

# ***PROFIBUS & Machinery Asset Management***

PROFIBUS User Conference  
June 2010, Stratford-Upon-Avon  
Nick Garrett & Martin Dudley



# ***Profibus & Machinery Asset Management Agenda***

- Introduction to Reliability / Asset Management
- Asset Optimisation Tools
- Asset Optimisation Tools for Profibus MS/VSD
- Asset Management Architecture
- Summary

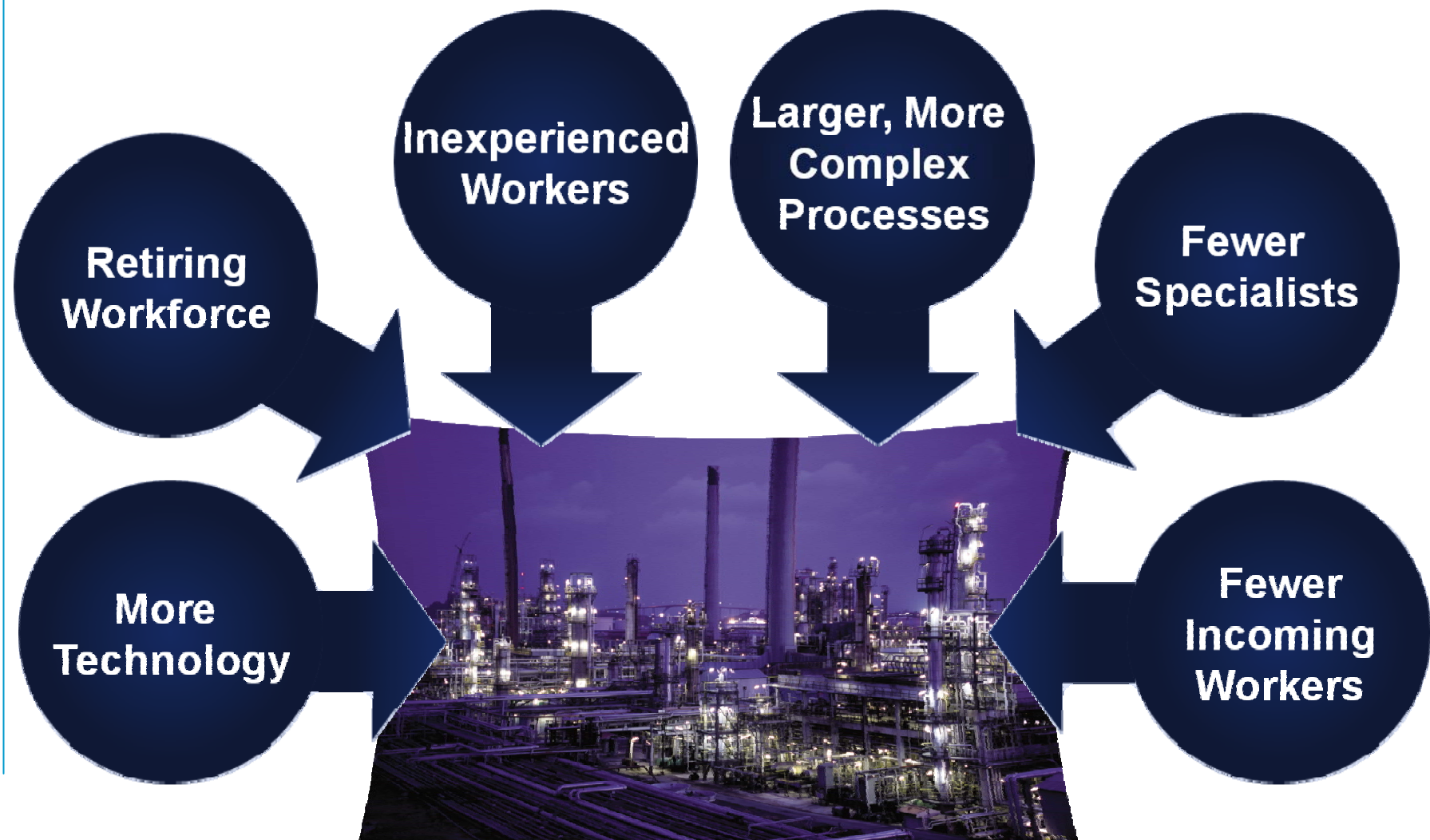
# ***What is Asset Management?***

- Asset Management services and technologies help Industry make the most of key production assets so that they can increase availability and performance for improved business results. This includes not only valves, transmitters, analyzers, and other field devices, but also mechanical equipment, electrical systems and process equipment.
- An Asset Management program includes three elements - technology, expertise and work processes deployed uniquely to meet the specific needs of each customer
- These three elements are required, whether considering a single instrument, or all production assets in a facility



**EMERSON™**  
Process Management

# ***Industries Face Tough Challenges***



# Leading Challenges For Manufacturers



Support me since I have limited Resources

We want to be Best in Class

Help me improve my ROCE

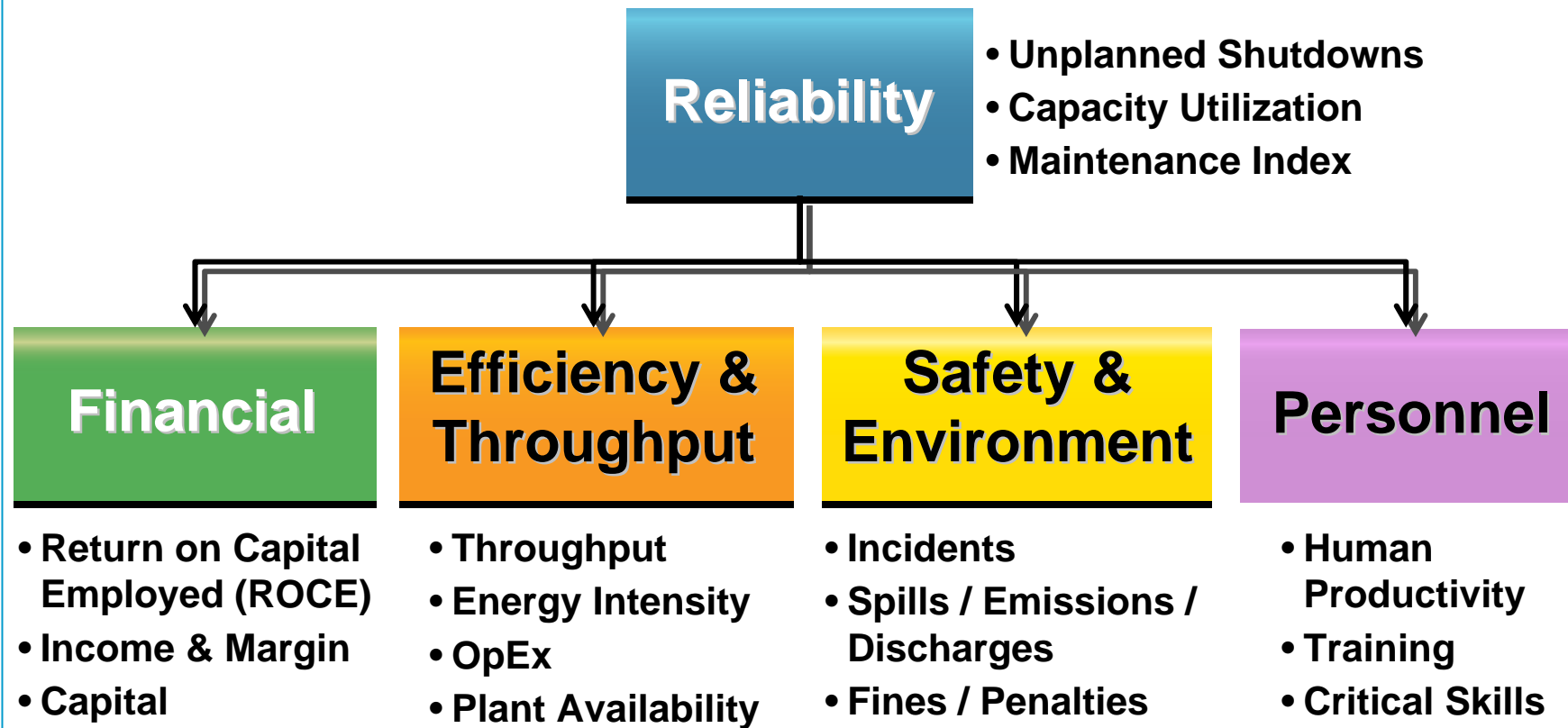
Help me reach my  
Safety, Health, Environment,  
Production Targets

