



**CURTISS
WRIGHT**
Flow Control Company
SCIENTECH

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2011 – CWFC Subsidiary Company Rationalization

Swantech becomes **StressWave Systems** Business Segment



Plant Performance Division

StressWave Systems

*Stress Wave Energy
Monitoring Instrumentation*

Plant Optimization

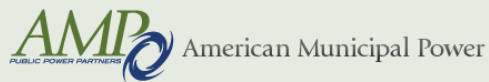
*Advanced Predictive
Pattern Recognition
Software*

Real Time Systems

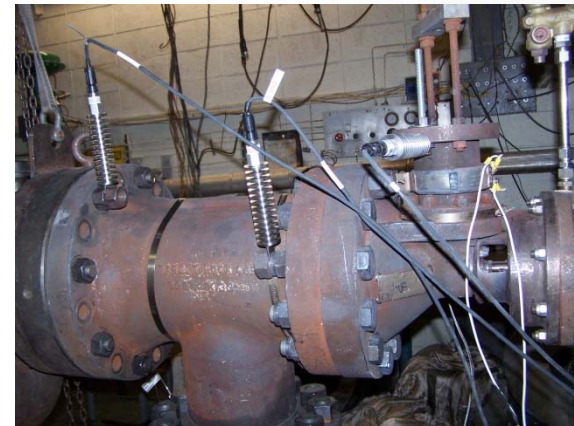
Plant Process Control

Equipment Reliability Improvement Solutions

Renewable & Fossil Utility Customers



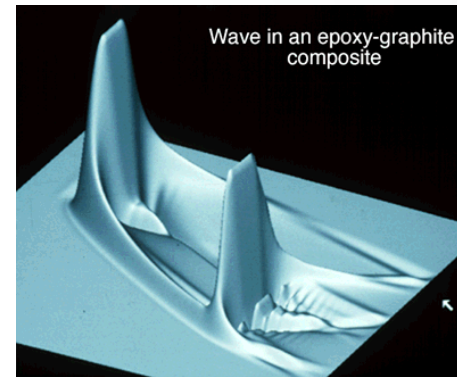
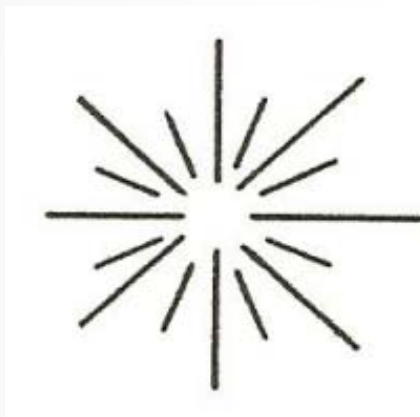
Valve Leak Detection Projects



TENNESSEE VALLEY AUTHORITY

What Are Stress Waves?

Stress Waves are acoustic energy impulses that radiate through solid, liquid and gas in all directions.



Stress Wave Visualization – Virginia Tech

Relative motion produces friction.

Friction generates stress waves.

Causes of STRESS WAVE ENERGY

Relative Motion

FRICTION

Contact Pressure
Contact Surface Area
Roughness -
Smoothness
Relative Surface
Speeds
Lubricant Condition
Operating Load
Operating Speed

SHOCK & IMPULSE

Impact Velocity
Damage/Imperfection
Size
Depth
Area

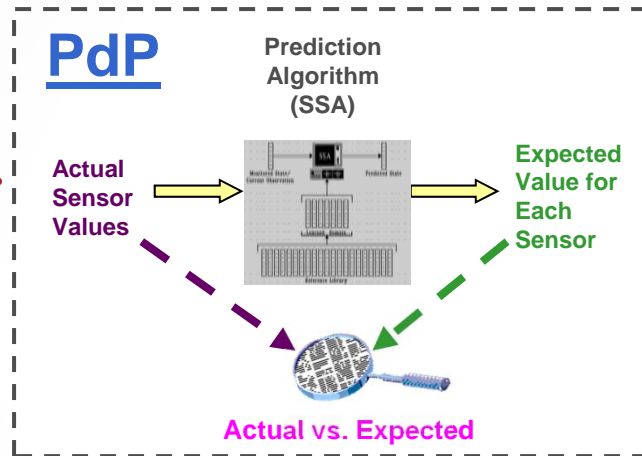
Gas or Fluid FLOW

Turbulence
Cavitation



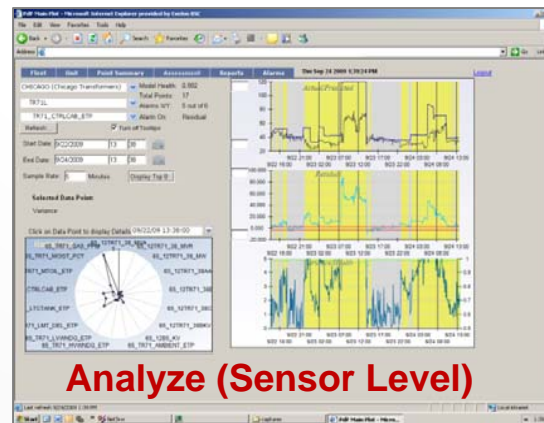
PREDICTIVE PATTERN RECOGNITION

Specific Component
REAL-TIME DATA
 Load
 Voltages
 Currents
 Temperatures
 Oil Analysis
 Performance results
 Calculated values
 Stress Wave Energy



Early Warning (System Level)

