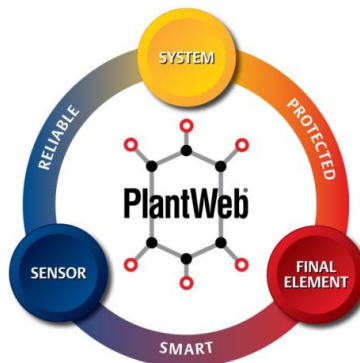


Smart SIS ***Diagnóstico e*** ***Gerenciamento de Ativos*** ***Totalmente Integrado ao*** ***Sistema Instrumentado de Segurança***

Tadeu Batista

Gerente de Vendas DeltaV SIS

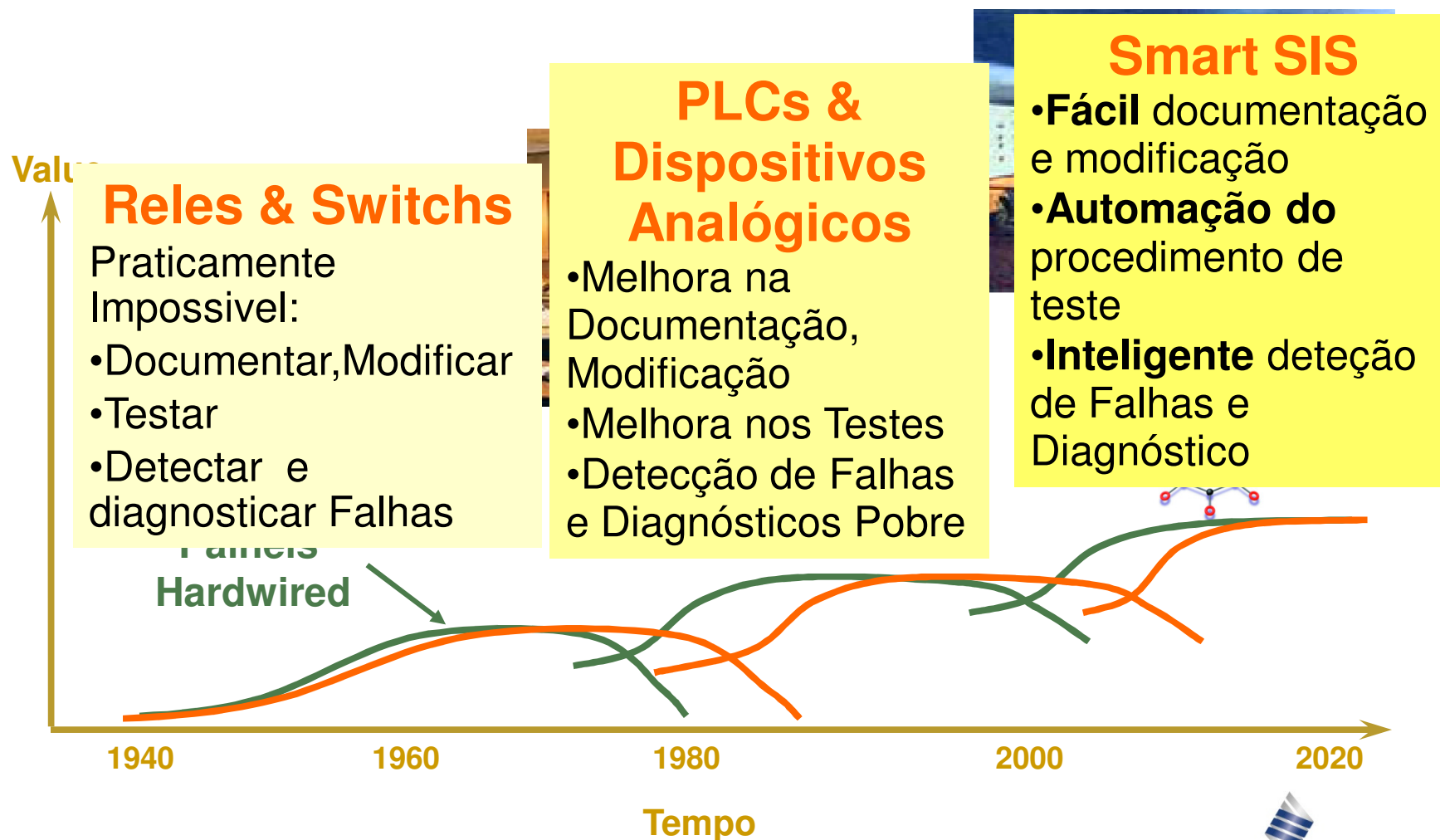
Tadeu.Batista@emerson.com



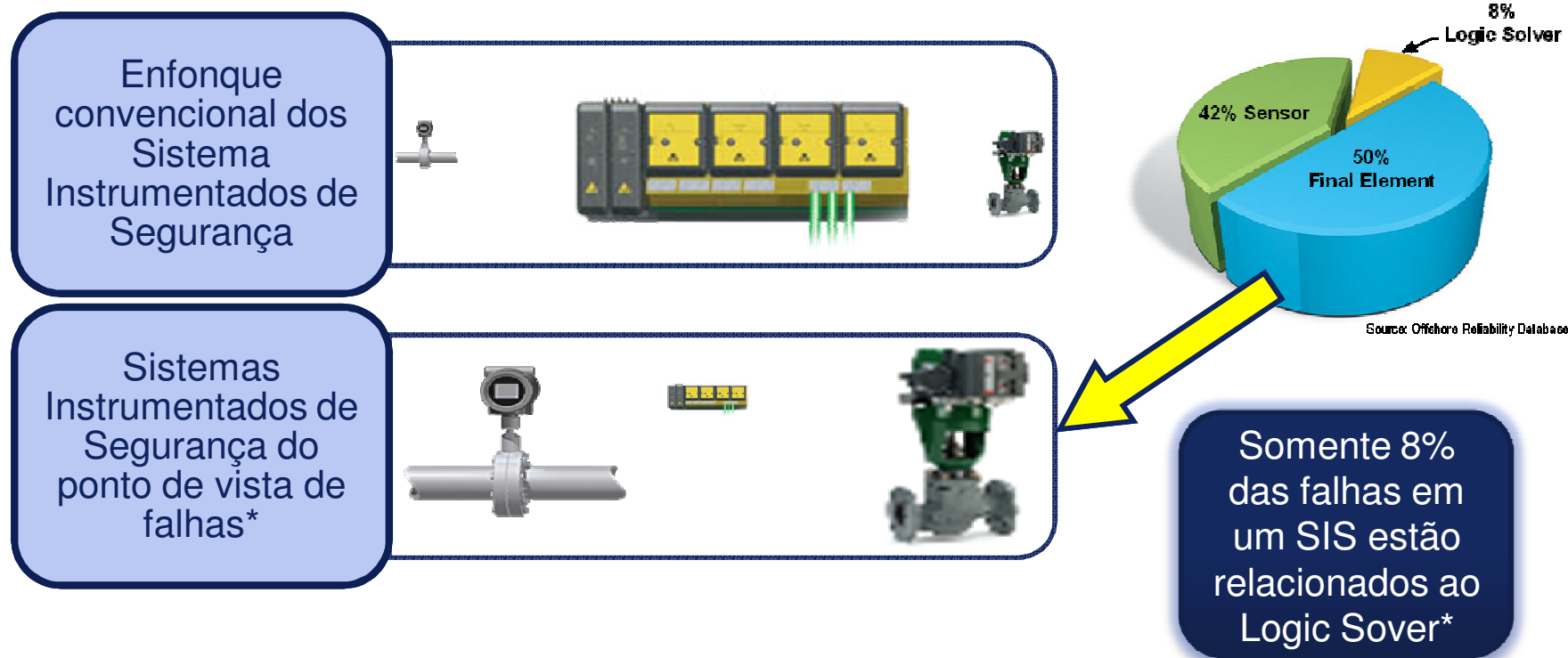
SMART SIS



Smart SIS Estende Benefícios Comprovados ao SIS

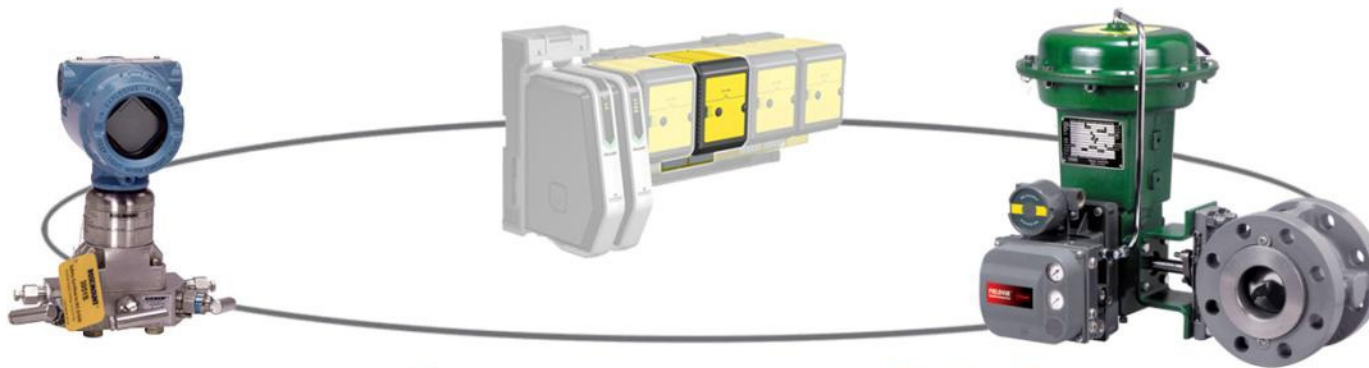


Confiabilidade depende da função de segurança completa!



*Source: OREDA (Offshore Reliability Database)

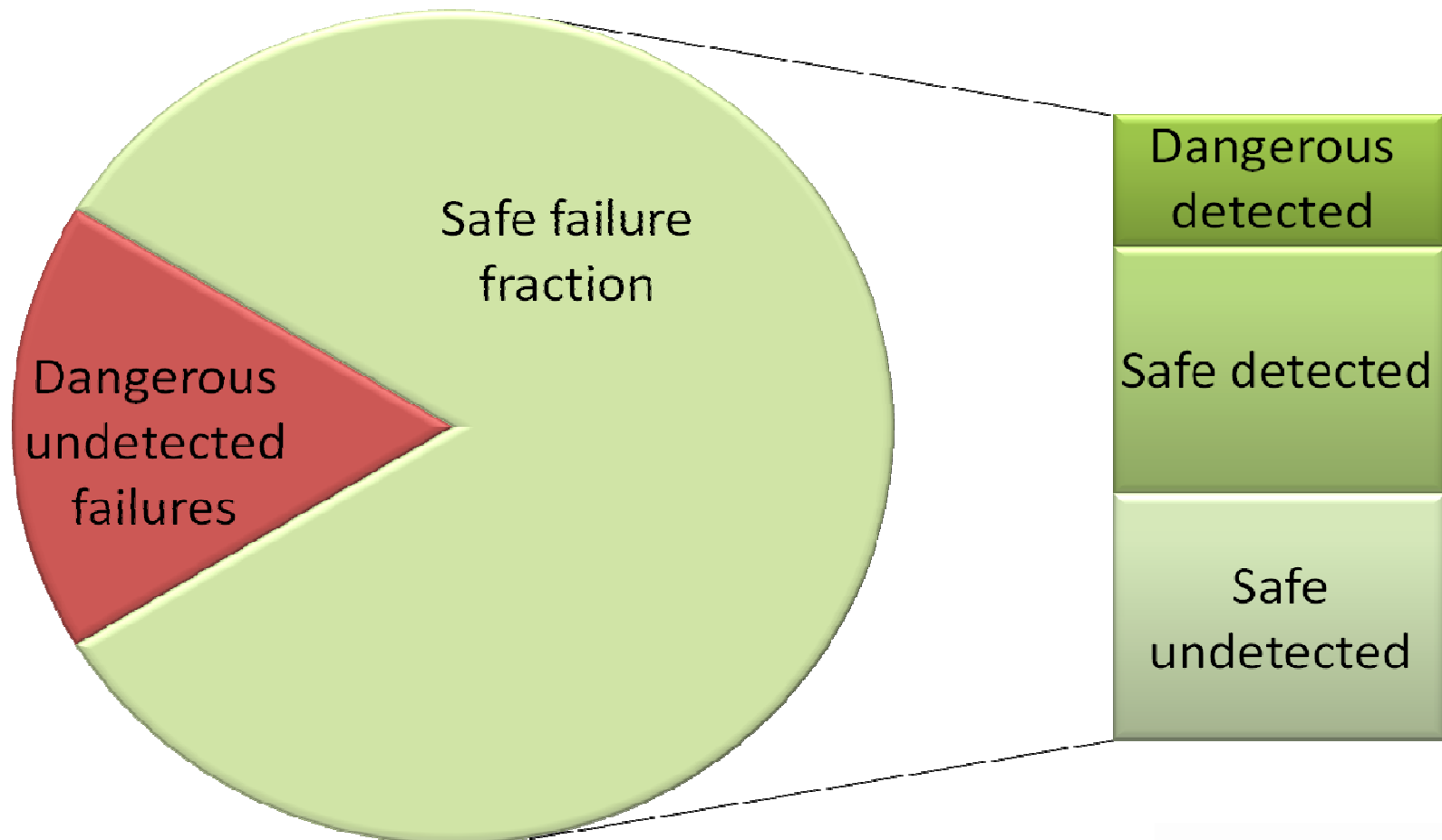
Confiabilidade de Processo Otimizada



SMART SIS

Leva a planta para Shutdown por segurança,
mantém a planta rodando de forma segura caso
um componente entre em modo de falha.