Improve my Plant Availability

Reduce my Maintenance Cost

Help me make Easy Decisions

# ***Reliability is Paramount to Achieve Business Goals***



# ***Sustained Reliability requires a Continuous Improvement approach to Maintenance***

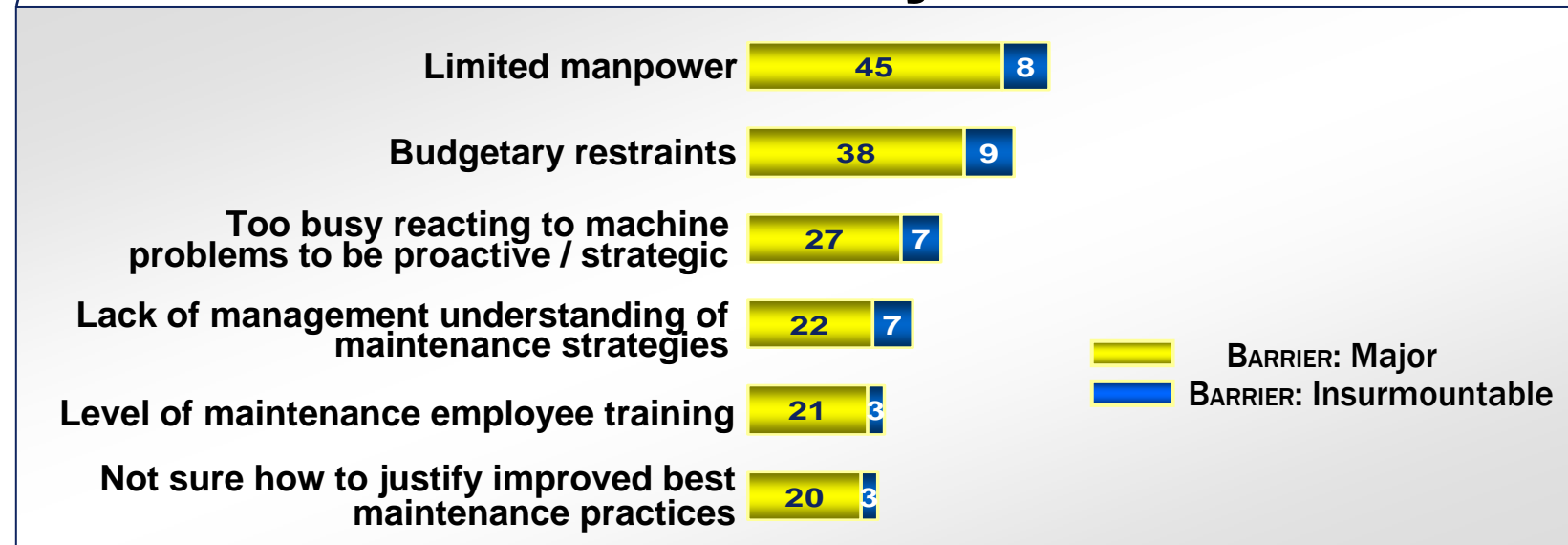


# Best Maintenance Strategy is Mostly Planned... ...But Industry Is Reactive

	1988	2008	Best Cost	
Reactive	55%	→ 55%	10%	Reactive
Preventive	30%	31%	25-35%	Planned
Predictive	10%	→ 12%	45-55%	
Proactive	5%	2%	5-15%	

Source: Maintenance Technology

## Why?





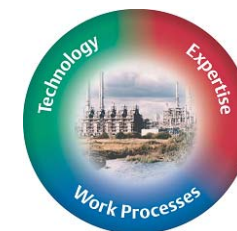
# ***Business Performance Indicators***

## World Benchmarks (Solomon)

- OEE (*Overall Equipment Efficiency*) > 95%
- Plant Availability > 98%
- Maintenance Cost / ERV  
(*Equipment Replacement Value*) < 1.2%
- Average Return on Assets Managed > 15%
- Lost Time Incident Rate < 0.3
- Planned work > 90%
- Reactive Work < 10%

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# Asset Management Tools



- Scope extends to all major production assets

- Instruments & valves
- Mechanical equipment
- Process equipment
- Other plant assets



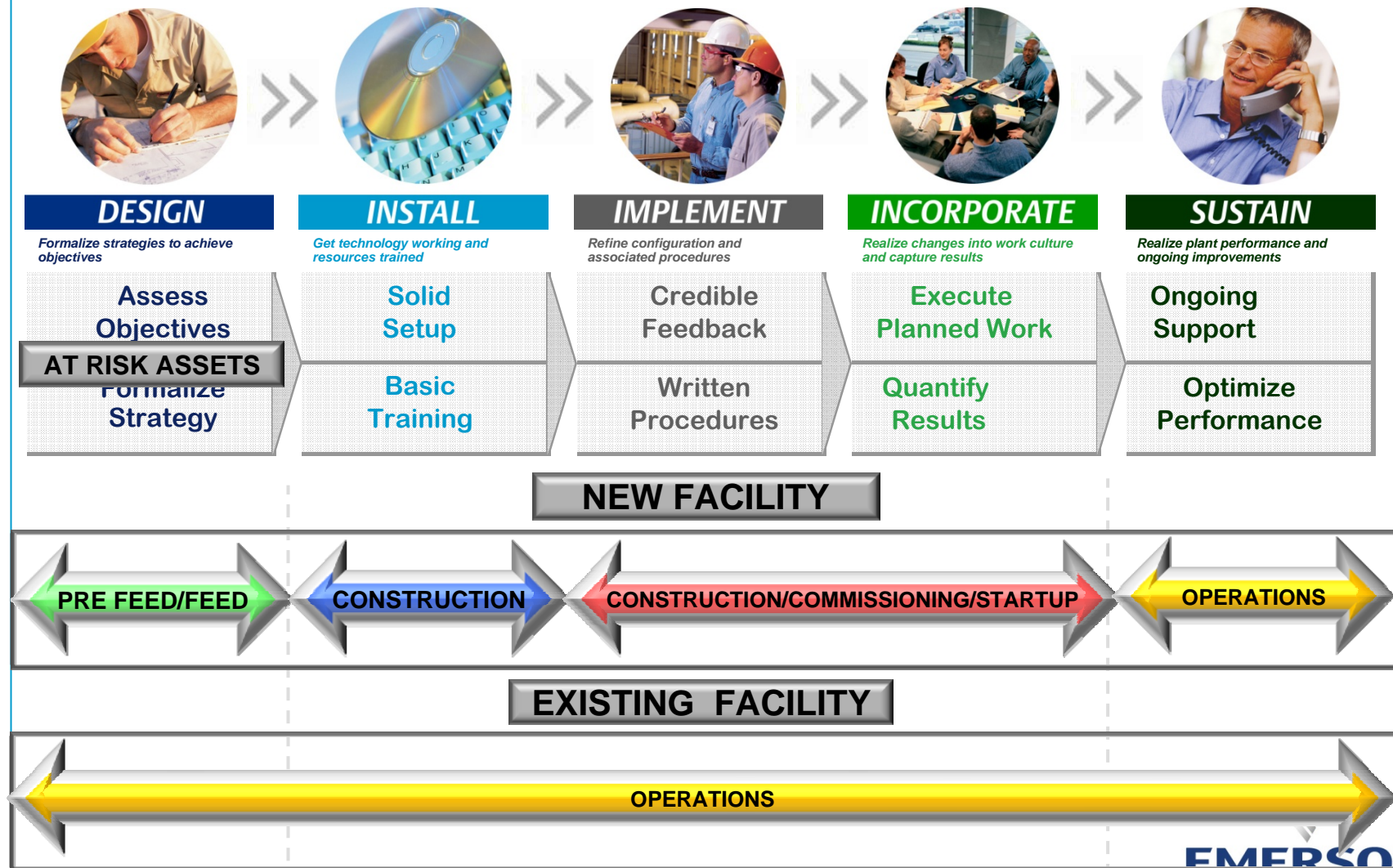
- Integrated family of applications and supporting Services