Fleet	Unit	Point Summary	Assessment	Reports	Archives	Stop
Gross MW	122.49					
#Notifications	19					
Unit	Unit	Description	Status	Signals or Alarms	Health	
	2110FF00A	21 HP FAN	ABNORMAL	0	0.993	
	2110FF00B	22 HP FAN	ABNORMAL	0	0.994	
	2110FF00C	23 LP FAN	ABNORMAL	1	0.997	
	2110FF00D	24 LP FAN	ABNORMAL	1	0.996	
	2110FF00E	25 LP FAN	ABNORMAL	1	0.988	
	2110FF00F	26 LP FAN	ABNORMAL	1	0.995	
	2110FF010	27 LP FAN	ABNORMAL	0	0.999	
	2110FF011	2A AXI HEATER	ABNORMAL	0	0.997	
	2110FF012	2A BOILER FEED PUMP	ABNORMAL	2	0.839	
	2110FF013	2A BOILER FEED PUMP TURB	ABNORMAL	2	0.994	
	2110FF014	2A COND PUMP	ABNORMAL	0	0.999	
	2110FF015	2A FO FAN	ABNORMAL	1	0.997	
	2110FF016	2A ID FAN	ABNORMAL	1	0.995	
	2110FF017	2A PULV A FEEDER	ABNORMAL	0	0.999	
	2110FF018	2A BRAC	ABNORMAL	1	0.998	
	2110FF019	2B AXI HEATER	ABNORMAL	0	0.995	
	2110FF020	2B BOILER FEED PUMP	ABNORMAL	0	0.999	
	2110FF021	2B BOILER FEED PUMP TURB	ABNORMAL	0	0.999	
	2110FF022	2B COND PUMP	ABNORMAL	0	0.999	
	2110FF023	2B FO FAN	ABNORMAL	1	0.996	
	2110FF024	2B ID FAN	ABNORMAL	1	0.995	
	2110FF025	2B PULV A FEEDER	ABNORMAL	0	0.997	
	2110FF026	2B BRAC	ABNORMAL	0	0.999	
	2110FF027	3 CONSUMER	ABNORMAL	1	0.997	

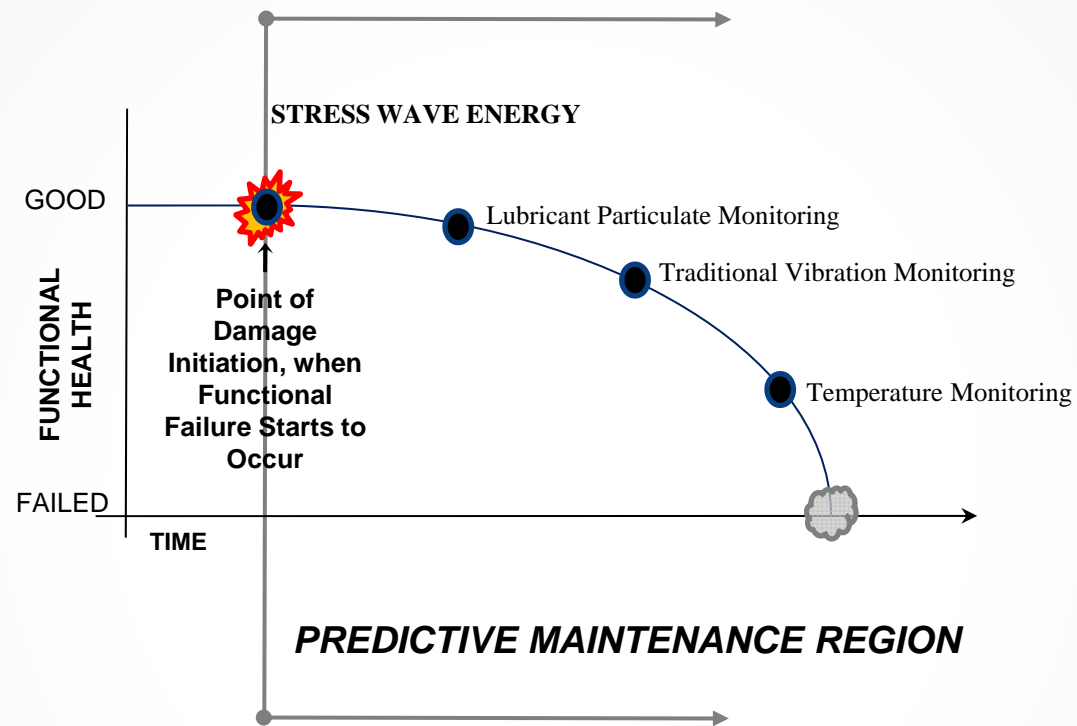


Analyze (Sensor Level)

Fleet	Unit	Point Summary	Assessment	Reports	Alarms	Stop					
Unit:	CHC400 (Chicago Transfer)		Processing Rate: 300 seconds								
Model:	1076L		Validation Parameter: 0.990								
	117R71		Total Points: 17								
			Cutoff Point: 117R71_3B8AMP								
Category:	OK		Cutoff Value: 117R71_3B8AMP								
			High Cutoff: 10000.0								
Model Health:	3.992		Low Cutoff: 5.00000								
Model Status:	ABNORMAL		Alarms X out of Y: 5 out of 6								
Abnormal Points:	1		Alarm On: Residual								
Man Plot	4 Point -1	4 Point -4	XY Plot	XZY Plot							
Point	Description	Unit	Assessment	Health	Dis. Alar.	Res. Last	Active	In Alarm	Trend		
1076L_019	TR72	ETP	39.568	39.230	2.074	4.30	3	-3	Yes	No	Trend
117R71_3	117R71_3B	RMK	26.242	26.242	0.000	-0.118	0.7	-0.7	Yes	No	Trend
117R71_3	117R71_3B	RMK	-2.688	-3.895	1.293	4.008	2	-2	Yes	No	Trend
117R71_3	117R71_3B	HW	-20.043	-20.2	0.272	0.137	0.7	-0.7	Yes	No	Trend
117R71_3	117R71_3B	AMP	923	933.65	8.447	-10.65	25	-25	Yes	No	Trend
117R71_3	117R71_3B8AMP	AMP	940	943.076	0.046	-1.076	25	-25	Yes	No	Trend
117R71_3	117R71_3B8AMP	AMP	923	928.663	0.007	-1.663	15	-15	Yes	No	Trend