SFF



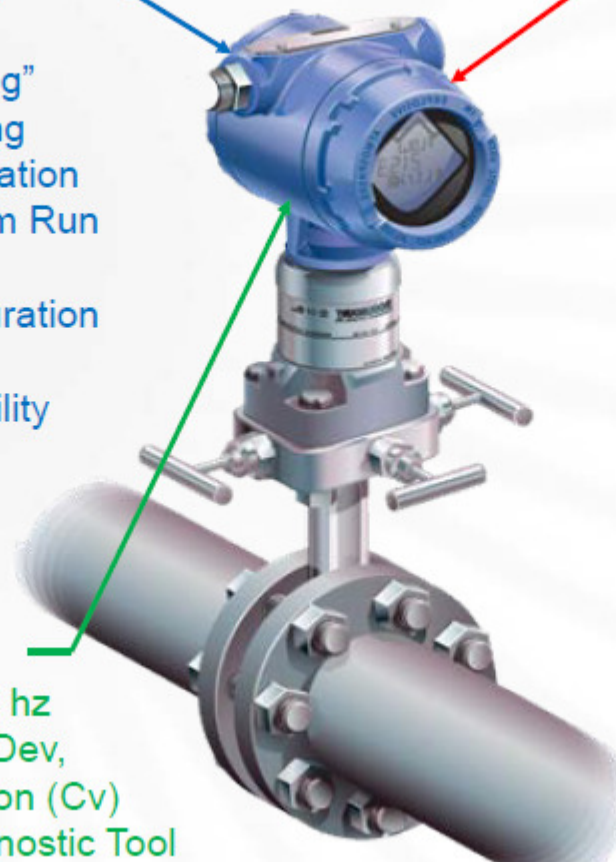
Diagnósticos Típicos

Internal Software:

- Excessive Memory Read/Writes
- Various "Watch Dog" Time-Outs Indicating Internal Communication Errors &/or Program Run Time Errors
- Change of Configuration
- Cold Start
- HW/SW Compatibility

Advanced Diagnostics:

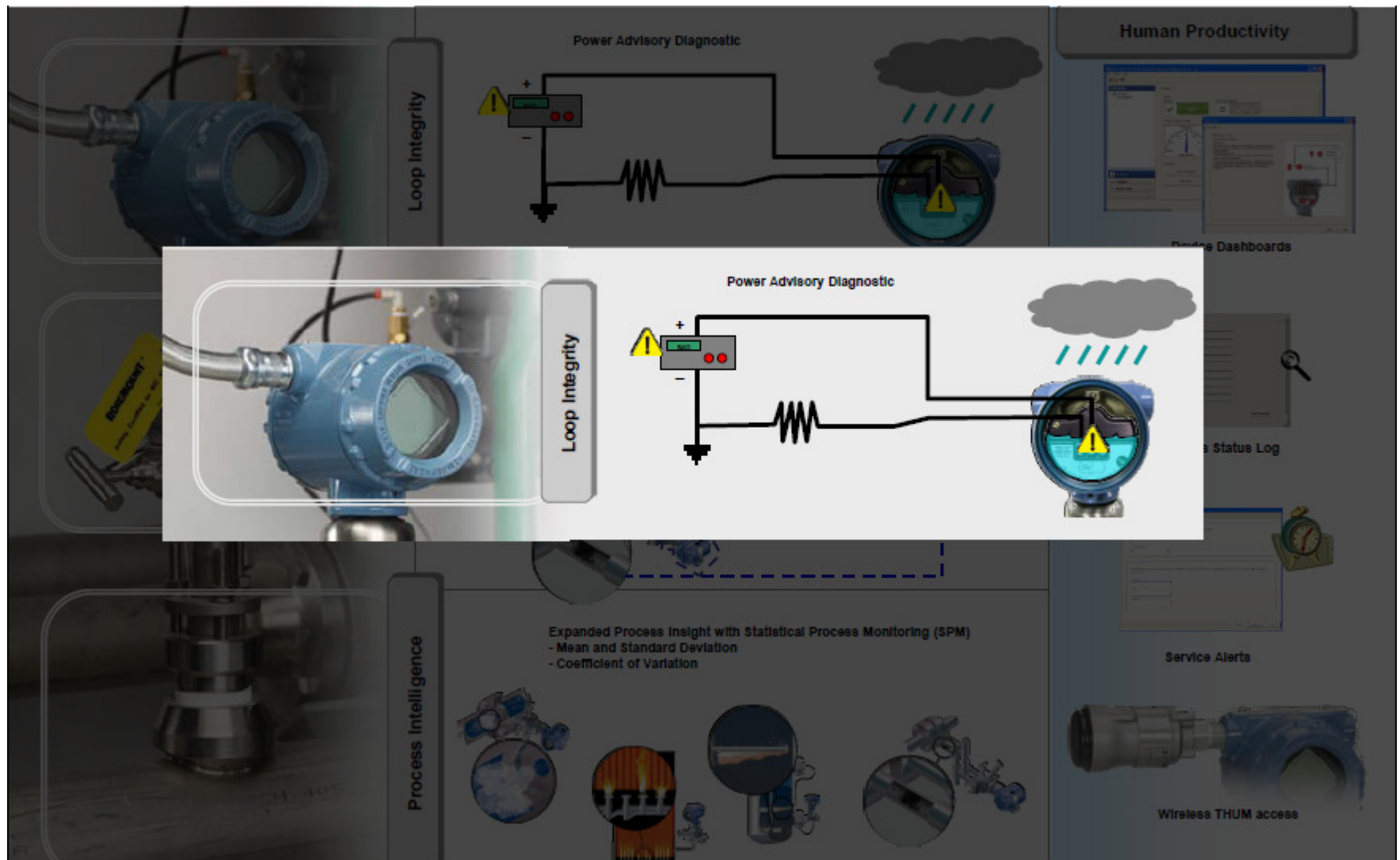
- Samples Sensor @ 22 hz
- Calculates Mean, Std Dev, & Coefficient of Variation (Cv)
- General Purpose Diagnostic Tool



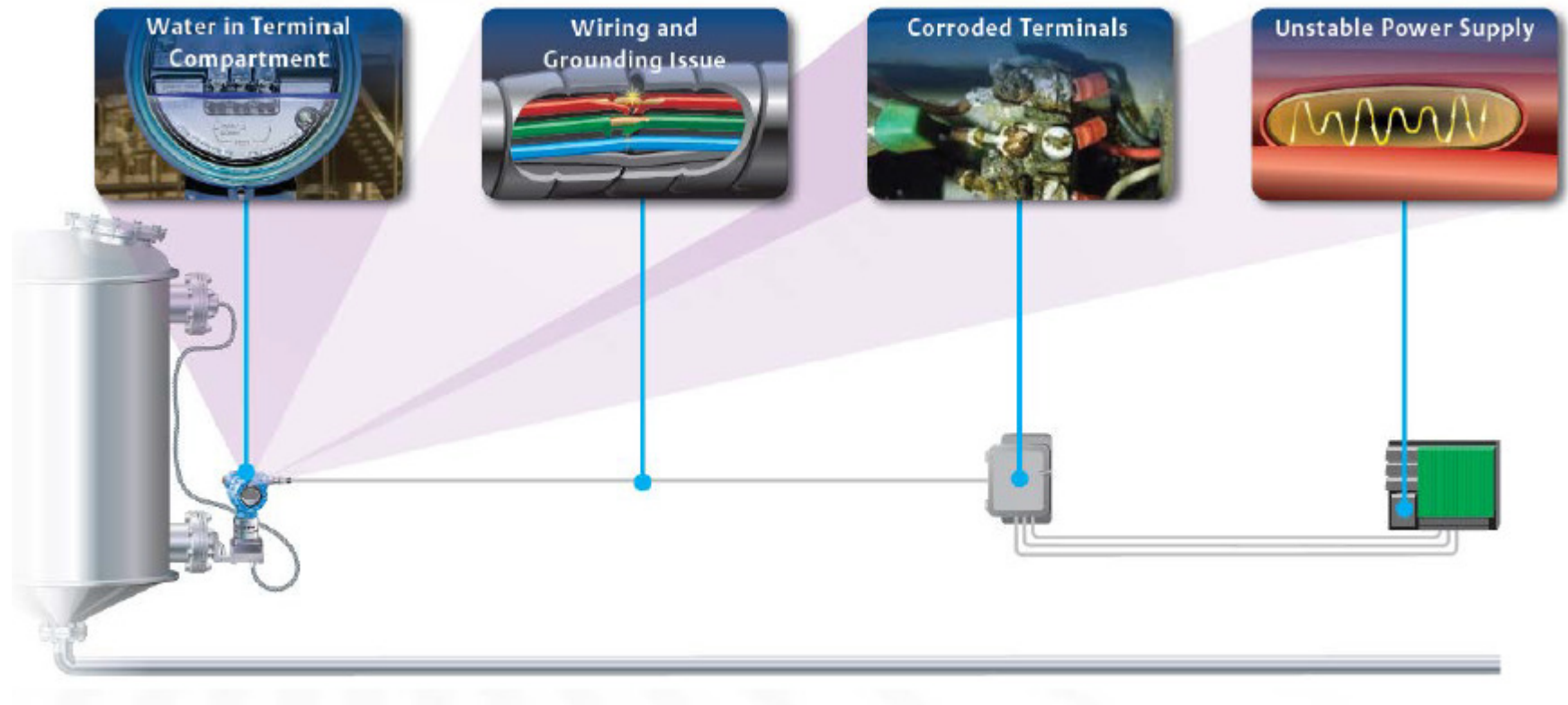
Internal Hardware:

- Pressure/Temperature Beyond Limits
- Power Advisory
- LCD Update Error
- Analog Output Fixed/Saturated/Erroneous
- Sensor Module Failure
- Sensor Module Memory Failure
- Circuit Board Memory Failure
- General Circuit Board Failure
- Stuck Zero/Span Buttons

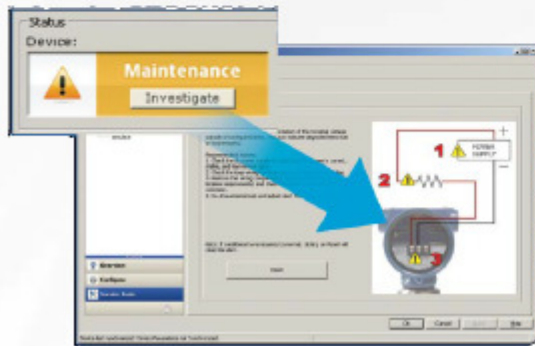
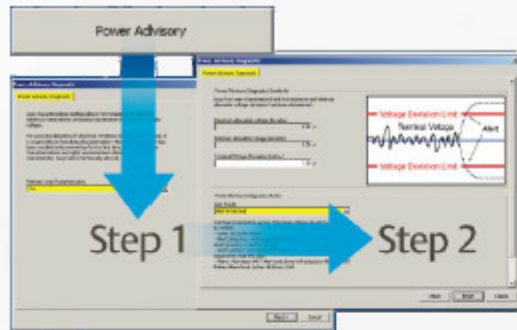
Diagnóstico Avançado – Power Advisory