- Predictive diagnostics
- Condition monitoring
- Performance monitoring

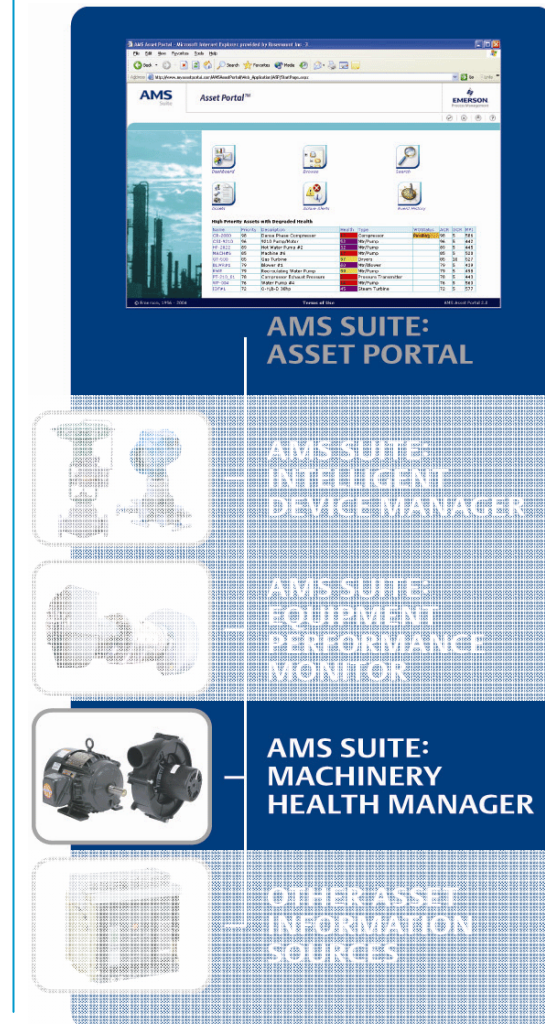
- Delivers improved availability, performance and more effective maintenance



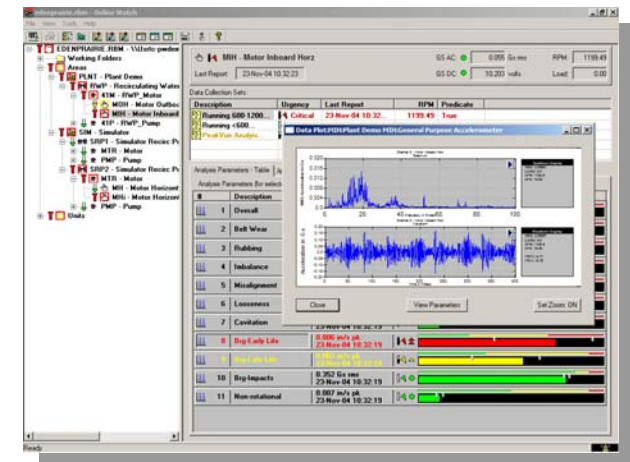
# Structured Services approach supports multiple Maintenance Strategies



# Machinery Health Management

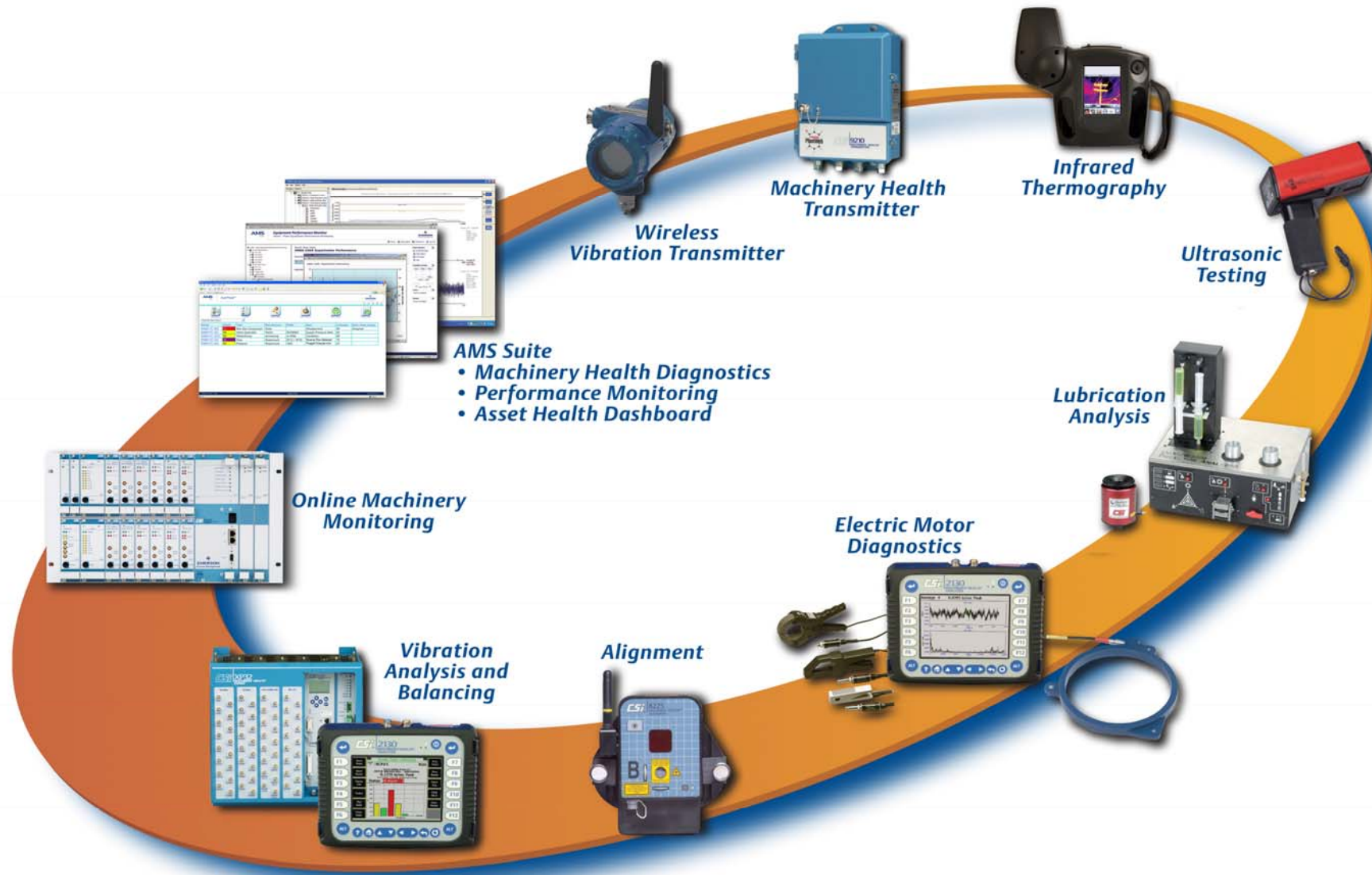


- Predictive diagnosis of mechanical equipment
  - Online and portable vibration
  - Oil analysis, infrared thermography, ultrasonics
  - Motor diagnostics
  - Laser alignment and balancing
- Automated analysis indicating the nature and severity of conditions
- Root-cause analysis with comprehensive reporting and graphical presentation of results





# Portable and Online Predictive Machinery Health Management Solutions



# Intelligent Device Management



- Enables Configuration and Predictive Diagnostics Of Instruments And Valves
- Enables access to Device's Built-in Intelligence
  - Configuration Management
  - Diagnostics And Monitoring
- Provides Management Of Information
  - Calibration Management
  - Documentation
- Connectivity
  - HART, Foundation Fieldbus (and Profibus DP Devices)
  - Emerson and non-Emerson Hosts & Devices
  - Business Systems (Maximo, SAP etc.) via Asset Portal



# *Intelligent Device Management*

## *- Overview*

- **Functionality**

- Configuration, Diagnostics & Monitoring, Documentation and Calibration Management of HART, FF, **Profibus** and non-smart device
- Independent of Control System
- Emerson and 3<sup>rd</sup> Party devices

- **Typical Device Manager Users**

- Instrument Technician
- Project/Service/Commissioning Engineer
- Maintenance/Calibration Supervisor


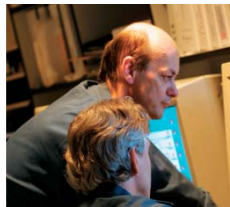


- **Job Responsibilities**

- Installation and commissioning of instruments and Valves
- Preventative maintenance and Predictive Diagnosis of instruments and Valves
- Calibration of Instruments and Valves