Alarm (Asset Level)

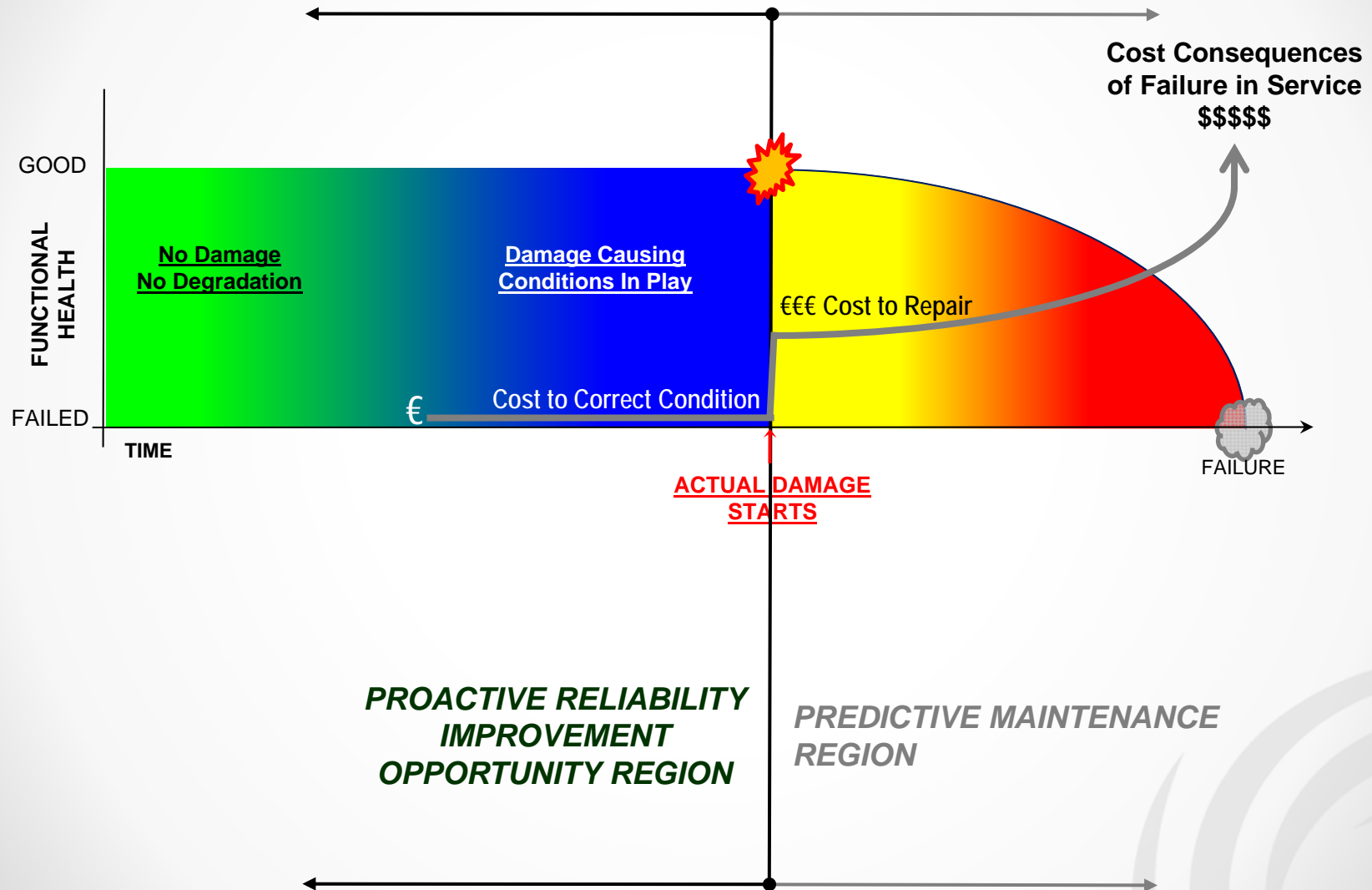
Predictive Maintenance Monitoring Technologies



