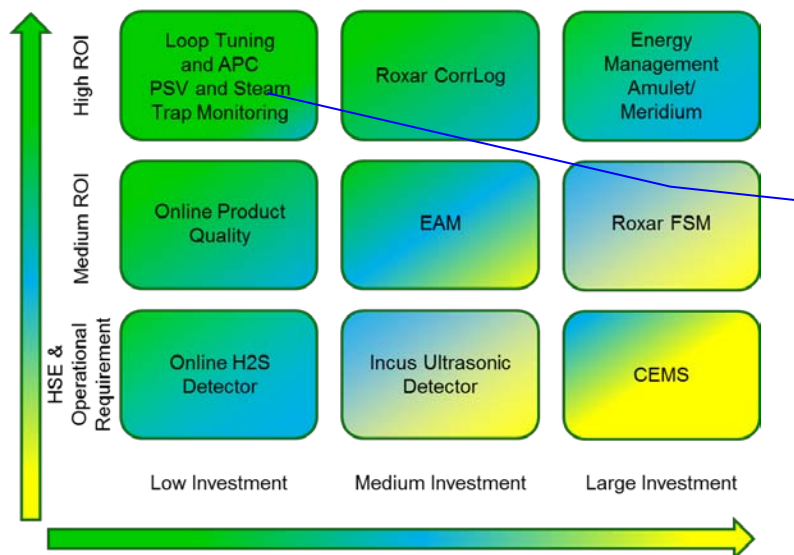



Table 2-2 Process control loop performance improvement – Cost Benefit Summary

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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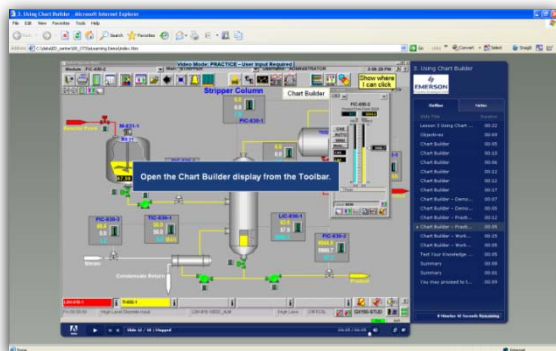
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Educational Services



E- Learning



Self Paced



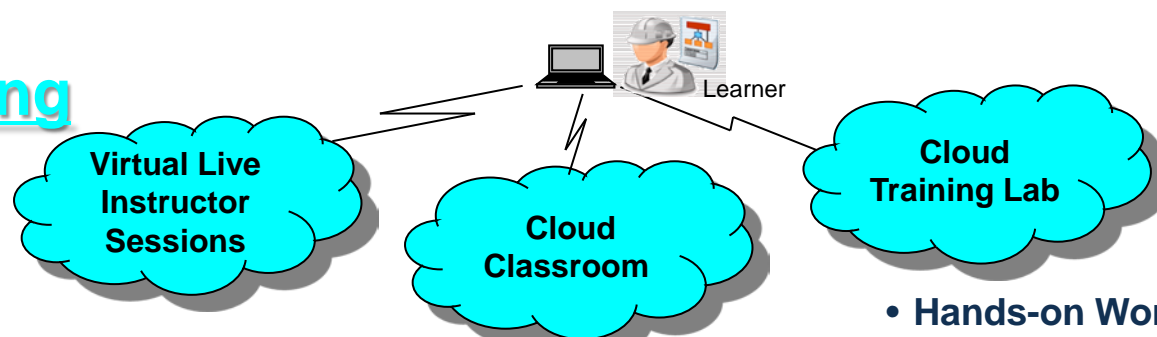
Collaborative Hub

On-Site / Classroom



Face to Face

Blended Learning

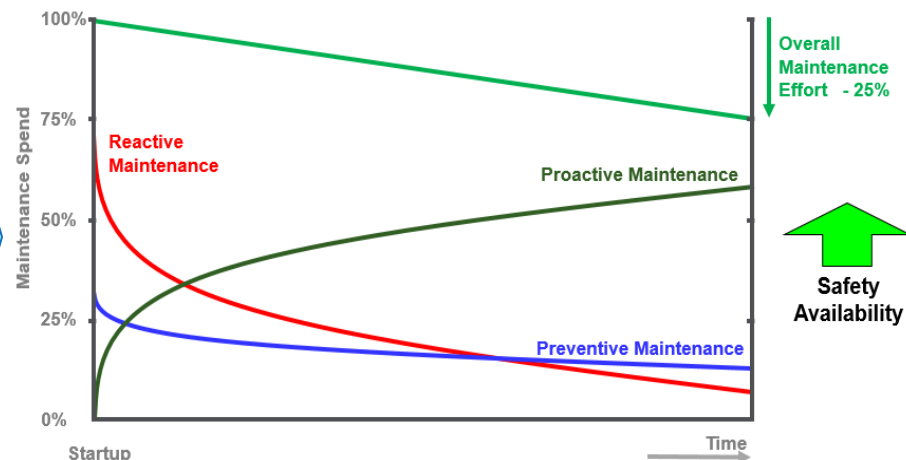
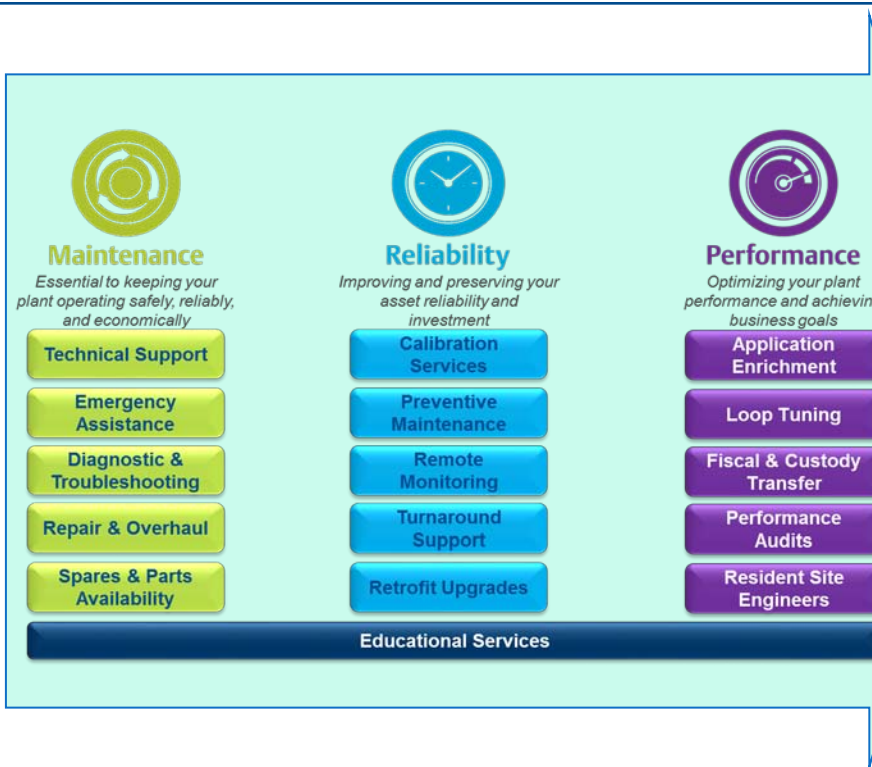


- “Kick-Off” with Students
- Scheduled Q&A Sessions

- 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™