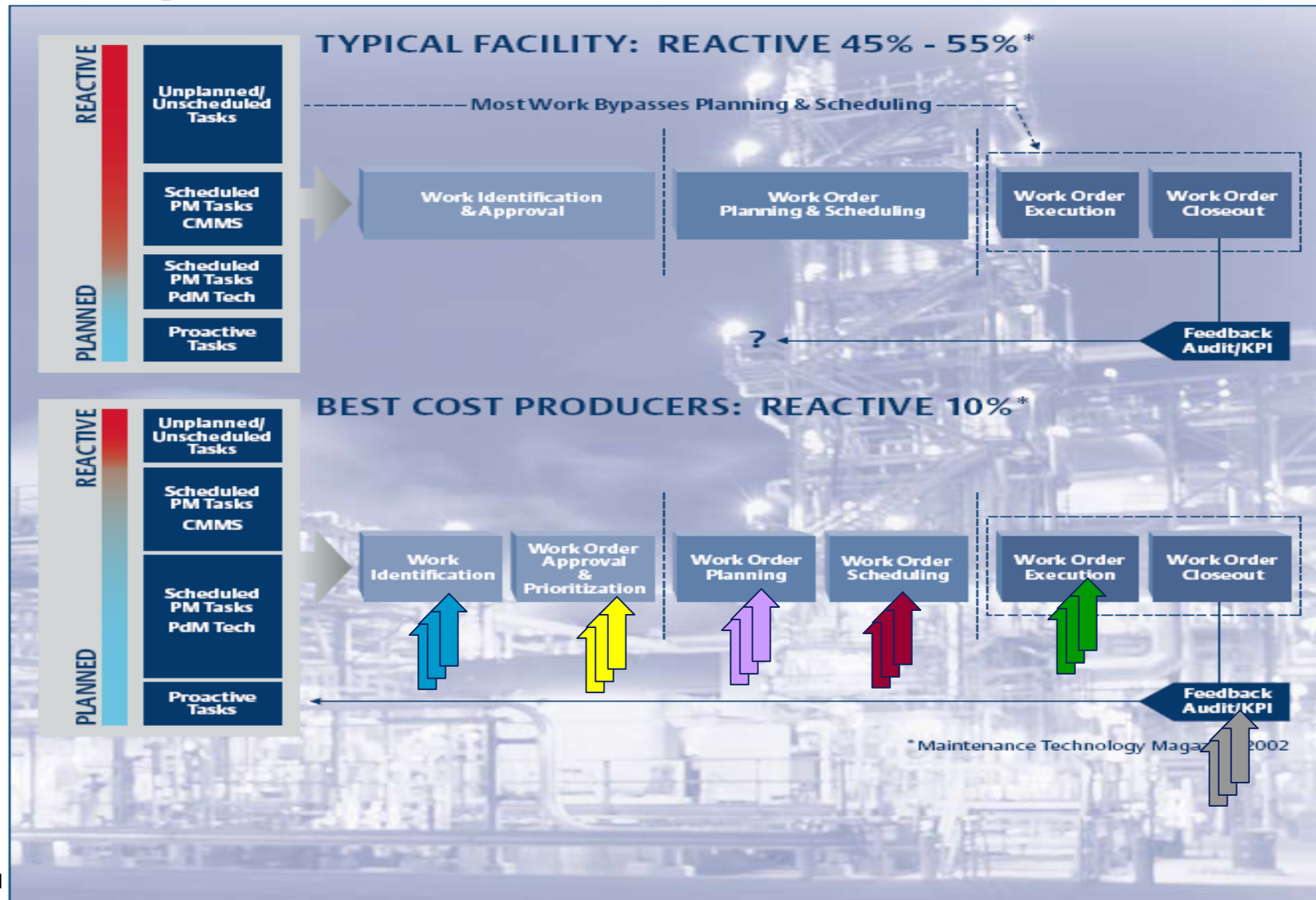




# Different Roles require Different Tools

	<b>Plant Manager</b>	<i>Dashboards and Reports</i> Assess and mitigate risk to safety, environmental, and production targets Optimize cost in the plant Maximize asset ROI
	<b>Maintenance Manager</b>	<i>Dashboards and Reports</i> Mitigate risk of assets causing downtime Optimize maintenance strategies and procedures Maximize physical asset performance Manage maintenance work through the CMMS
	<b>Electrical and Instrument Engineer</b>	<i>Analytical Tools and Reports</i> Identify bad actors Mitigate risk of instruments, valves & motors causing downtime Optimize maintenance with confidence Extend Calibration intervals Reduce Valve PMs
	<b>Reliability Engineer</b>	<i>Analytical Tools and Reports</i> Identify bad actors Mitigate risk of rotating equipment causing downtime Optimize maintenance with confidence Extend PM intervals Reduce inspections

# Multiple tools or an integrated Asset Management Solution?



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# ***What is a Variable Speed Drive (VSD)?***

- **A Piece of Electrical Equipment Which Can Control the Speed, Torque or Position of:**
  - AC Motors
  - DC Motors
  - Servo Motors
- **By Using Advanced Switching Techniques:**
  - PWM (pulse width modulation)
  - Vector control
  - Thus enabling current, voltage and hence power control
- **Can be Controlled by:**
  - Manual interaction (switches and joysticks)
  - Automated PLC / code control (complex automation systems)
  - Hybrid manual and automated (user assisted systems)
  - Fieldbus (including PROFIBUS and PROFINET)



# ***Why Use a Drive?***

- ***Lower costs through:***
  - *Energy savings*
  - *Tighter control*
  - *Increased productivity*
- ***Better Performance:***
  - *Higher throughput*

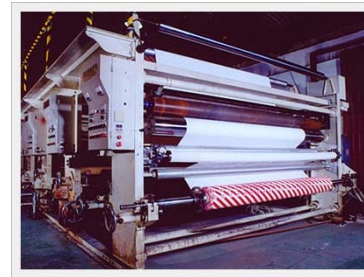
## ***Example :***

*At 80% of rated speed only 50% of the maximum power is used.*

*At 50% of rated speed only 12.5% of the maximum power is used.*

# Drive Application Diversity

- Fans/Pumps
- Paper machines
- Steel mills
- Chemical plants
- Marine
- Fairground rides
- Ski Lifts
- Printing
- Cable laying
- Lifts/Escalators
- Cranes/Hoists
- Electric cars
- Textile machines





# Control Techniques' Drives and PlantWeb

## ASSET OPTIMIZATION



- Device Manager
- Machinery Manager
- Performance Monitor
- Asset Portal

## DIGITAL CONTROL



## MEASUREMENT



## VALVES & REGULATORS



## AC DRIVES

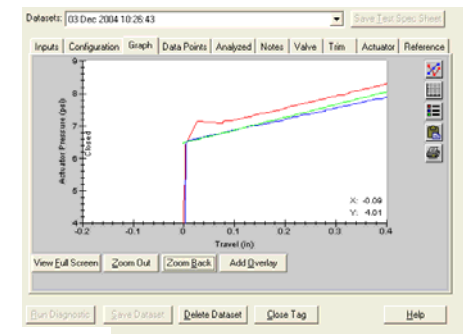


## ***Using Drives with AMS and PROFIBUS***

- To get the best out of our business we need to **monitor both the process and the plant**, this is achieved with AMS Device Manager.
- AMS Device Manager allows management of field instruments, valves, general plant and **now Control Techniques Drives**, through the use of **PROFIBUS!**
- Allows for **predictive diagnostics**, device **configuration**, **calibration**, **management**, and **documentation integration**



Calibration Certificate #			
AMS Tag: FC-600			
Calibrated at: 6/20/2009 10:22 10 AM			
Calibration Result: PASSED			
Device Identification			
AMS Tag	FC-600		
Serial Tag	19N1401027-12-1200		
Manufacturer	Fluke Calibration		
Model Name	1588A		
Device Name	1588A		
Owner Name	000 10000000-000000000000000000000000		
Block Name	19N1401027-12-1200		
Calibration Data			
Reference	62026009 10:22 10 AM	Max Error Limit	0.50 % of span
Temperature	25.000000		
Technical	Line 00000000	Adjustment Limit	0.50 % of span
Technical	Line 00000000	Adjustment Limit	0.50 % of span
Actual	00.00 ppm	Calibration Interval	3 Weeks
Temperature	(15.00)		
Standard		Current Sense	No
Work Order Number	060200	Input Range	0.00 - 1.00 100.00 Percent
Service Notes	Calibration Test	Output Range	0.00 - 1.00 100.00 Percent
Service Notes	This is a routine calibration.		
Signature	None		