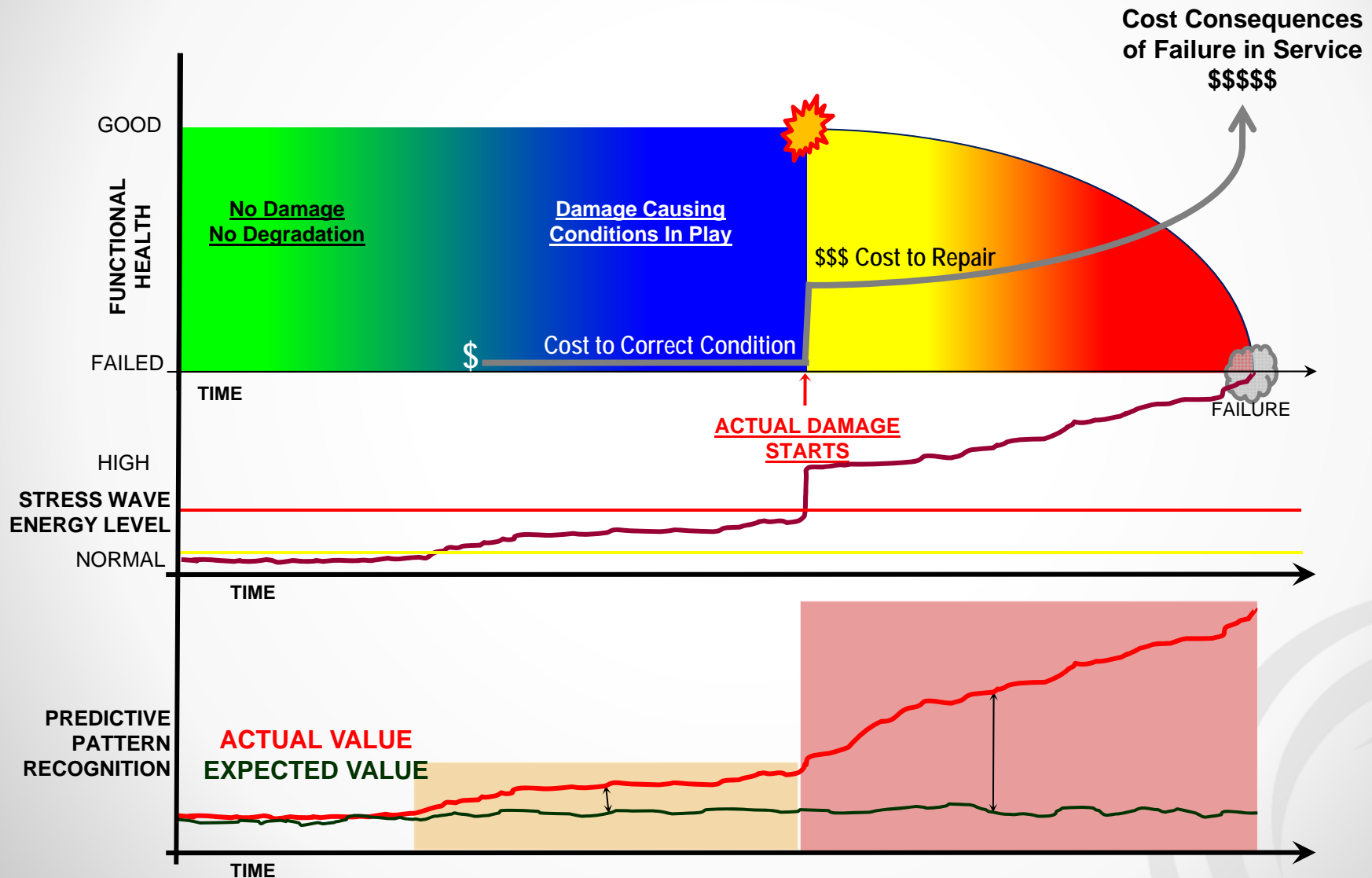
John Moubray,
Reliability Centered Maintenance II
1991