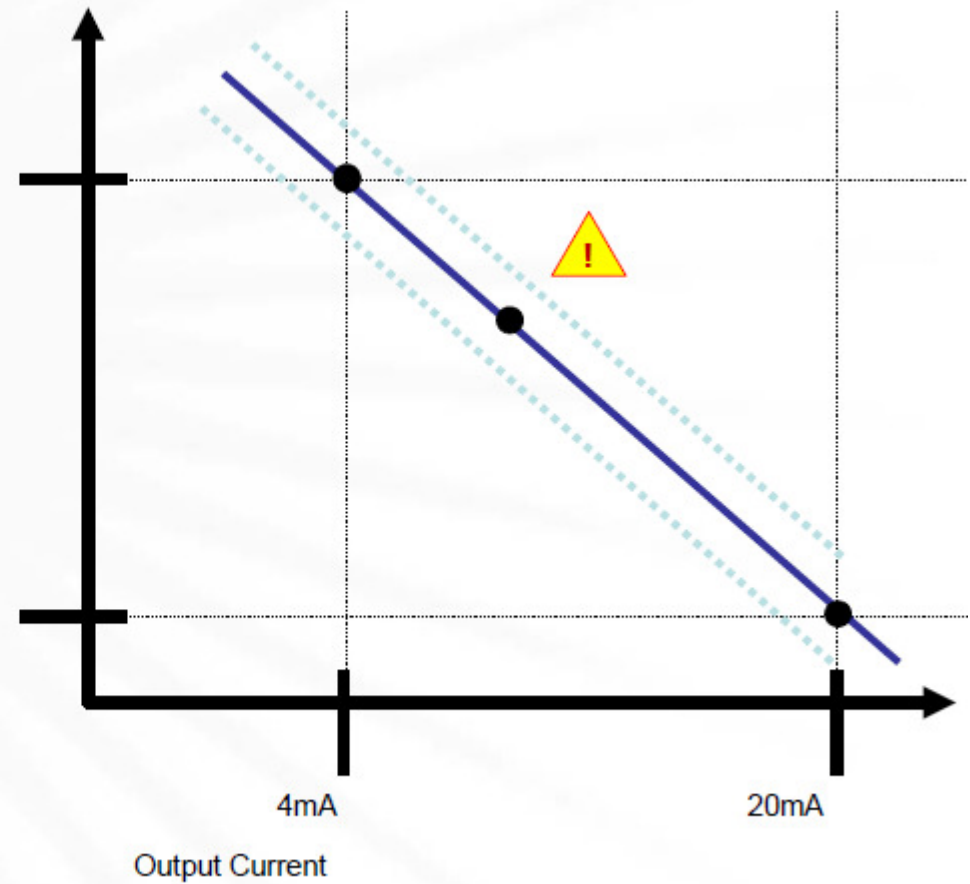
Diagnóstico Avançado – Power Advisory



Diagnóstico Avançado – Power Advisory



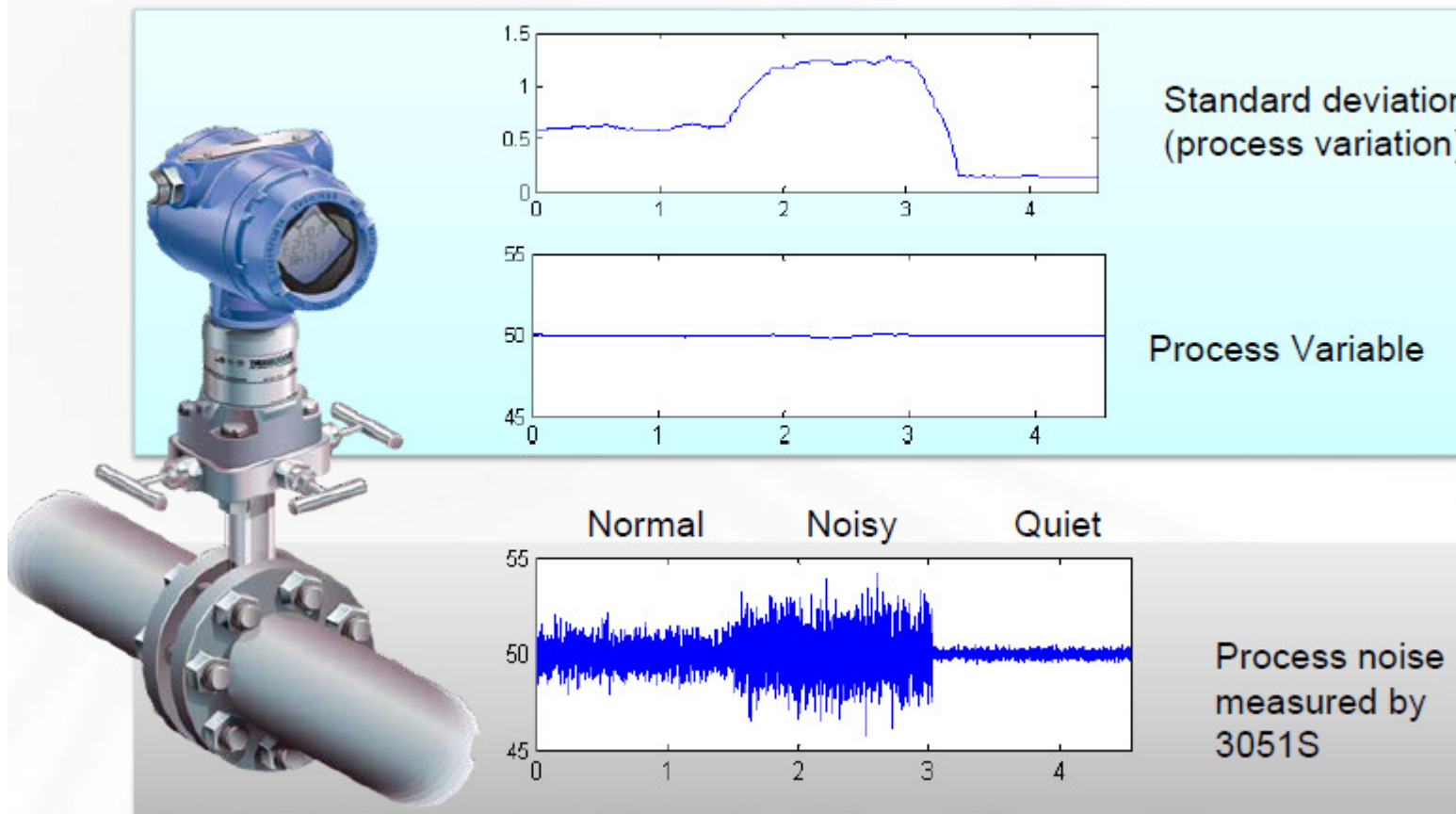
Terminal Voltage (Volts)



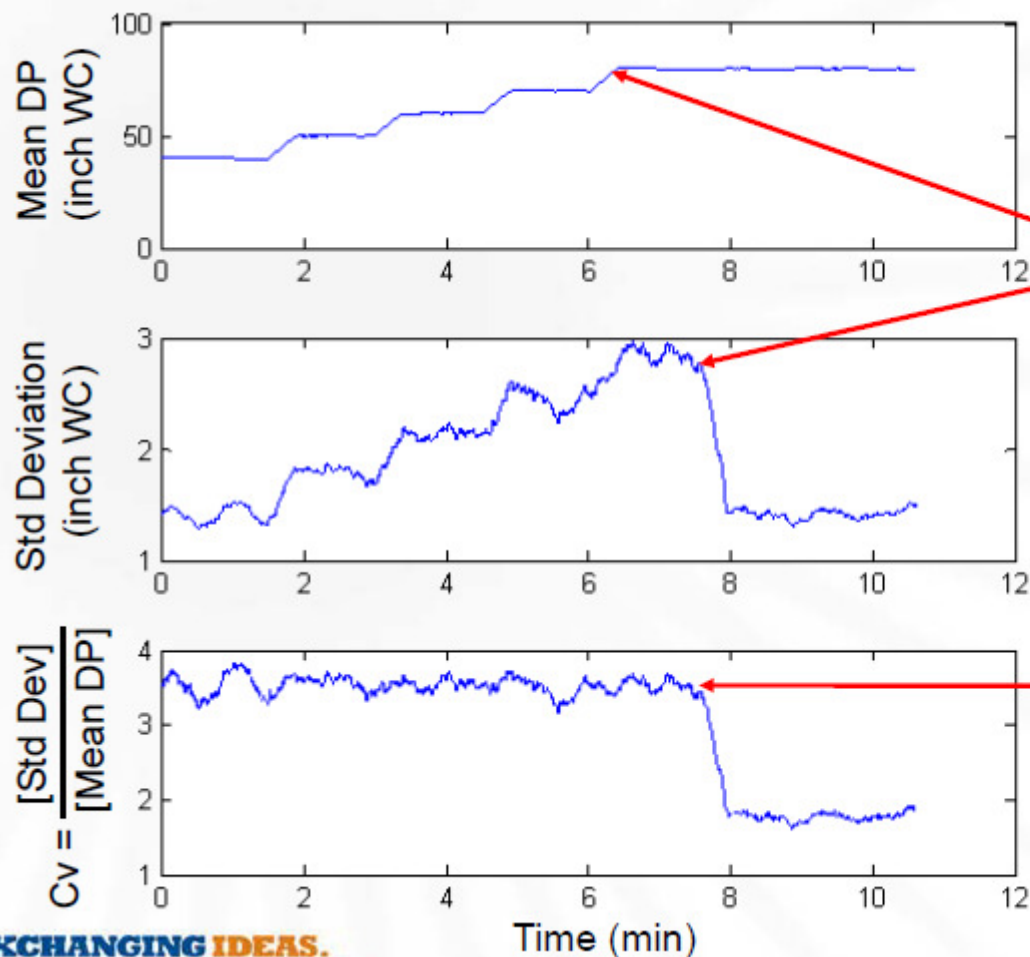
Diagnóstico Avançado – SPM (Statistical Process Monitor)



Turns process noise into valuable information



Diagnóstico Avançado – SPM (Statistical Process Monitor)



For Many Processes
Std Dev Increases
With Mean

Cv Often Stays
~ Constant

EXCHANGING IDEAS.