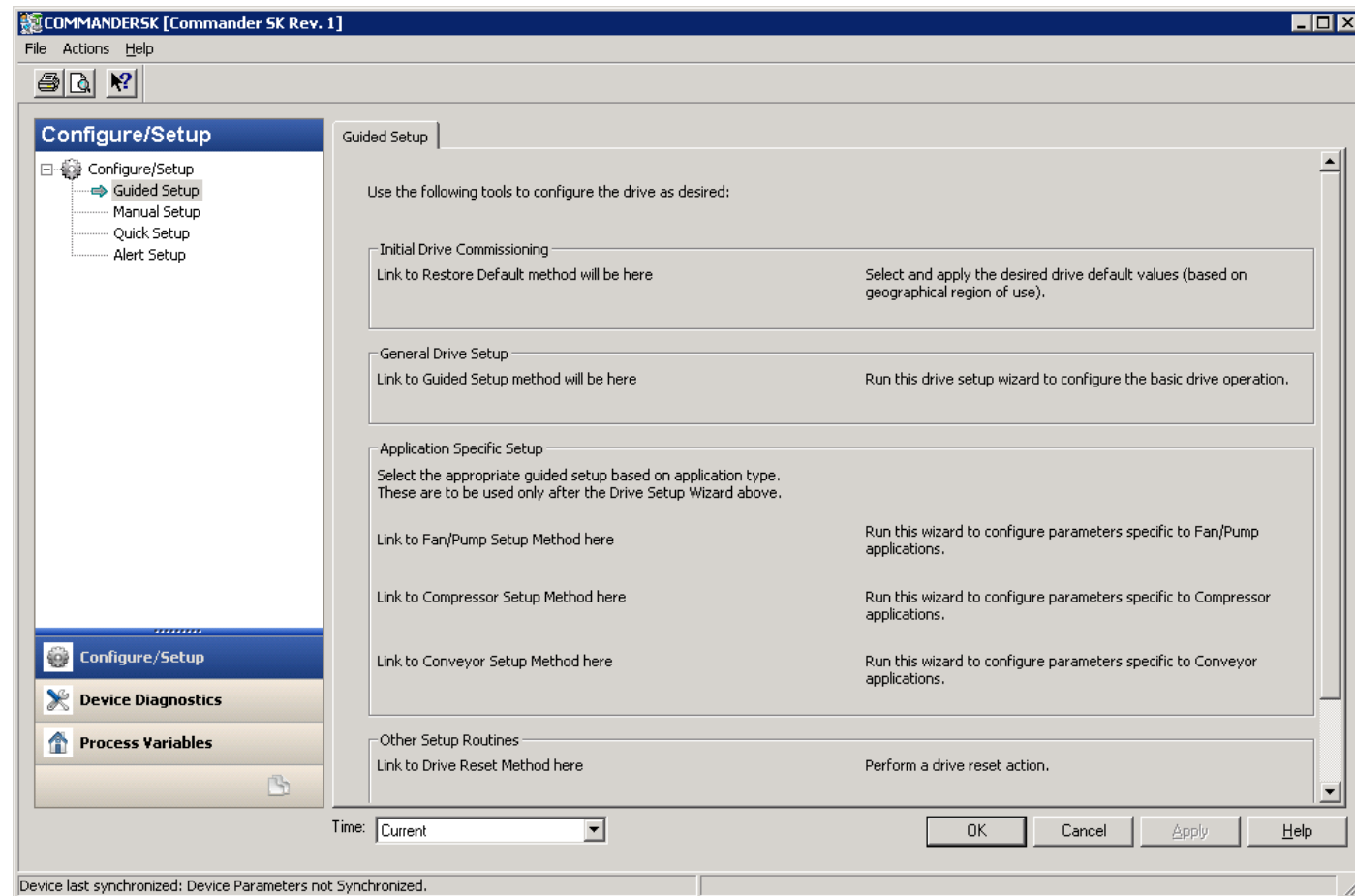
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# ***What Additional Value Does PlantWeb with PROFIBUS Bring to Drives?***

- *Easy communication using PROFIBUS to get plant health data*
- *Offers unprecedented levels of monitoring without cyclic data congestion (does not affect manufacturing activities)*
- *Simplifies setup*
- *Enables faster diagnostics*
- *Familiar interface within the PlantWeb environment*
- *Preventative maintenance (be Proactive!)*
- *Scheduled downtime that fits your plans*
- *Reduces unnecessary plant maintenance (why shutdown plant to check for possible problems?)*
- *Provides an indication of changing operating conditions (investigate changes in drive operation, BEFORE it's an issue)*

# Guided Setup – Facilitates Rapid Setup and Deployment



# Device Configuration Made Easy Providing a Familiar Interface for All Plant

PT-100 [3051 Rev. 7]

File Actions Help

**Configure/Setup**

- Configure/Setup
  - Basic Setup
  - Device Configuration
  - Variables Configuration
  - Calibration Configuration

Identification Alarm/Sat Levels Variable Mapping LCD Comm Setup Materials of Construction

Tag: PT-09342 Date: 07/23/2005

Manufacturer: Rosemount Descriptor:

Model: 3051 Message:

Transmitter S/N: 9876518 Model Numbers

Sensor S/N: 16777215 Model Number I:

Write Protect: Off Model Number II:

Model Number III:

Revision Numbers

HART Universal Rev: 5

Field Device Rev: 7

Software Rev: 1

Hardware Rev: 1

Config Write Protect

EMERSON Industrial Automation

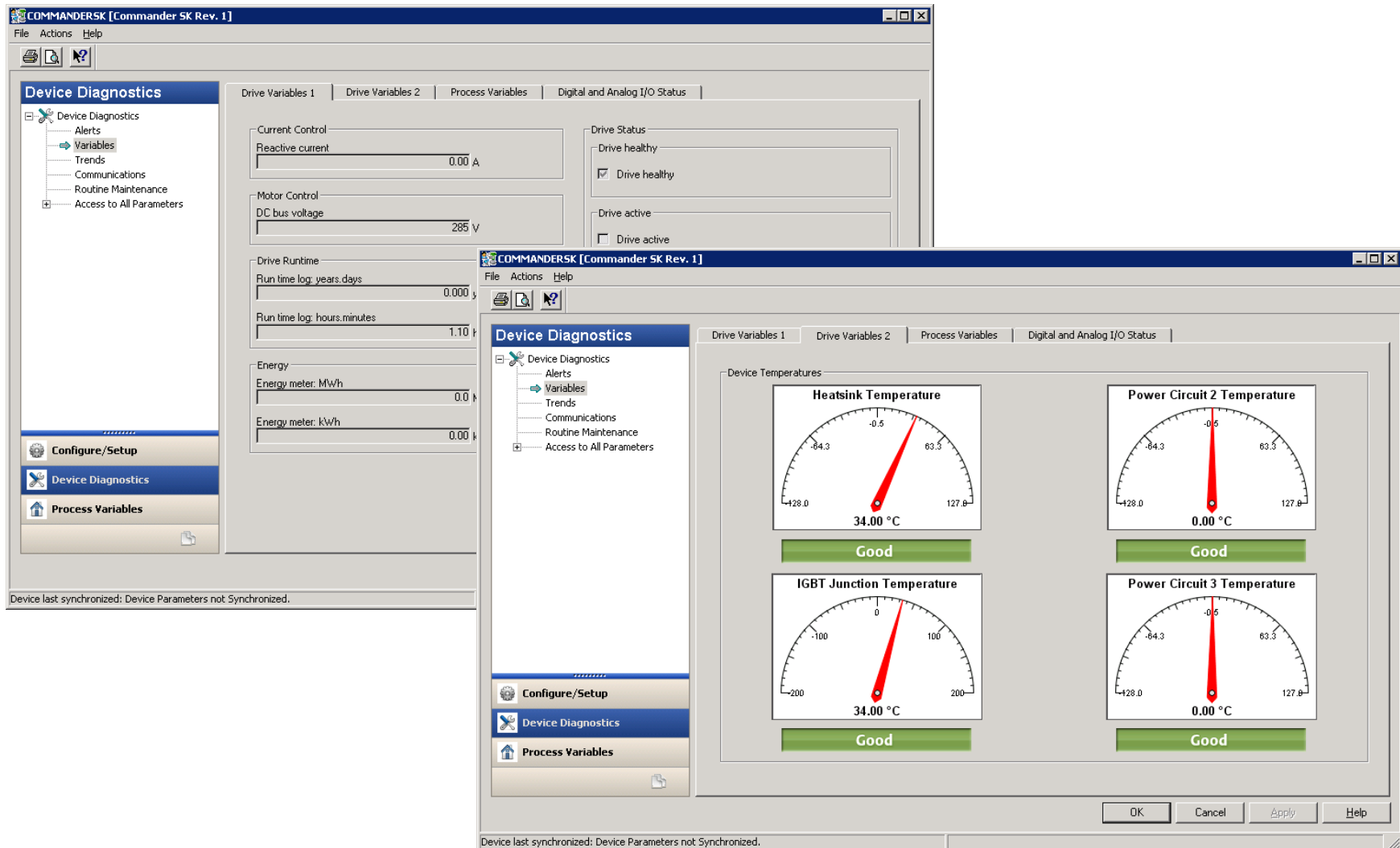
CONTROL TECHNIQUES

Time: Current

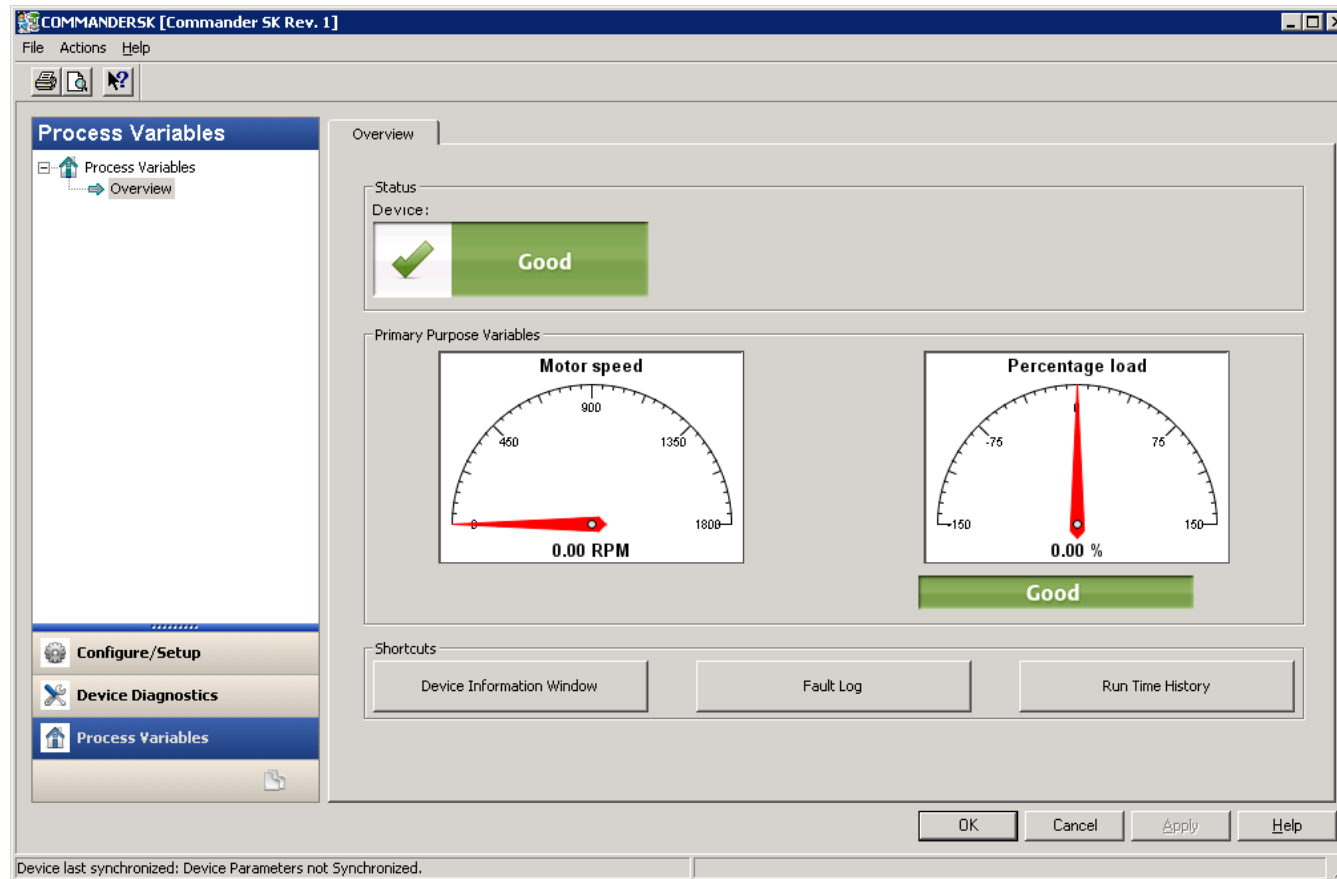
OK Cancel Apply Help

Device last synchronized: 11/20/2008 7:31:22 AM

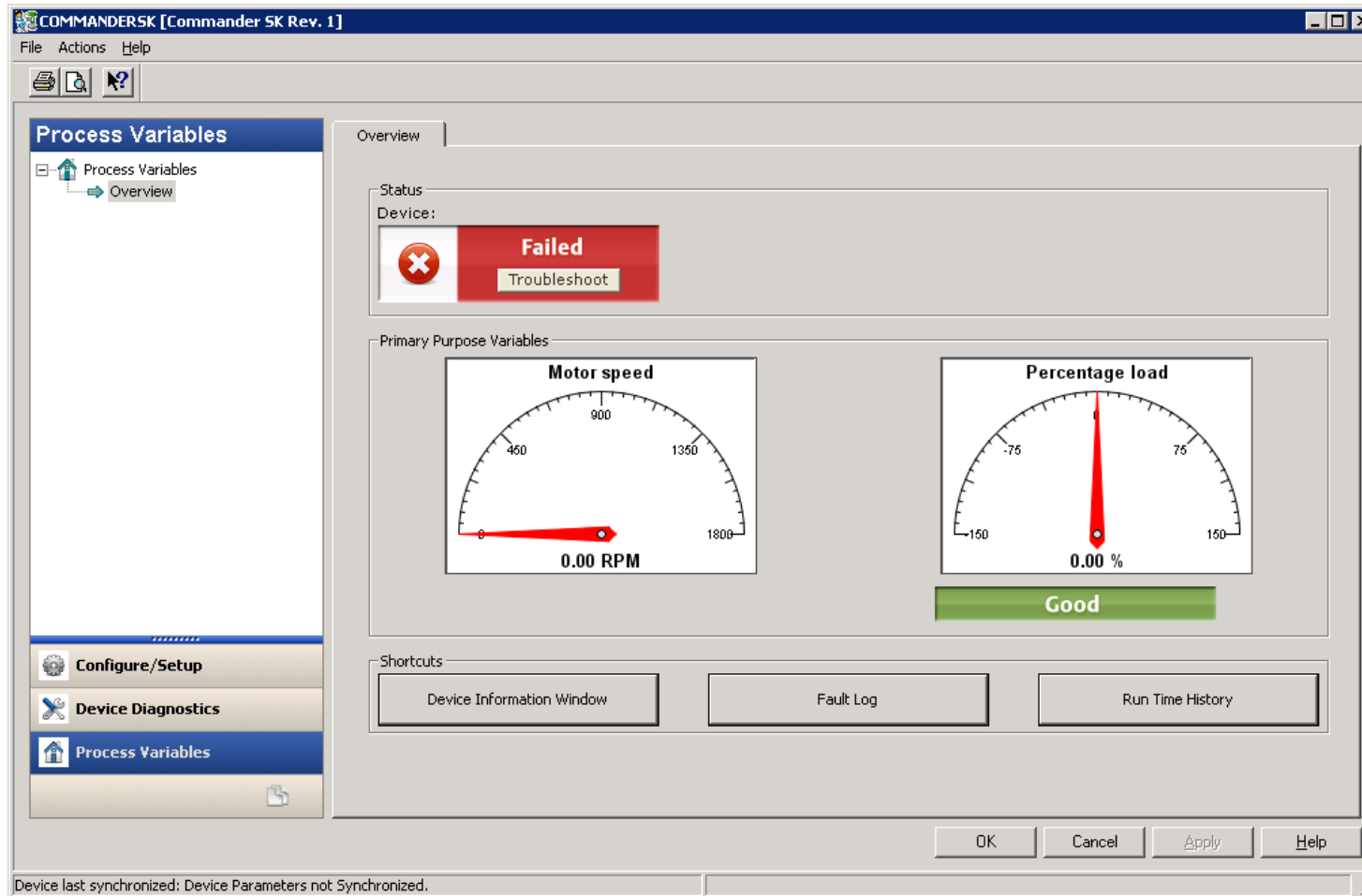
# Monitor Drive Performance in Real Time – From Within a Standard Interface