Anatomy of UNReliability

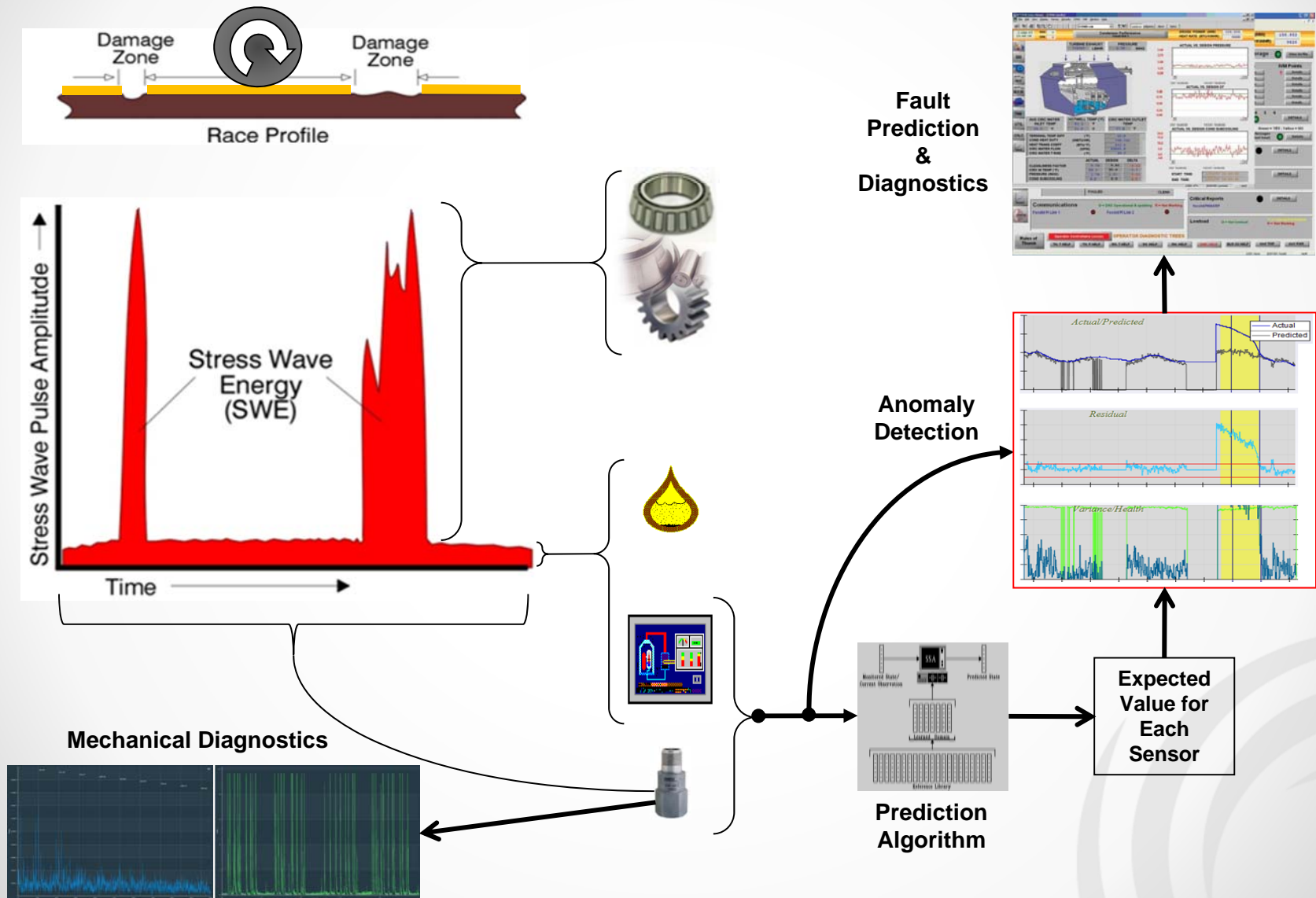
Failure is a Process, Not an Event



Sciencetech Technology Applied

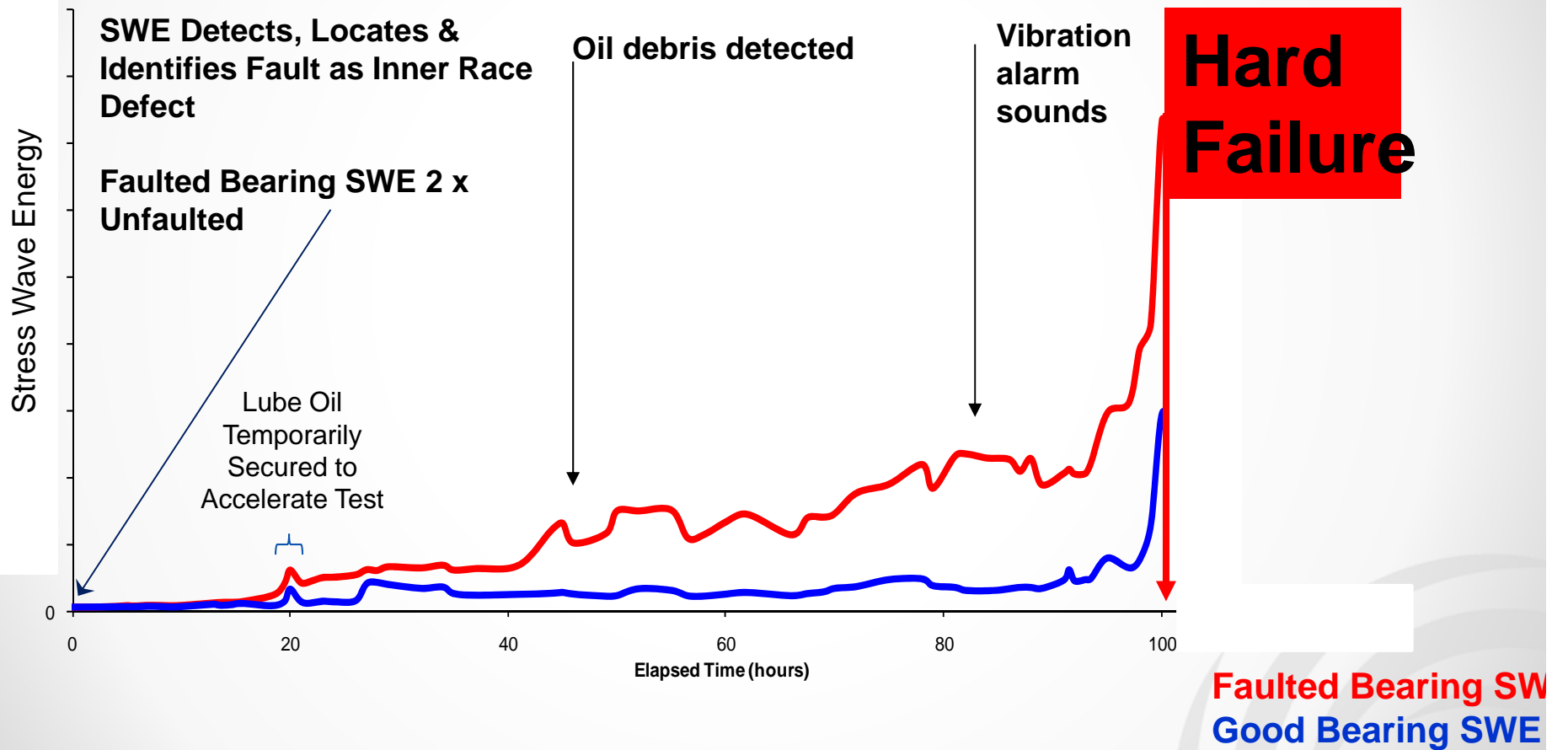