EMERSON

Diagnóstico Avançado – SPM (Statistical Process Monitor)



Diagnostic Application	Customer Site	R&D Facility	Emerson Lab	In Theory
Plugged Impulse Lines	X		X	
Catalyst Circulation in FCC	X			
Coal Pulverizer Primary Fan Wear	X			
Coated / Plugged Annubar	X			
Pulsation Induced Measurement Error	X			
Distillation Column Flooding		X		
Furnace Flame Instability		X		
Wet Gas Flow		X		

Diagnóstico Avançado – SPM (Statistical Process Monitor)

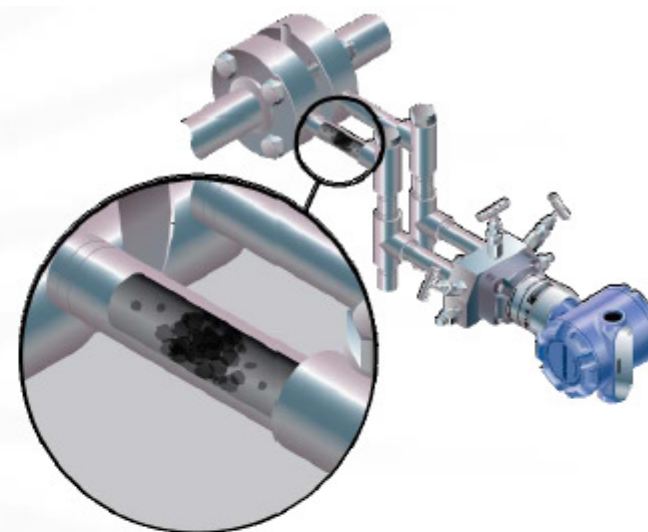
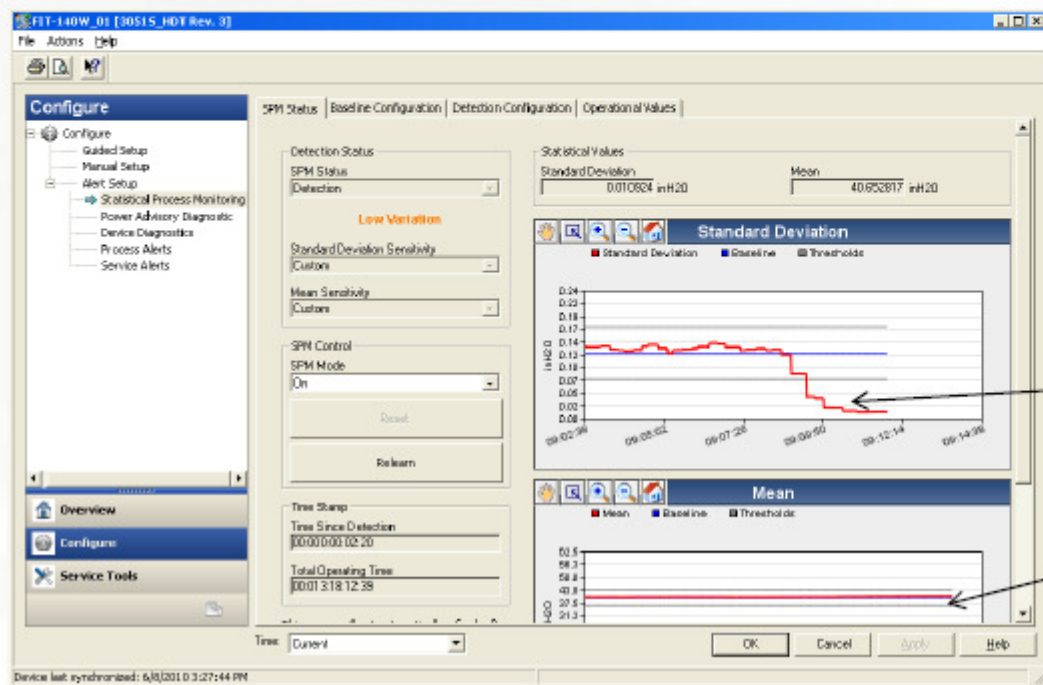


Diagnostic Application	Customer Site	R&D Facility	Emerson Lab	In Theory
Aerated Liquid Flow			X	
Agitation Loss in DP Level			X	
Bubbler Tank Level			X	
Process Leak Detection			X	
Pump / Valve Cavitation			X	
Steam Trap Failure				X
Turbine Blade Wear & Coating				X
Wet Steam Flow				X

Diagnóstico Avançado – SPM (Statistical Process Monitor)



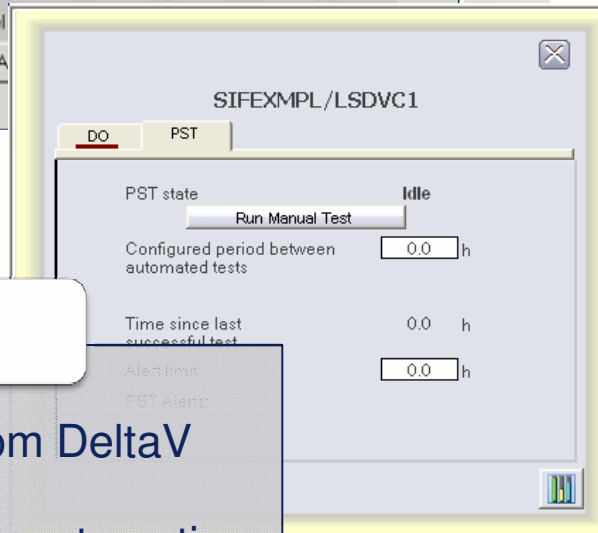
Diagnóstico Avançado – SPM (Statistical Process Monitor)



Impulse Line
Plugs

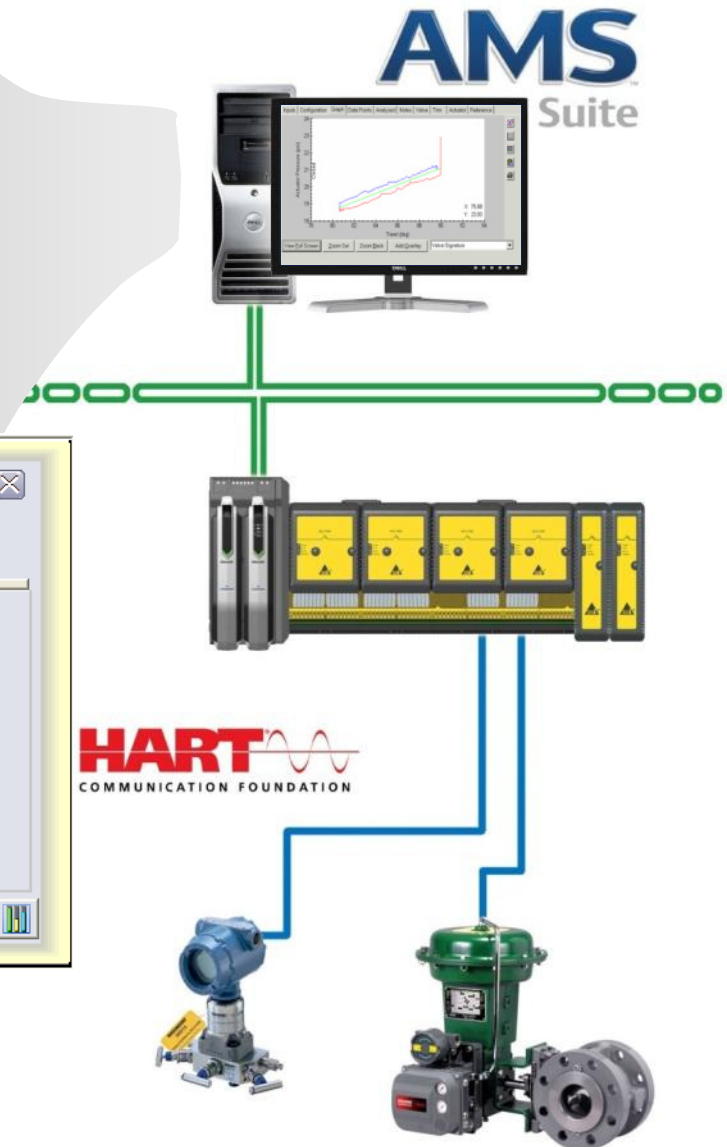
No Change
in PV

Fisher DVC6000 SIS Partial Stroke



Pontos Chave

- Teste automatizado com DeltaV SIS logic solver
- AMS permite gravação automática de dados – IEC 61511
- Aumento no Intervalo de Testes



Opções de Teste de Válvulas



Offline

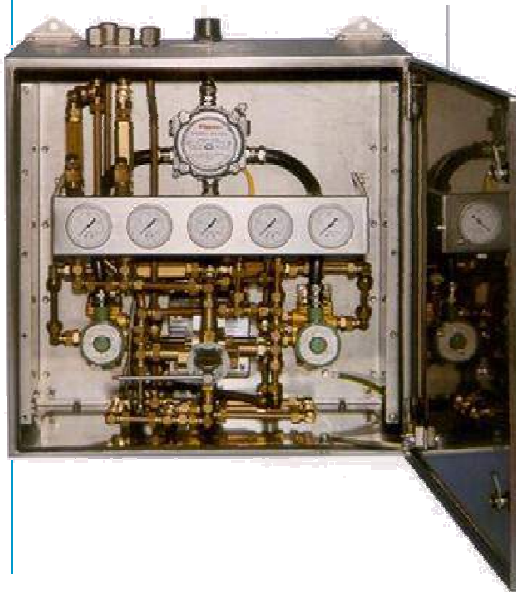
- Total Stroke
- Parada do Processo

Online

- Total stroke
 - By-pass in service
- Component test
 - Solenoid valve
- Partial stroke



Opções de Teste de Válvulas

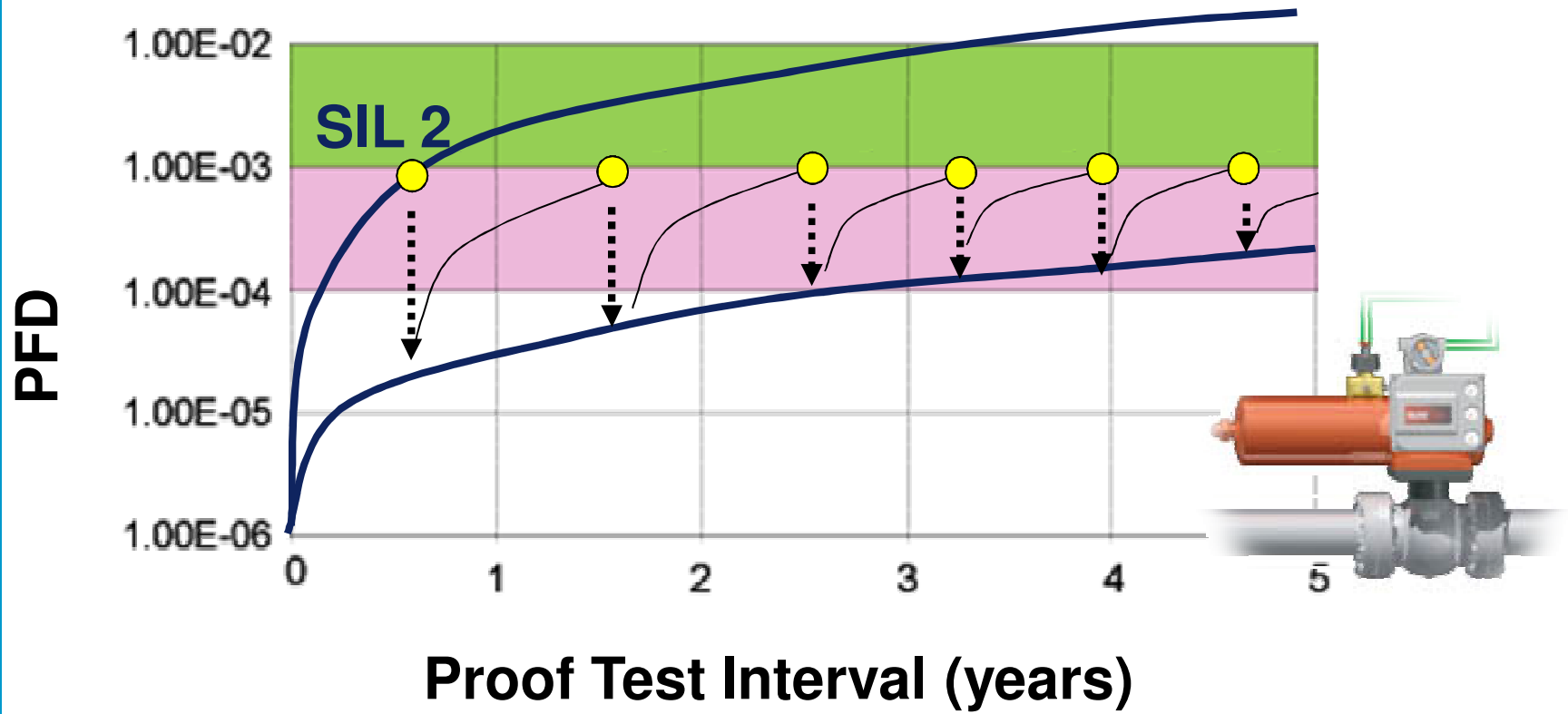


Metodos de Teste Convencionais

- Processo desprotegido durante o teste
- SIF não retorna ao normal após o teste
- Risco de trip expurio
- Iniciado manualmente pelo campo
- Uso extensivo de mão de obra
- Sujeito a erro