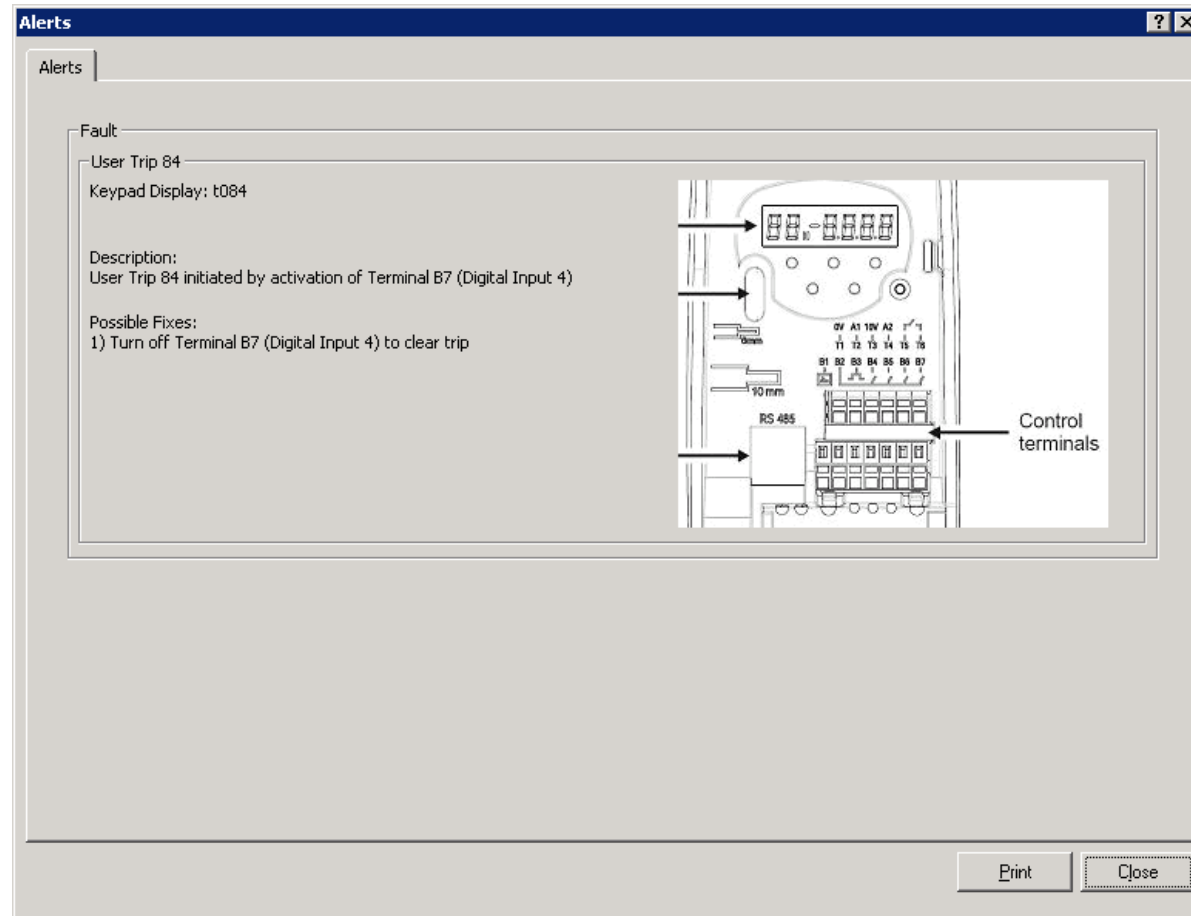
# Instant Access to the Status of Your Drive



# Get Alerts and Warnings Immediately Showing Where Problems Are



# ***When a Drive Problem Occurs Guided Fault Finding is Only a Click Away***



# Clear Overview of Your Plant and It's Health with Associated History

- Clearly shows all unhealthy devices (including drives) and status
- Historic view allows engineers to see previous events (audit trails)

**Alert Monitor - Alert List**

File Edit View Help

Configure Station Monitoring Audit Trail Alert Details Acknowledge Clear Entry Silence

Active Alerts Unacknowledged Alerts

AMS Tag	Count	Time	Severity	Description	Device Group	Plant Location	Station	Manufa
TT-345	1	6/9/2009 9:08:55 ...	Failed	Primary Value Failure	1	Texas\Austin\Ch...	USRTC-PLANTW...	Rosemor
FC-400	28	6/5/2009 3:42:55 ...	Abnormal	Device Not Responding	1	Minnesota\Eden ...	USRTC-PLANTW...	Fisher Co
FT-405	40	6/5/2009 3:42:52 ...	Abnormal	Device Not Responding	1	Minnesota\Eden ...	USRTC-PLANTW...	Rosemor
8LOGIC	24	6/5/2009 3:20:22 ...	Failed	No I/O Power	1	Minnesota\Eden ...	USRTC-PLANTW...	Rosemor
XMT-239E	19	6/5/2009 3:20:00 ...	Failed	Broken glass	1	Texas\Austin\En...	USRTC-PLANTW...	Rosemor
FC-111	25	6/5/2009 3:19:53 ...	Maintenance	NPV Out of Limits	1	Texas\Austin\En...	USRTC-PLANTW...	Fisher Co
FC-111	25	6/5/2009 3:19:53 ...	Failed	Field Device Malfunction	1	Texas\Austin\En...	USRTC-PLANTW...	Fisher Co
XMT-239E	6	6/5/2009 2:56:26 ...	Failed	Field Device Malfunction	1	Texas\Austin\En...	USRTC-PLANTW...	Rosemor
XMT-239E	6	6/5/2009 2:56:26 ...	Failed	NPV Out of Limits	1	Texas\Austin\En...	USRTC-PLANTW...	Rosemor
FT-405	2	5/18/2009 12:06:5...	Advisory	Electrodes open circuit	1	Minnesota\Eden ...	USRTC-PLANTW...	Rosemor
FT-405	2	5/18/2009 12:06:5...	Advisory	Empty pipe detected	1	Minnesota\Eden ...	USRTC-PLANTW...	Rosemor
FT-405	2	5/18/2009 12:06:5...	Failed	Field device malfunction	1	Minnesota\Eden ...	USRTC-PLANTW...	Rosemor
FT-405	2	5/18/2009 12:06:5...	Abnormal	More status available	1	Minnesota\Eden ...	USRTC-PLANTW...	Rosemor

Active Alert Count = 13 Unacknowledged Alert Count = 14



# ***Making Your Manufacturing Plant Work for you with PROFIBUS***

- Take control of your investment in Drives
- Use a standard interface for all key tasks
- Rapid deployment of assets allowing fast ROI
- Fast fault diagnosis
- UNIQUE pre-emptive plant failure strategies allowing you to take control of your plant and schedule down time
- Remove the need for “just in case” inspections

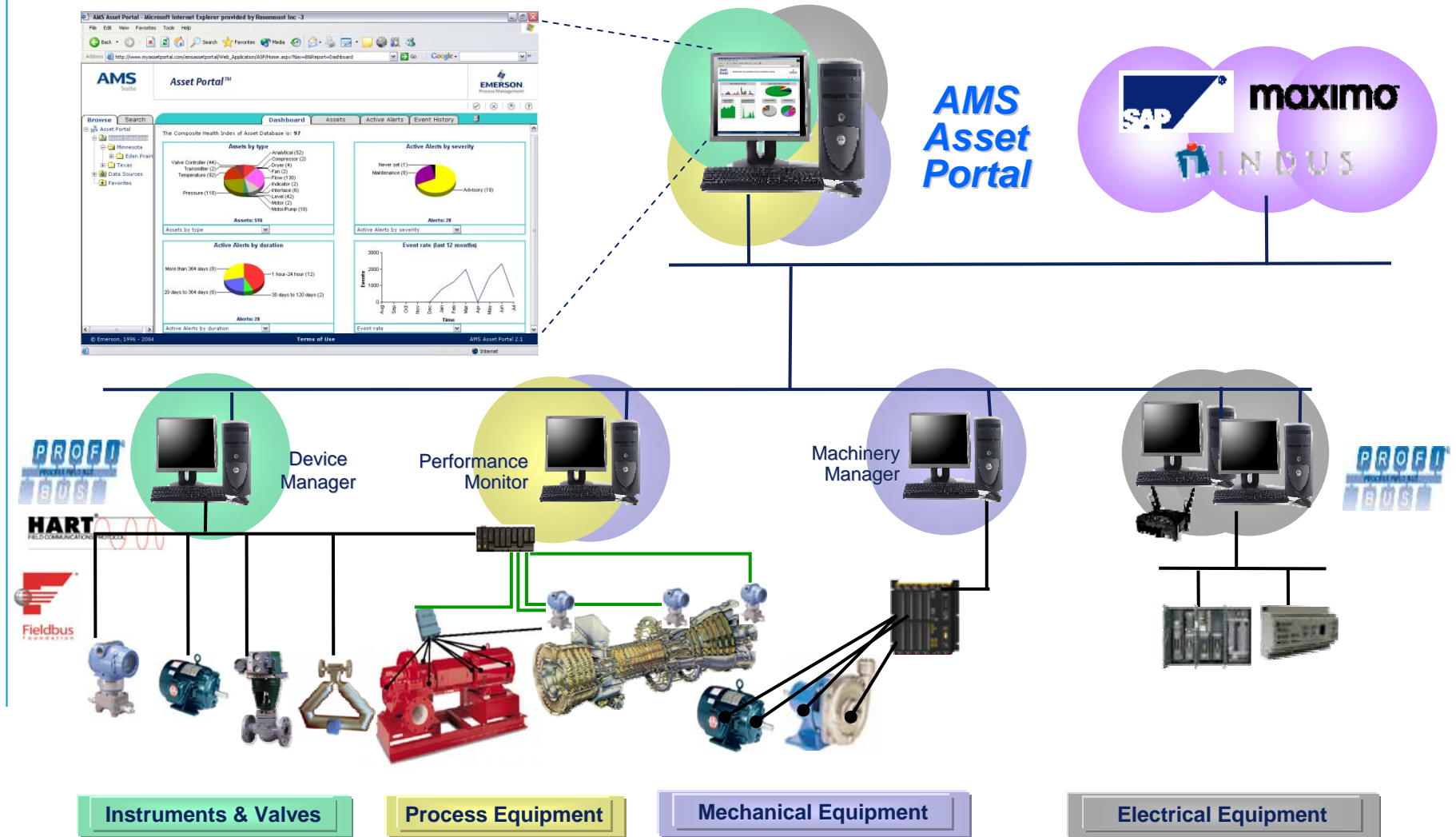
# ***Key Messages***

- Your plant's health is as critical to your business as your personal health is to you
- Careful monitoring and diagnosis using PROFIBUS helps prevent serious or unexpected problems in the future
- Emerson Process Management, PROFIBUS and Control Techniques provide this reassurance for your business