Complete Mechanical Process Solution

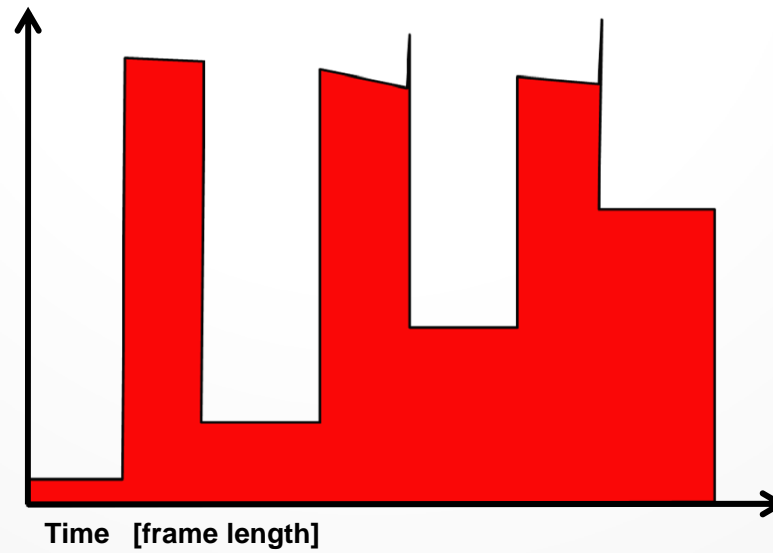
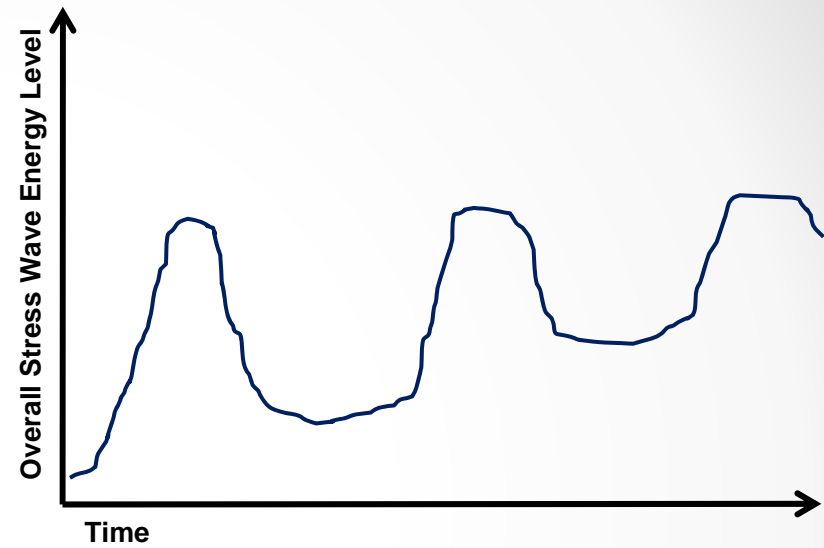
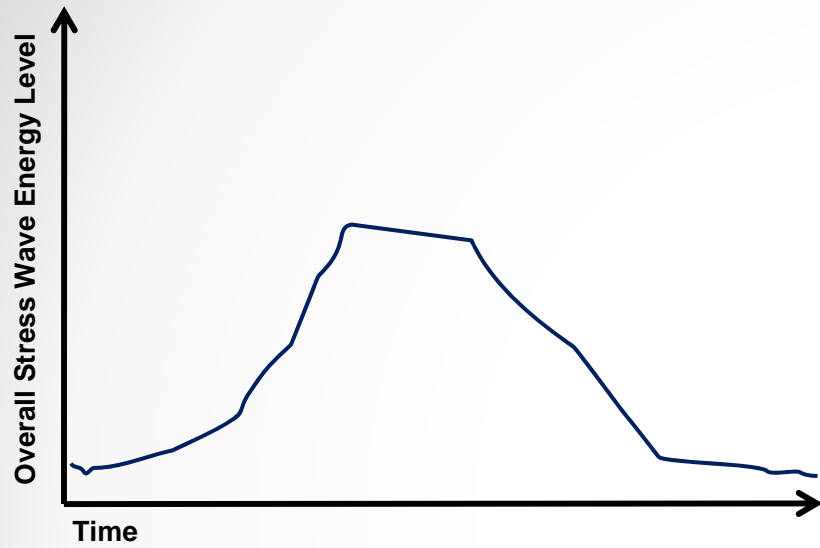