Partial Stroke



Cobertura dos Testes



Falhas	Modo de Falha	Partial Stroke	Full Stroke
Engaxetamento Gasto	Falha ao Fechar	X	X
Engaxetamento Apertado	Move Devagar	X	X
Restrição linha ar Atuador	Move Devagar	X	X
Entupimento linha ar Atuador	Falha ao Fechar	X	X
Haste da válvula agarrando	Falha ao Fechar	X	X
Sede da Válvula arranhada	Falha na Vedação		X
Sede da Válvula com encrustação	Falha na Vedação		X
Sede Entupida	Falha na Vedação		X

Source: Instrument Engineers' Handbook, Table 6.10e – Dangerous Failures, Failure Modes, and Test Strategy



Diagnóstico Integrado ao Logic Solver

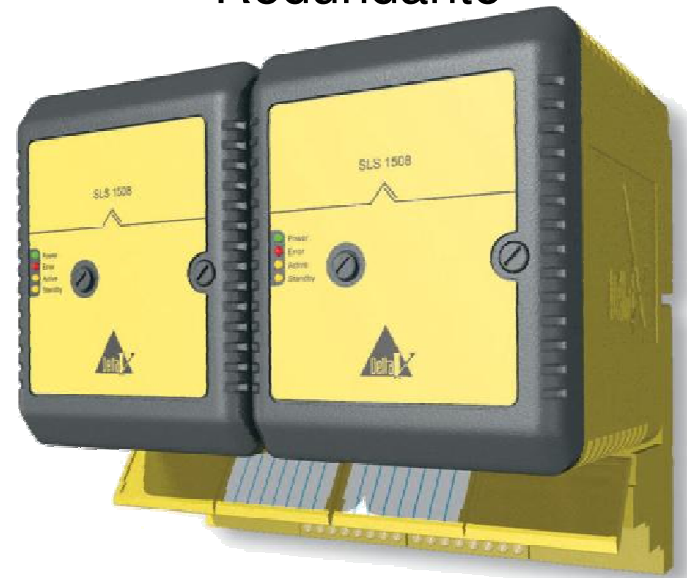


Logic Solver
Simplex



MTTFS = 33 Anos

Logic Solver
Redundante

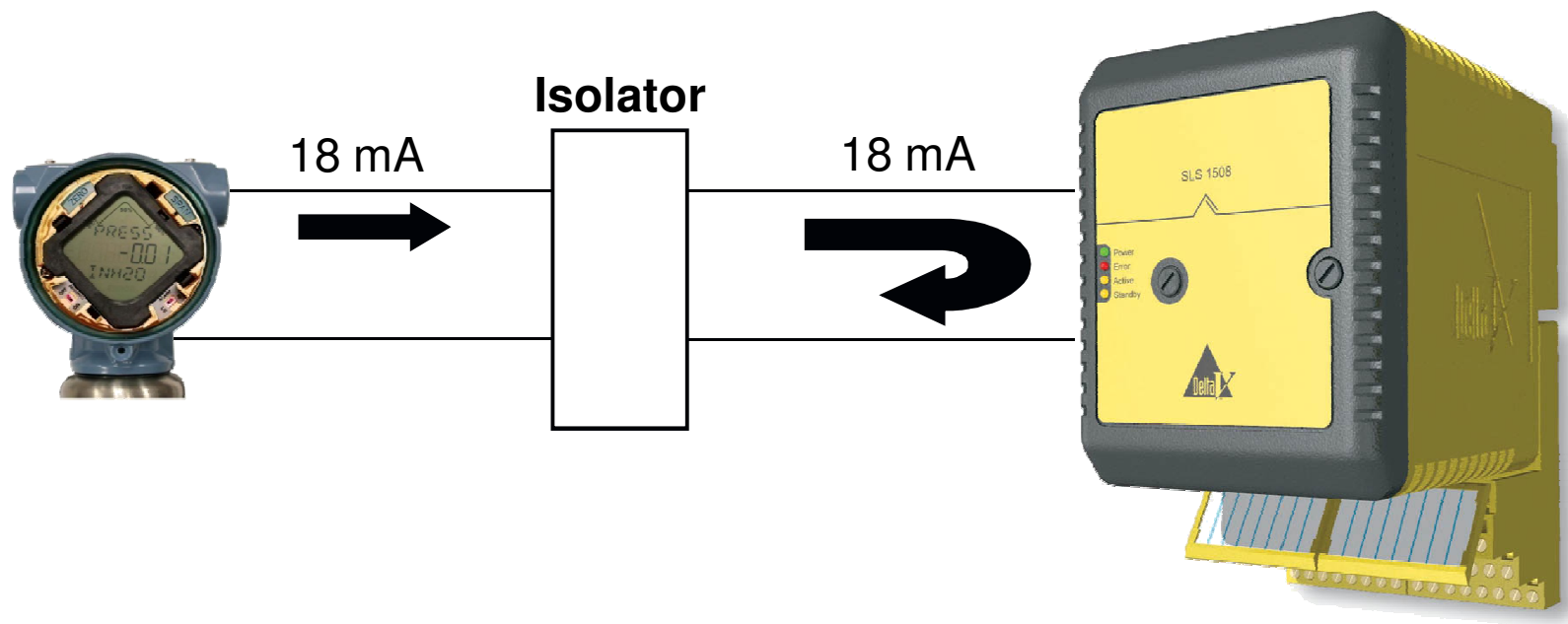


MTTFS = 3000 Anos

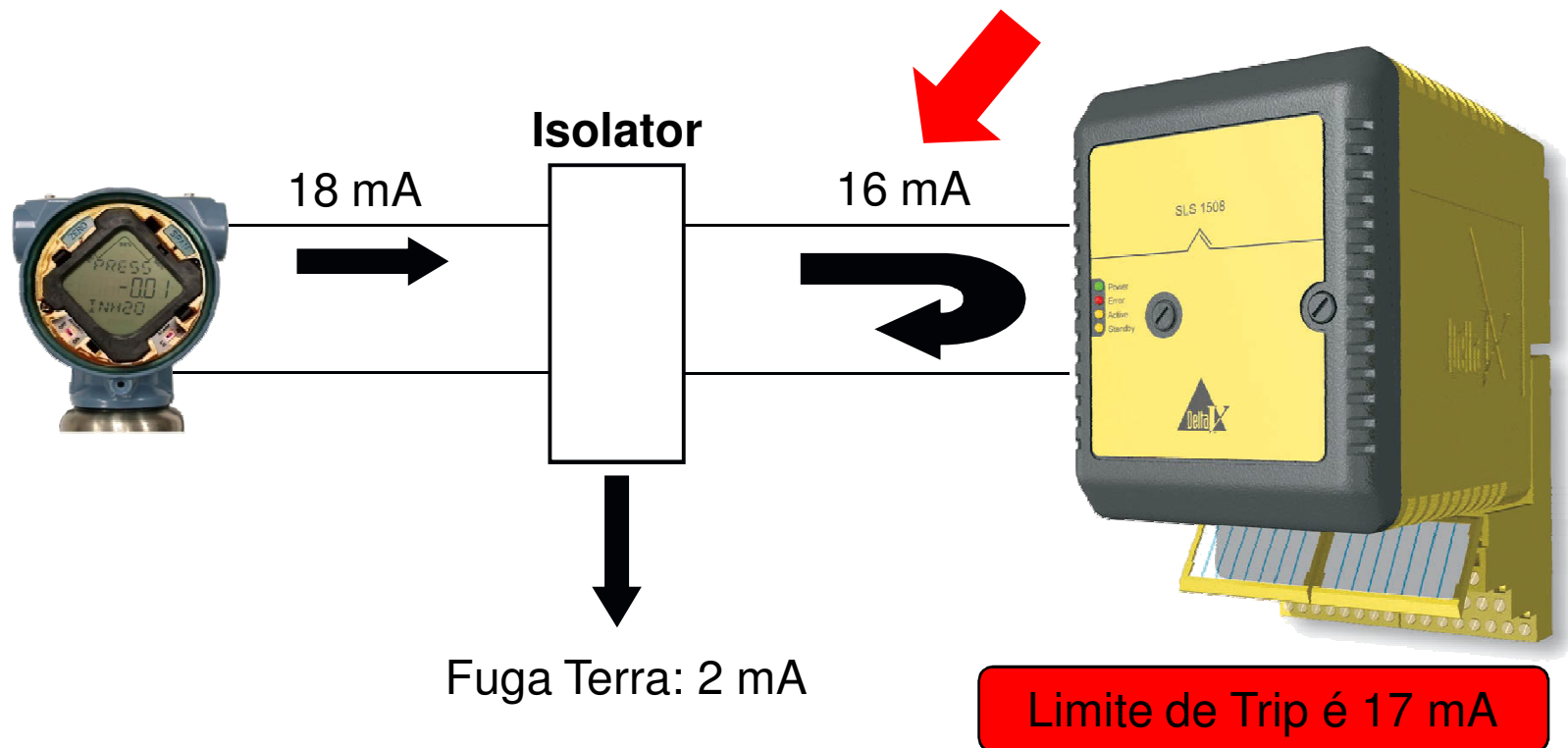
Pontos Chave

- Logic Solver modular com I/O configurável
- Redundância Flexível
- Certificação SIL 3 para SLS Simplex ou Redundante
- Scan Rate Determinístico
- Proof Test automático do Logic Solver
- Suporte ao HART v7

Monitora a Saúde do Campo



Monitora a Saúde do Campo



DeltaV SIS irá detectar a falha,
através de comparação automática
entre Corrente & HART PV



Realizando Loop Teste com Diagnóstico



The screenshot displays the Exploring DeltaV software interface. The main window shows a tree view of containers on the left, including 'SL54 (CTLR-SIS02/C01)', 'SL55 (CTLR-SIS02/C05)', and 'Assigned SIS Modules'. The 'Contents of 'REACT_SHUTDOWN'' table lists various function blocks and parameters. A context menu is open over the 'PT-505-2' container, showing options like 'Explore', 'Diagnose', and 'Methods'. The 'Methods' menu is expanded, showing 'Diagnostics and Test' with sub-options 'Self test' and 'Loop test'. A 'Loop test - PT-505-2' dialog box is open, prompting the user to 'Choose analog output level' with radio button options: '4mA', '20mA' (selected), 'Simulate Alarm', 'Other', and 'End'. The 'Next >' button is highlighted.

Name	Type	Parameter Value
LSAVTR1	Function Block	
LSAVTR2	Function Block	
LSAVTR3	Function Block	
LSCEM1	Function Block	
EXEC_TIME	Parameter	
SIF_ALERTS	Parameter	

Loop test - PT-505-2

Choose analog output level

☐ 4mA

☒ 20mA

☐ Simulate Alarm

☐ Other

☐ End

Next > Cancel Help

S Loop test- Allows the User to manually manipulate the Analog Output to a selected (User: ADMINISTRATOR | 17 object(s) | 11-May-11, Slide 24



Realizando Loop Teste com Diagnóstico



[AREA_A/PT-505 [On-Line Mode] Running] - Control Studio

File Edit View On-line/Debug Tools Graphics Window Help

100%

PT-505

- LSAI1
- LSAI2
- LSAVTR1

Filtered by: ☒ ☒ ☒ ☒ ☒ ☒ ☒ ☒

Alphabetic Categorized

Parameter	On-line value
STARTUP_TIME	0
STARTUP_TI...	0
STATUS_OPT	Will Not Vot...
TIME_TO_ST...	0
TRIP_DELAY	0
TRIP_HYS	0.5
TRIP_LIM	90
TRIP_STATUS	Normal
TRIP_VOTE_IN1	False
TRIP_VOTE_IN2	False
TRIP_VOTES	0

LSAI1

OUT #1

100.021 X

IO_IN=SLS5/CH03/FIELD_VAL_PCT

LSAI2

OUT #2

61.3875

IO_IN=SLS5/CH01/FIELD_VAL_PCT

LSAVTR1

IN1 IN2

OUT_D #3

1

True

SECPARAM1

For Help, press F1

Assigned to: SLS5

NUM

Properties

CH07

CH08

CH09

Loop test- Allows the User to manually manipulate the Analog Output to a selected (User: ADMINISTRATOR | 17 object(s) | Configure All | Download All | NUM