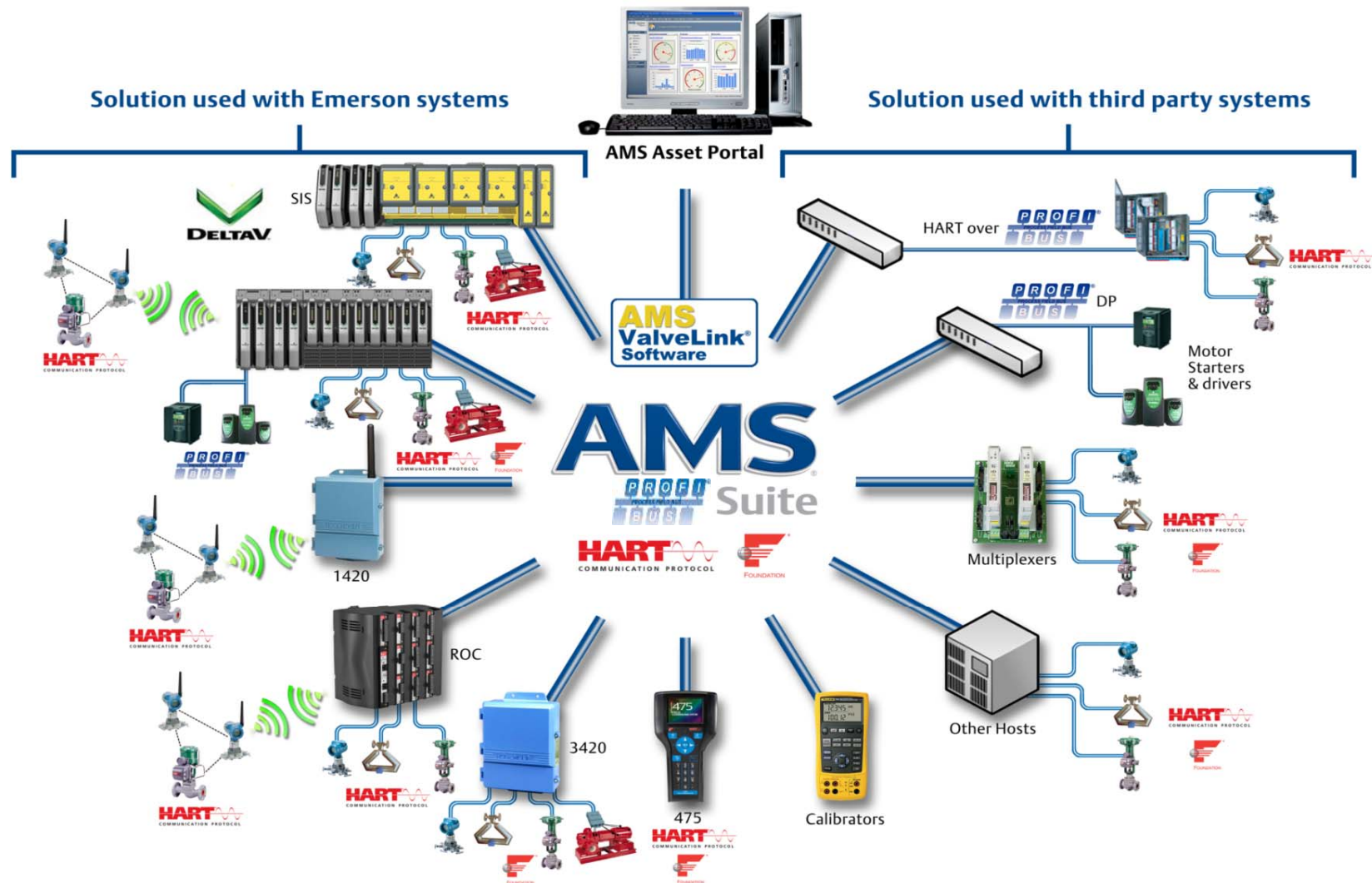
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# Asset Management Architecture



# AMS Device Manager Comprehensive Connectivity Options

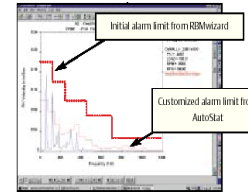


# Example Diagnostics:

Travel Deviation  
Cycle Counter  
Valve Signature  
Step Response  
Dynamic Error Band  
Drive Signal  
Output Signal



Bearing Faults  
Gear Faults  
Belt Wear  
Mounting



Boiler Sooting  
Turbine Blade Wear  
Capacity Reductions



Process Condition  
Configuration Warning  
Plugged Impulse Lines  
Electronics Failure  
Sensor Failure



Chemistry Analysis  
Contamination Alerts  
Particulates



Increased Energy Use  
Hourly Cost Increase



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



Broken rotor bars  
High resistance joints  
Voids in aluminum cast rotors  
Cracked rotor end rings



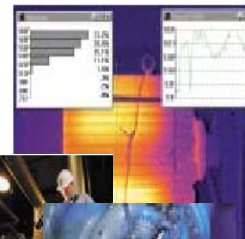
Pump Efficiency Dropping  
Equipment Efficiency Drop



Process Condition  
Configuration Warning  
RTD Drift  
RTD Life Estimation  
Electronics Failure  
Sensor Failure



Steam Traps  
Compressed Air  
Grease Points



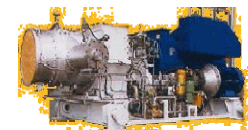
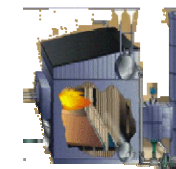
Heat Exchanger Fouling  
Cumulative Cost Increase  
Maintenance Effectiveness



Reverse Flow  
Empty Pipe  
Calibration Error  
Process Condition  
Configuration Warning  
Electronics Failure  
Sensor Failure



Alignment  
Balance  
Shaft /Coupling Wear





# Integrated Asset Management Solution provides better Decision-support, Reporting and Analysis

- A consolidated view of Asset health and Asset performance using all the different diagnostic technologies enable Industry to face tough challenges



Asset Health Views and KPI reports



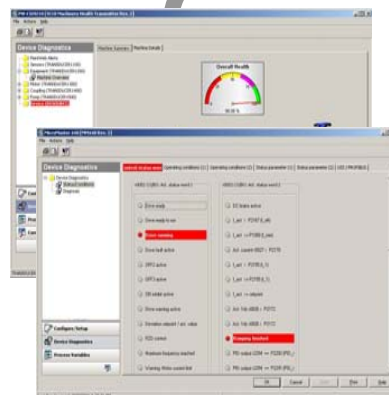
'Mechanical' Diagnostics

Process Diagnostics

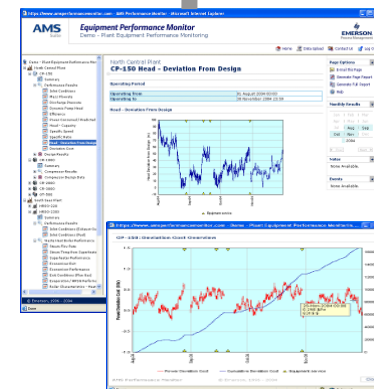
'Electrical' Diagnostics



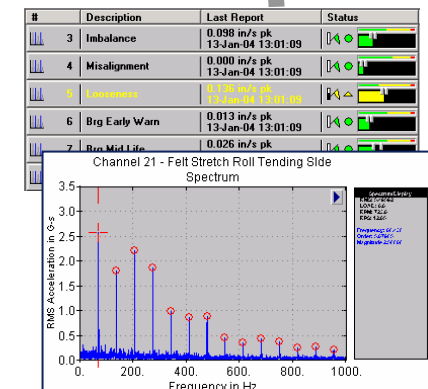
'Electrical' Diagnostics



Process Diagnostics



'Mechanical' Diagnostics



# Questions





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