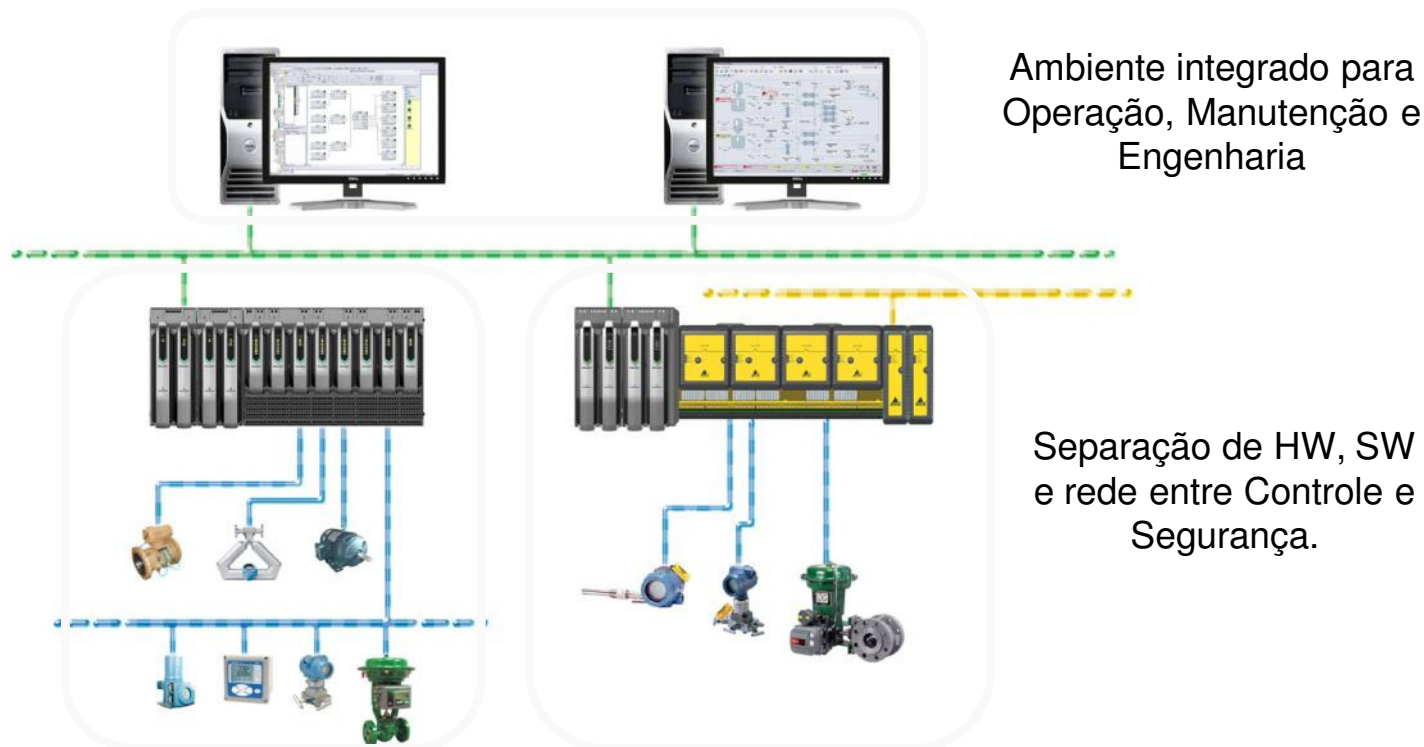
EMERSON Process Management

Logic Solver

Totalmente Integrado ao Sistema



Arquitetura Integrada, porém separada



Oferece os benefícios da separação total e da integração total, sem os pontos negativos do dois extremos.



DELTA V SIS

Uso do Diagnóstico na FLS

The screenshot displays the DeltaV Operate (Run) interface. The main window shows the 'SIS_EXAMPLE_1' module with a 'Main' tab. A 'Faceplate FB' window is open, displaying the 'SIS_EXAMPLE_1/LSAVTR1' configuration. The 'Trip' tab is selected, showing the following parameters:

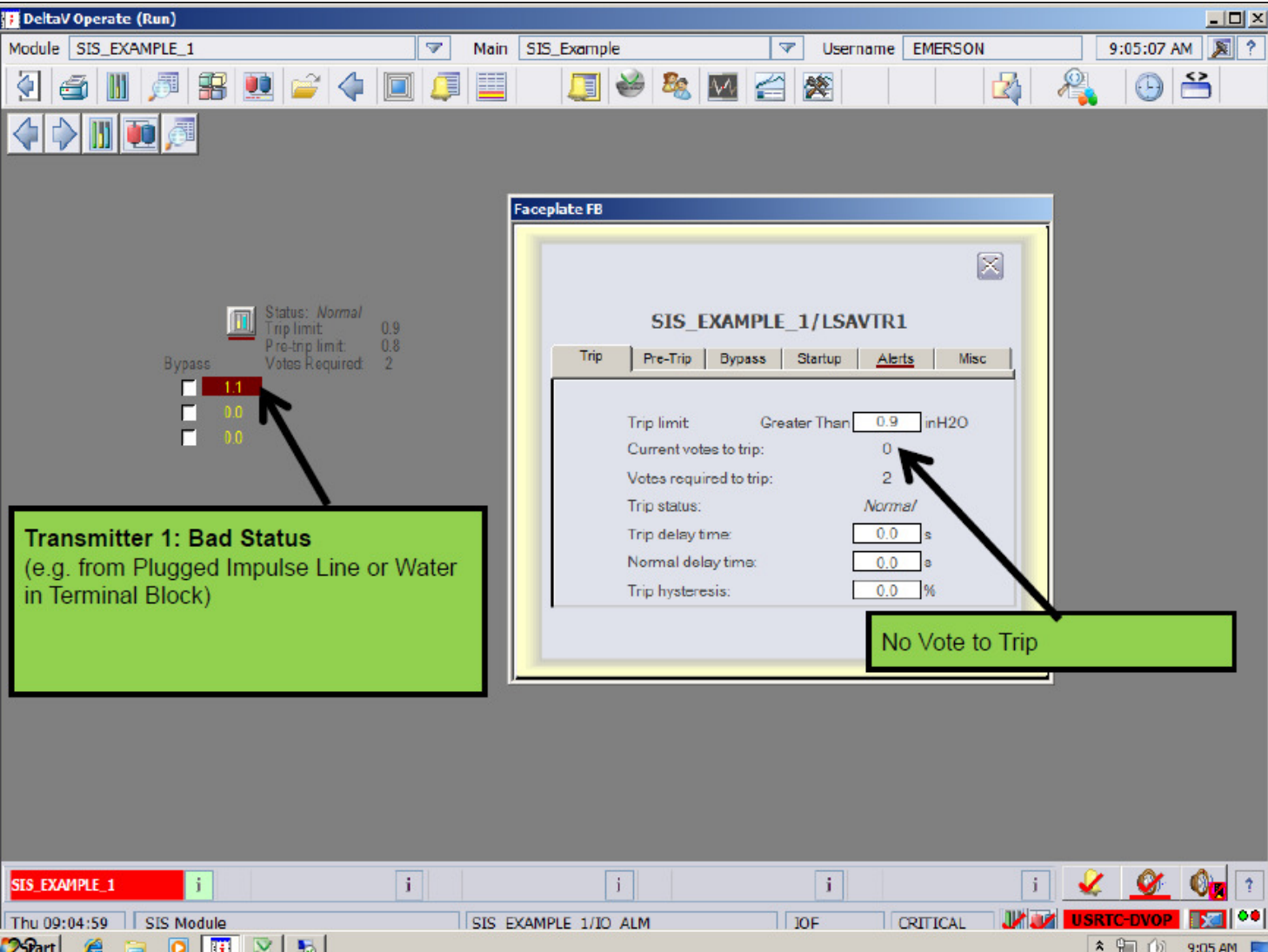
- Trip limit: Greater Than 0.9 inH2O
- Current votes to trip: 0
- Votes required to trip: 2
- Trip status: Normal
- Trip delay time: 0.0 s
- Normal delay time: 0.0 s
- Trip hysteresis: 0.0 %

On the left side of the main window, the 'Status: Normal' is displayed, along with a 'Bypass' section showing three checkboxes, each with a value of 0.0. A green box highlights the text:

SIS 2oo3 Voting Logic
Trip Limit = 0.9

Configured as "Do Not Vote" on Bad Status

Uso do Diagnóstico na FLS



DeltaV Operate (Run)

Module: SIS_EXAMPLE_1 | Main: SIS_Example | Username: EMERSON | 9:05:07 AM

Faceplate FB

SIS_EXAMPLE_1/LSAVTR1

Trip | Pre-Trip | Bypass | Startup | **Alerts** | Misc

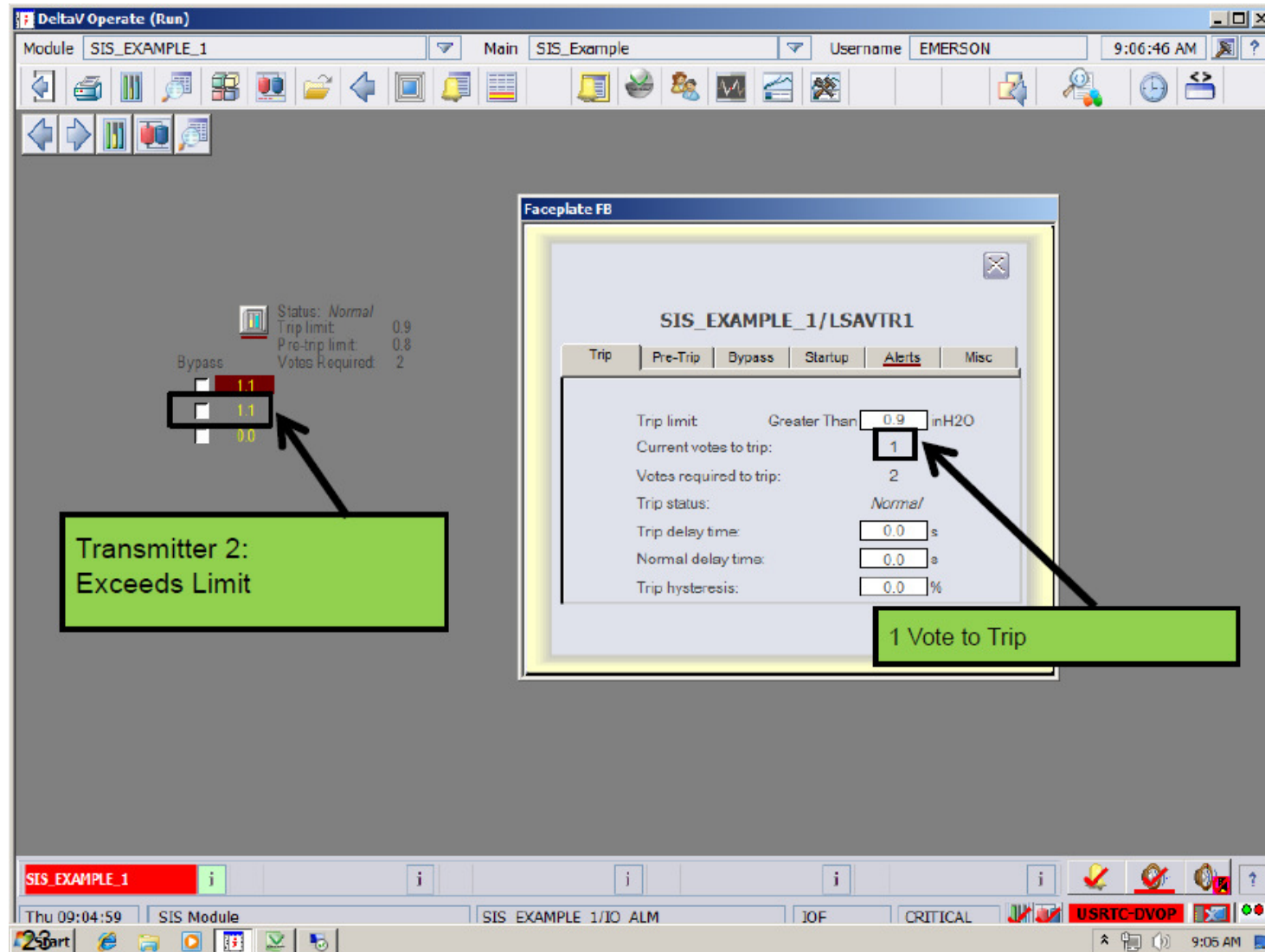
Trip limit: Greater Than 0.9 inH2O
 Current votes to trip: 0
 Votes required to trip: 2
 Trip status: Normal
 Trip delay time: 0.0 s
 Normal delay time: 0.0 s
 Trip hysteresis: 0.0 %

Transmitter 1: Bad Status
 (e.g. from Plugged Impulse Line or Water in Terminal Block)

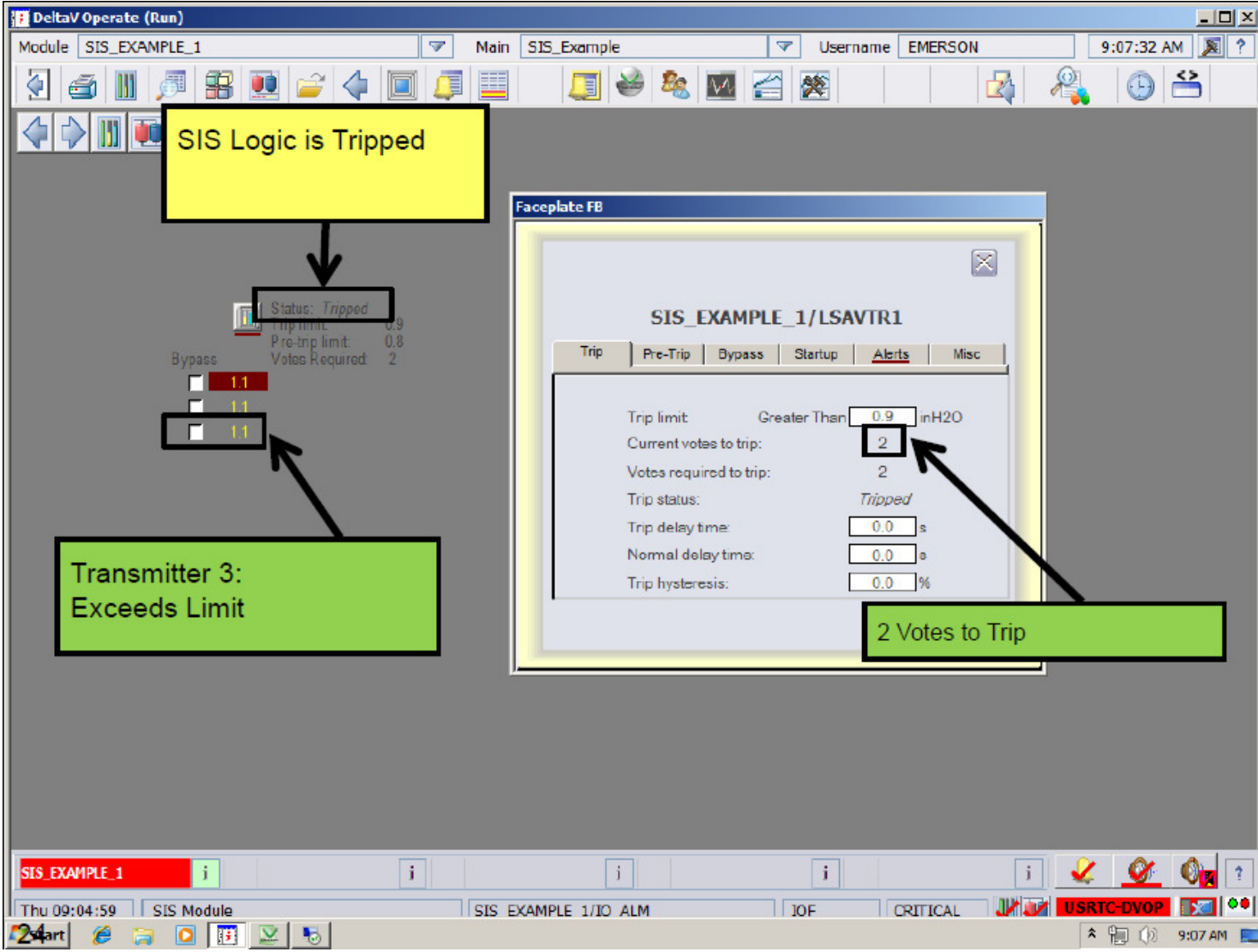
No Vote to Trip

SIS_EXAMPLE_1 | Thu 09:04:59 | SIS Module | SIS EXAMPLE 1/IO ALM | IOF | CRITICAL | USRTC-DVOP | 9:05 AM

Uso do Diagnóstico na FLS



Uso do Diagnóstico na FLS



The screenshot displays the DeltaV Operate (Run) interface for the SIS_MODULE. The main window shows the SIS Logic is Tripped status. A yellow box highlights the text "SIS Logic is Tripped". A green box highlights the text "Transmitter 3: Exceeds Limit". The interface shows the status of the SIS Logic, including the Trip limit (Greater Than 0.9 inH2O), Current votes to trip (2), Votes required to trip (2), Trip status (Tripped), Trip delay time (0.0 s), Normal delay time (0.0 s), and Trip hysteresis (0.0 %). The status bar at the bottom indicates the system is in a CRITICAL state with a USRTC-DVOP alarm.

SIS Logic is Tripped

Transmitter 3: Exceeds Limit

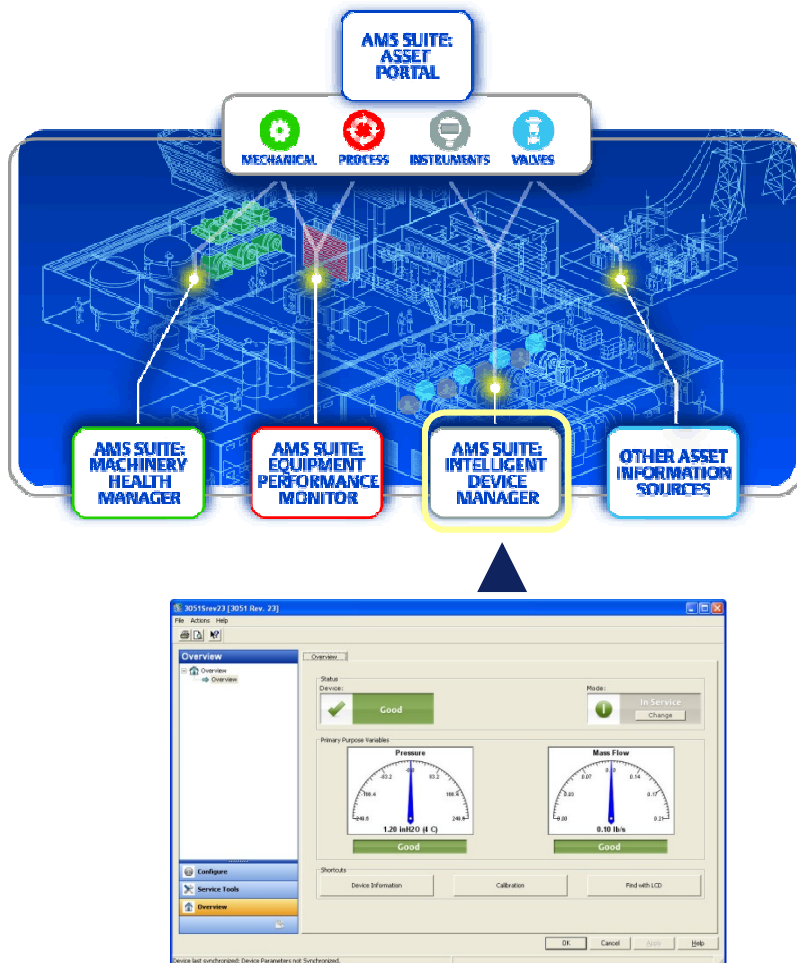
2 Votes to Trip

SIS_MODULE

CRITICAL

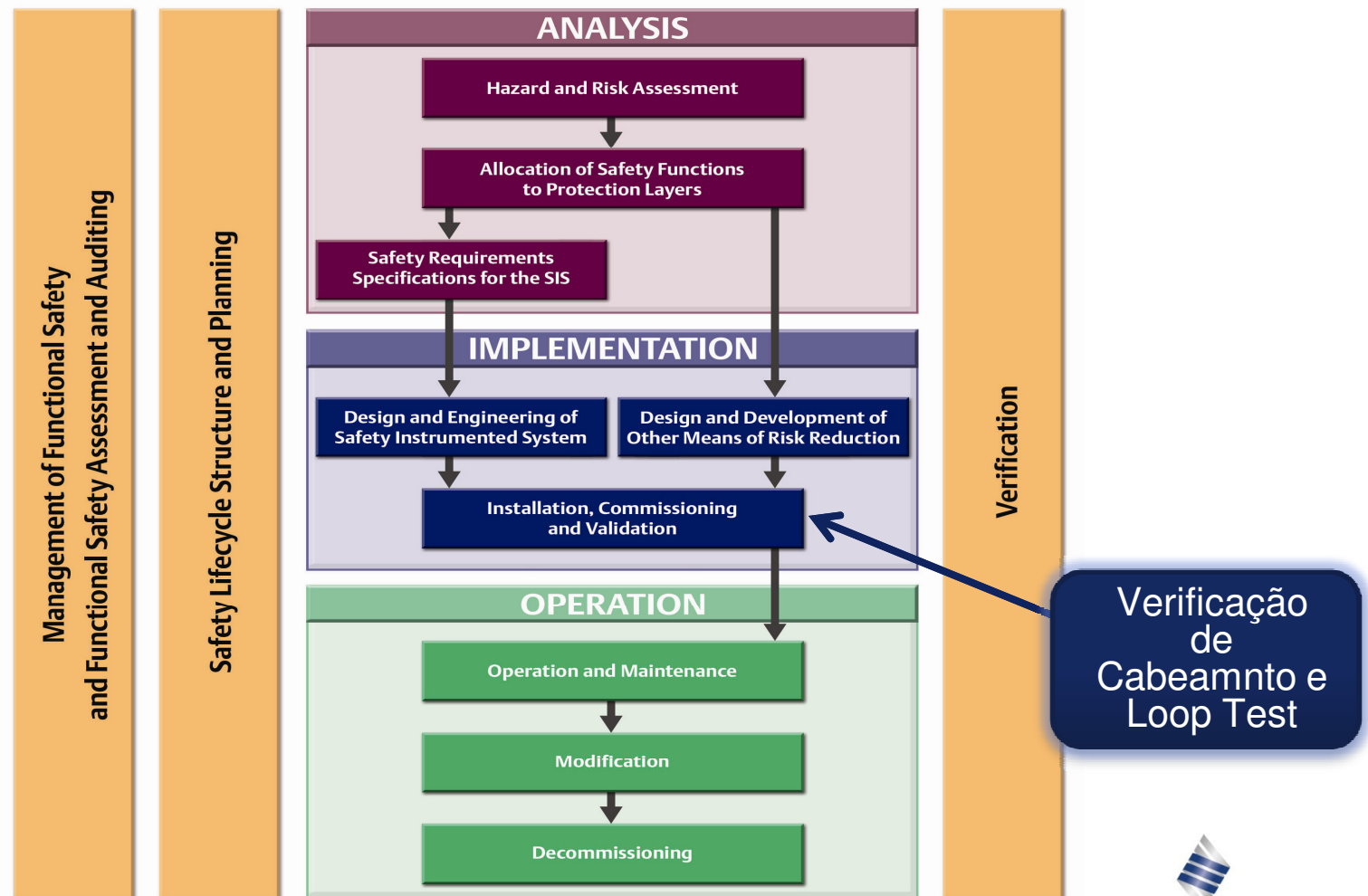
USRTC-DVOP

AMS Intelligent Device Manager



- Gerenciamento Completo de Instrumentos e Valvulas– HART, FF and WirelessHART
 - Configuração
 - Diagnóstico Preditivo
 - Gerenciamento de Calibração
 - Loop check / interlock verification
 - Audit Trail / documentação
- Suporte Universal ao Dispositivos
- Diagnósticos Avançados através de SNAP-ON
- Baseado em padrões ABERTOS
- Integração com MES

Aderencia a IEC 61511 - Safety Life Cycle



3051S Workflow para o Proof Testing



Agendamento Eletrônico dos Testes



Syncade-Smart Operations Management Suite - Windows Internet Explorer

http://dmics2005demo/

File Edit View Favorites Tools Help

Syncade-Smart Operations Management Suite

Welcome Chris Praxis 2010-09-14 Menus Help

Portal Documents Training Equipment Materials Orders Workflows Reports Administration

Custom Views Equipment Classes Equipment Actions Search View Min/Maximize Legend

Custom Views

- SIS Devices
 - PT105
 - TT101
 - TT102
 - Unit 100 Level Shutdown Equipment
 - Unit 100 Temperature Shutdown Equipment
 - Equipment
 - Events
 - 3051S Proof Test Expiration
 - 3051S Proof Test Scheduling
 - 3144P Proof Test Expiration
 - 3144P Proof Test Scheduling
 - 2010-09-14 13:35:32
 - 2010-09-13 19:33:37
 - Calibration
 - Workflows

- Equipment Class
- Code
- Physical Model
- My Work Orders
- Work Flow Status
- Demo
- Shift Reports
- Industries
- Equipment with WFs
- Safety Equipment

2010

Day	Week	Month	Year
1	January, 2010	February	March
2	April	May	June
3	July	August	September Unit 100 Temperature Shutdown Equipment 3144P Proof Test Expiration Due Date: 2010-09-30
4	October - PT105 Calibration Due Date: 2010-10-13 - TT101 Calibration Due Date: 2010-10-24	November TT102 Calibration Due Date: 2010-11-13	December PT105 3051S Proof Test Expiration Due Date: 2010-12-09

Current User: cp

Trusted sites 100%



EMERSON
Process Management

Portal personalizado para o Instrumentista



Syncade-Smart Operations Management Suite - Windows Internet Explorer

http://dmics2005demo/ Live Search

File Edit View Favorites Tools Help

Syncade-Smart Operations Management Suite

Welcome Chris Praxis 2010-09-14 Menu Help

Portal Documents Training Equipment Materials Orders Workflows Reports Administration

OPERATE Training Change Control Repository Others Mgmt Suite Materials Orders Inventory Change Content Change Colors Help

Orders Currently Running

Order Number	Creation Date	Execute
Unit_100_Temperature_Shutdown_Equi...	2010-09-14T13:35	▶
SIM-20100913-180933-2710	2010-09-13T18:09	▶
TT101_100824c	2010-08-24T18:54	▶
TT101_100824b	2010-08-24T18:44	▶
TT101_100824a	2010-08-24T18:29	▶
TT101_100824e	2010-08-24T18:21	▶
TT101_100824d	2010-08-24T18:14	▶
Mechanic_Shift_Change_6	2010-05-26T11:34	▶

Orders With Instruction Comments - WF

Order Number	Comments	Recipe Name
TT101_100824c	1	OP_PROOF_TEST-SIP
Unit_100_Temperature_Shutdown_...	1	OP_PROOF_TEST-IN

Orders With Dispensing Comments

Order Number	Order Comments	Component Comments	Campaign Number
08-08051	0	2	
09-03056	0	2	
09-06111	0	1	
09-100721-API-01	0	1	
70000425	0	2	
70000426	0	2	
70000547	0	2	

Order Charging Summary

Order Number	Campaign Number	Product Code	Prd De
08-112013-WD		I32453_WD_Only	Tris
09-03145		TST-003	Tes

Current User: cp Trusted sites 100%



Controle de Acesso previne Intervensões Não Autorizadas



Syncade-Smart Operations Management Suite - Windows Internet Explorer

http://dmics2005demo/

File Edit View Favorites Tools Help

Syncade-Smart Operations Management Suite

Welcome Chris Praxis 2010-09-14 Menu Help

Portal Documents Training Equipment Materials Orders Workflows Reports Administration

Back Search Certify Training Planner Requirement Planner Legend

My Company

- Acme Incorporated
 - Required Skills
 - Departments
 - Demo
 - Required Skills
 - Departments
 - 1-Material Prep Operations
 - 2-Downstream Operations
 - 3-E&I
 - Required Skills
 - Departments
 - Positions
 - SIS Technician
 - Required Skills
 - Calibration
 - Proof Test
 - Employees
 - Safety Nolan
 - Safety Sally
 - Supervisor
 - Technician
 - 4-Engineering
 - 5-QA
 - Positions
 - Fill Finish
 - Polymers,Chemical,Resins
 - Positions

Skills

Courses

Change Requests

Safety Sally
View employee properties

General

Name: Safety Sally
Employee ID: 71
Phone:
Email:

Qualifications

Skill Name	Training Level	Tasks	Description
Proof Test	Employee	2 of 2	Proof Test
Calibration	Employee	2 of 2	Calibration

Required Tasks

Name	Due Date	CR Due Date	Status	Description
General Safety 1	2010-09-23			
OSHA 2254	2010-09-23			OSHA 2254
3144P Calibration	2011-08-24			3144P Calibration - Temperatu...
Test 88-Part A and B	2010-09-23			Transmitter Function Check LP ...
1001-NO DCA	2010-09-23			
3051S Proof Test	2011-08-24			3051S Proof - Pressure Trans...
3051S Calibration	2011-08-24			3051S Calibration - Pressure T...
EHS1008	2010-09-23			Site Safety Procedures
3144P Proof Test	2011-08-24			3144P Proof - Temperature Tr...
QA1007	2010-09-23			CGMP Basics

Scheduled Classes
No items to display

Current User: cp

Start Syncade-Smart ... Syncade-Sma... C:\CSDebug DMI Compliance... Simple Flow.bn... Desktop



EMERSON
Process Management

Acompanhamento Eletrônico da Ordem de Serviço



DMI WF - Windows Internet Explorer

OP_PROOF_TEST-INTERMEDIATE - Proof Test - Intermediate

Order Number: Unit_100_Temperature_Shutdown_Equip... Product Code: U-100-TT Product Description: 3144P Proof Test

OP_PROOF_TEST-INTERMEDIATE

80%

START

BEGIN

Verify Device 1

A_WRONG_DEVICE

Display Message

A_CORRECT_DEVICE

Verify Calibration S...

A_CALIBRATED

Verify Device

B_WRONG_DEVICE

Display Message

B_CORRECT_DEVICE

Verify Calibration S...

B_CALIBRATED

Verify User Training

TRAINED

ProofTest "Interm ...

START_PROOF

Output set to Nor...

Execution History

Done

Verify Device

Type or Scan the device ID.

The system will automatically verify that you are working with the correct device.

Description	Actual Value	Signatures or Date Executed
Ap: Device ID	TT102	2010-09-14T13:40:09
Ap: Device Barcode	TT102	2010-09-14T13:40:16

Verify Calibration Status

The current Calibration information:

Device	Status	Due Date	Certificate Number
TT102	Calibration-True	2010-11-13 17:51:46	C091310d

Verify User Training

The system will verify the operator's credentials are current with the correct training requirements.

Training Task = 3144P Proof Test

Description	Actual Value	Signatures or Date Executed
Ap: Skill Name	3144P Proof Test	2010-09-14T13:41:28

Proof Test "Intermediate" Overview

Output set to Normal

Read DeltaV value from Normal output

Trusted sites 100%



Acompanhamento Eletrônico da Ordem de Serviço



Return to OM | Workflows | Go To Current Step | View | History | Auto Refresh | Session | Legend | Settings | Help

OP_PROOF_TEST-ILK - Interlock Proof Test

Order Number: SIM-20100630-182322-1093 Product Code: Product Description: Simulation - OP_PROOF_TEST-ILK

OP_PROOF_TEST-ILK

90%

START

WI_PT_VERIFY_DEVICE:1 - Verify Device

WI_PT_B_OVERVIEW:1 - Proof Test B Overview

WI_PT_PRE-TRIP_TEST:1 - Pre-Trip Test

WI_PT_VERIFY_PRE_TRIP:1 - Verify Pre-Trip Result

WI_PT_TRIP_TEST:1 - Trip Test

WI_PT_VERIFY_TRIP:1 - Verify Trip Result

START

This proof test, when combined with Proof Test A, will detect over 99% of DU failures not detected by the 3051S automatic diagnostics.

Required Tools: Pressure calibration equipment.

Syncade will perform a series of interlock and loop tests using the following values:

Upper Range Value	9.016
Lower Range Value	0
Pre-Trip Limit	7
Trip Limit	8

1. A pre-trip condition will be tested by setting the device's output to be between the Trip and Pre-Trip limits
2. A trip condition will be tested by setting the device's output to be between the Trip and Upper range value limits
3. General calibration will be tested by setting the device's output to 40% and 60% of the measurement span using the upper and lower range values

WI_PT_PRE-TRIP_TEST:1 - Pre-Trip Test

First test will create a pre-trip condition based on the average of the pre-trip and trip limits.

WI_PT_VERIFY_PRE_TRIP:1 - Verify Pre-Trip Result

Syncade will verify a pre-trip condition exists.

Description	Target	Initial Value
DCS Result	True	False

WI_PT_TRIP_TEST:1 - Trip Test

Execution | History



Acompanhamento Eletrônico da Ordem de Serviço



DMI WF - Windows Internet Explorer

OP_PROOF_TEST-INTERMEDIATE - Proof Test - Intermediate

Order Number: Unit_100_Temperature_Shutdown_Equip... Product Code: U-100-TT Product Description: 3144P Proof Test

OP_PROOF_TEST-INTERMEDIATE

90%

START_PROOF

Output set to Normal

NORMAL_SET -A

Read DeltaV value f...

NORMAL_RESULTS -A

Output set to Trip

TRIP1_SET -A

Read DeltaV value f...

TRIP1_RESULTS -A

Output set to Normal

NORMAL_SET -B

Read DeltaV value f...

NORMAL_RESULTS -B

Output set to Trip

TRIP2_SET

Read DeltaV value from Normal output

System captures and stores the DeltaV read value for TT101 and TT102.

Normal	Expected	Actual
TT101	13	13.0331125
TT102	13	13.0498018

Description Actual Value Signatures or Date Executed

Ap Read Alarm 2010-09-14T13:45:44

Output set to Trip

System sets TT101 output to the "Trip" value of 27.

(via Quickcheck Web service)

Read DeltaV value from Trip output

System captures and stores the DeltaV read value for TT101 and TT102.

System captures and stores the associated alarms.

System captures and stores the DeltaV read position value for the trip device (safety valve with DVC SIS positioner).

Normal	Expected	Actual	Safety Valve Position (Open=1/Closed=0)
TT101	27	27.0428	0
TT102	13	13.052186	0

ALARM?

Safety logic has shut down the process

Execution History

Trusted sites 100%





Relatório das Ordens de Serviço



History

History - SIM-20100630-182322-1093

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WI_PT_B_OVERVIEW:1

MANUAL WORK INSTRUCTION - Complete

Unique ID: 2 (1) Status: Complete

Start Time: 2010-06-30T18:24:14 End Time: 2010-06-30T18:24:20

This proof test, when combined with Proof Test A, will detect over 99% of DU failures not detected by the 3051S automatic diagnostics.

Required Tools: Pressure calibration equipment.

Syncade will perform a series of interlock and loop tests using the following values:

Upper Range Value	9.016
Lower Range Value	0
Pre-Trip Limit	7
Trip Limit	8

1. A pre-trip condition will be tested by setting the device's output to be between the Trip and Pre-Trip limits
2. A trip condition will be tested by setting the device's output to be between the Trip and Upper range value limits
3. General calibration will be tested by setting the device's output to 40% and 60% of the measurement span using the upper and lower range values

Signatures:
Operator - sa (SA Administrator) - 2010-06-30T18:24:20

WI_PT_PRE-TRIP_TEST:1

MANUAL WORK INSTRUCTION - Current

Unique ID: 3 (1) Status: Current

Start Time: 2010-06-30T18:24:21 End Time:

First test will create a pre-trip condition based on the average of the pre-trip and trip limits.

Close



DELTA VTM