STRESS WAVE ENERGY

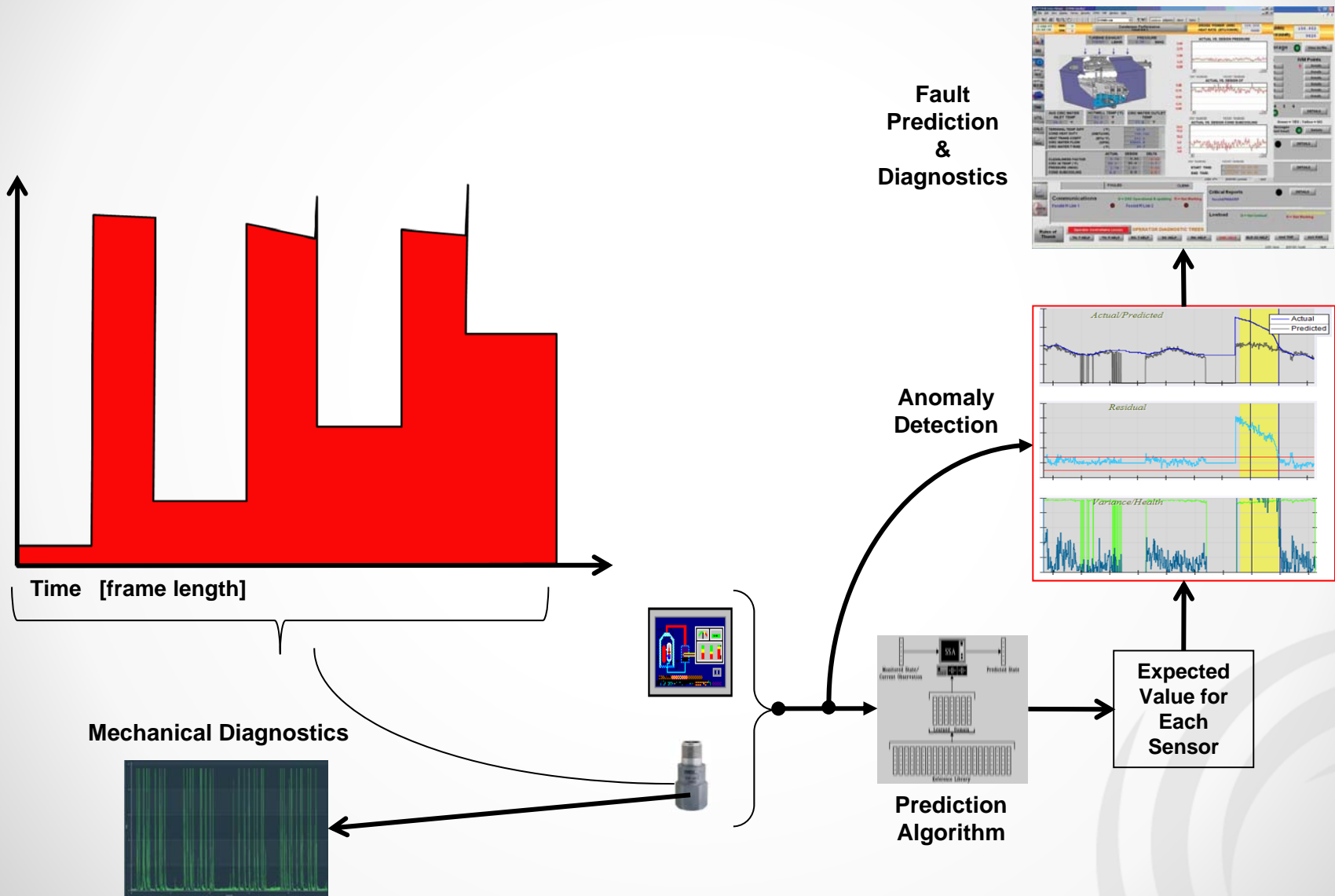
The Leading Indicator



Valve Leakage

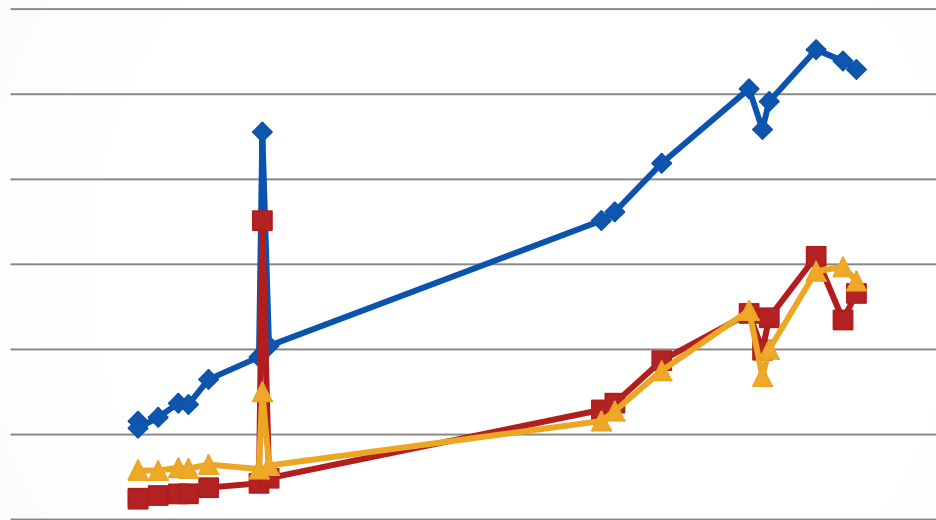


Complete Valve Process Solution



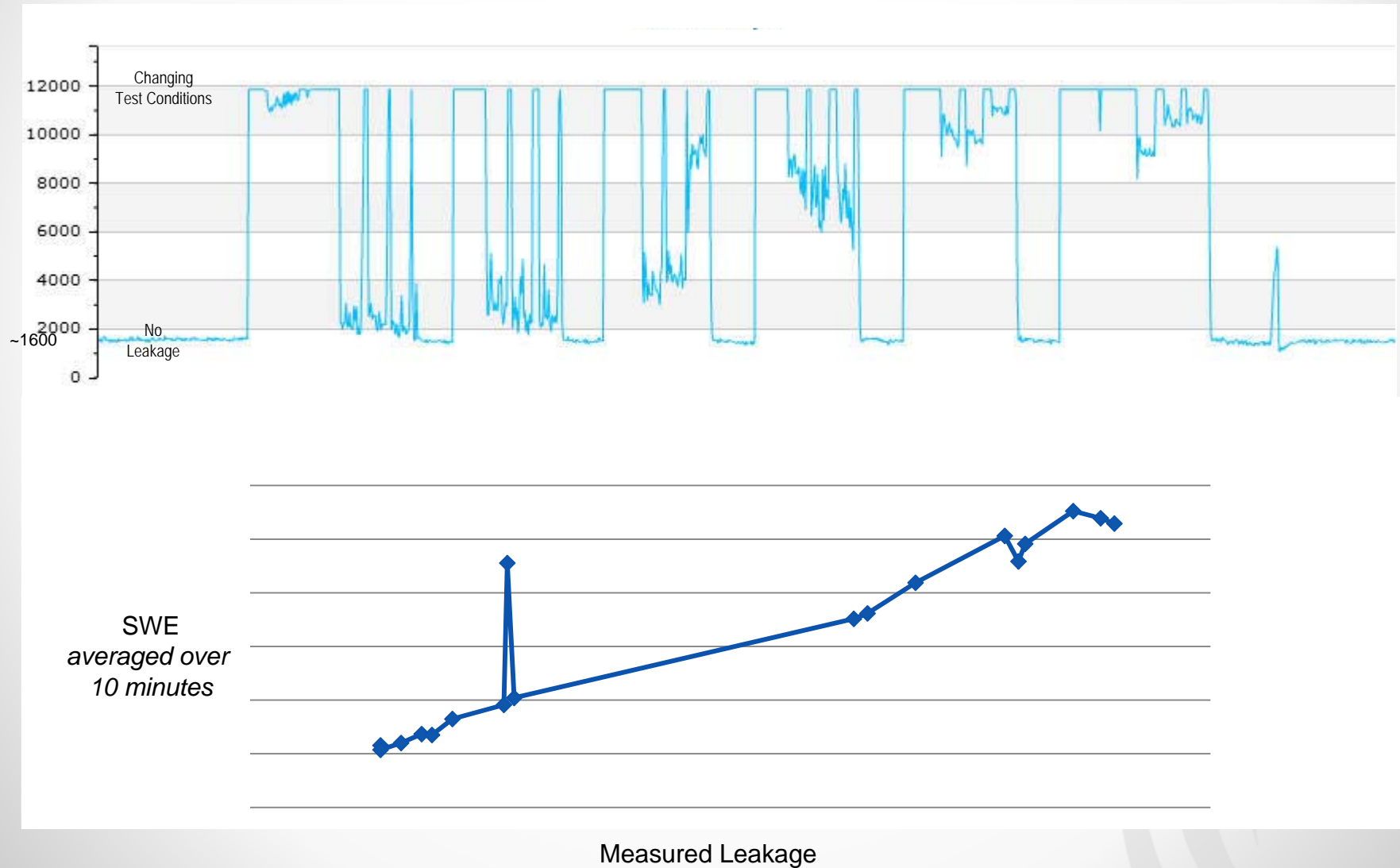
Example Data

SWE
averaged over
10 minutes

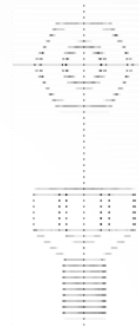


Measured Leakage

Pilot Test – Pilot Sensor



Stress Wave Energy Sensor & Mounts



Certified Intrinsically Safe for the Following Hazardous Locations:

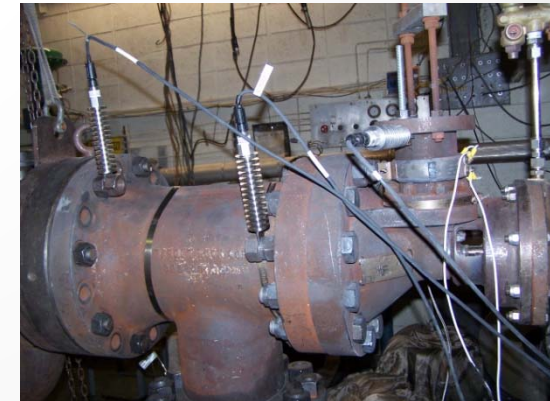
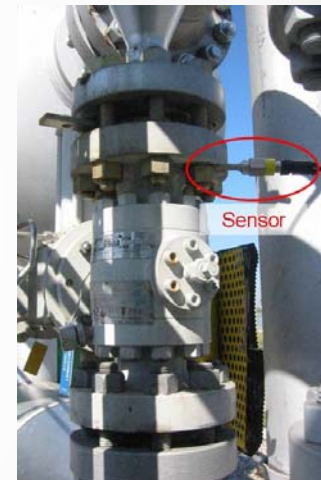
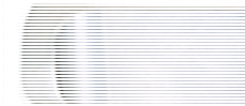
- Atex li 1g Ex Ia lic T4
- Zones 0, 1, 2
- Class I, Division 1, Groups A, B, C & D
- Temperature Code T4
- Process Temperature -50°C To 120°C
- Temperature Ambient 85°C

Environmental Characteristics

- Temperature °C -50 To +120
- Shock Limit G Pk 5000
- Humidity Hermetically Sealed
- Protection Meets Or Exceeds Ip67

Certified To Comply With The Following Entity Parameters:

- $U_i = V_{max} = 30v$
- $I_i = I_{max} = 100 Ma$
- $C_i = 10.2nf$
- $L_i = 0 Uh$



SWANguard+



CE Approved

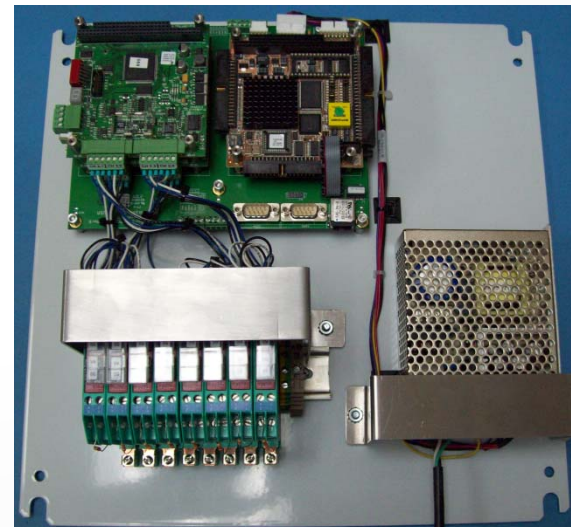
Operating Temperature: -13 to 149°F (-25 to + 65° C)
Humidity: 20 – 90%, non-condensing

Industrial, weatherized 16 gauge steel enclosure
ANSI/ASA 61 powder coat grey finish
Suitable for: NEMA 4, 12, 13, or IP66 environments.

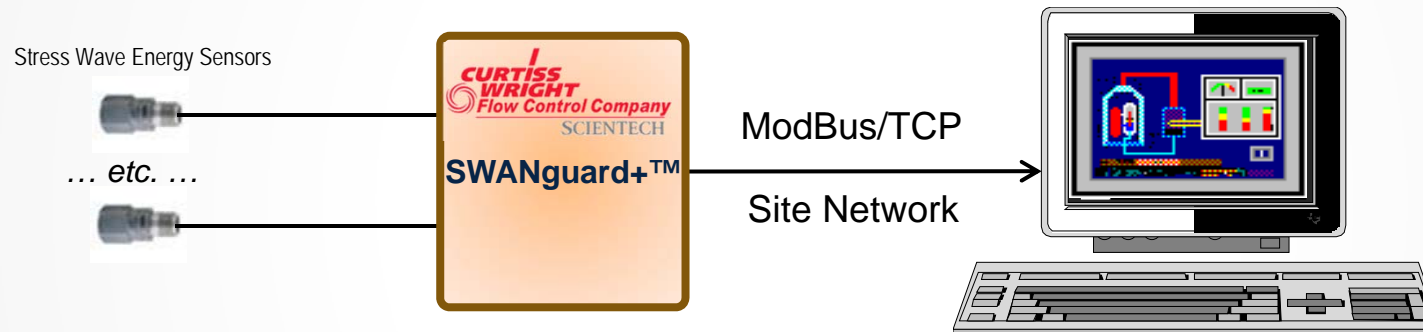
IS Barriers may be included, Internally or Externally

100 – 240 VAC, 50/60Hz

RJ-45 Ethernet, Optional Media Converters may be included

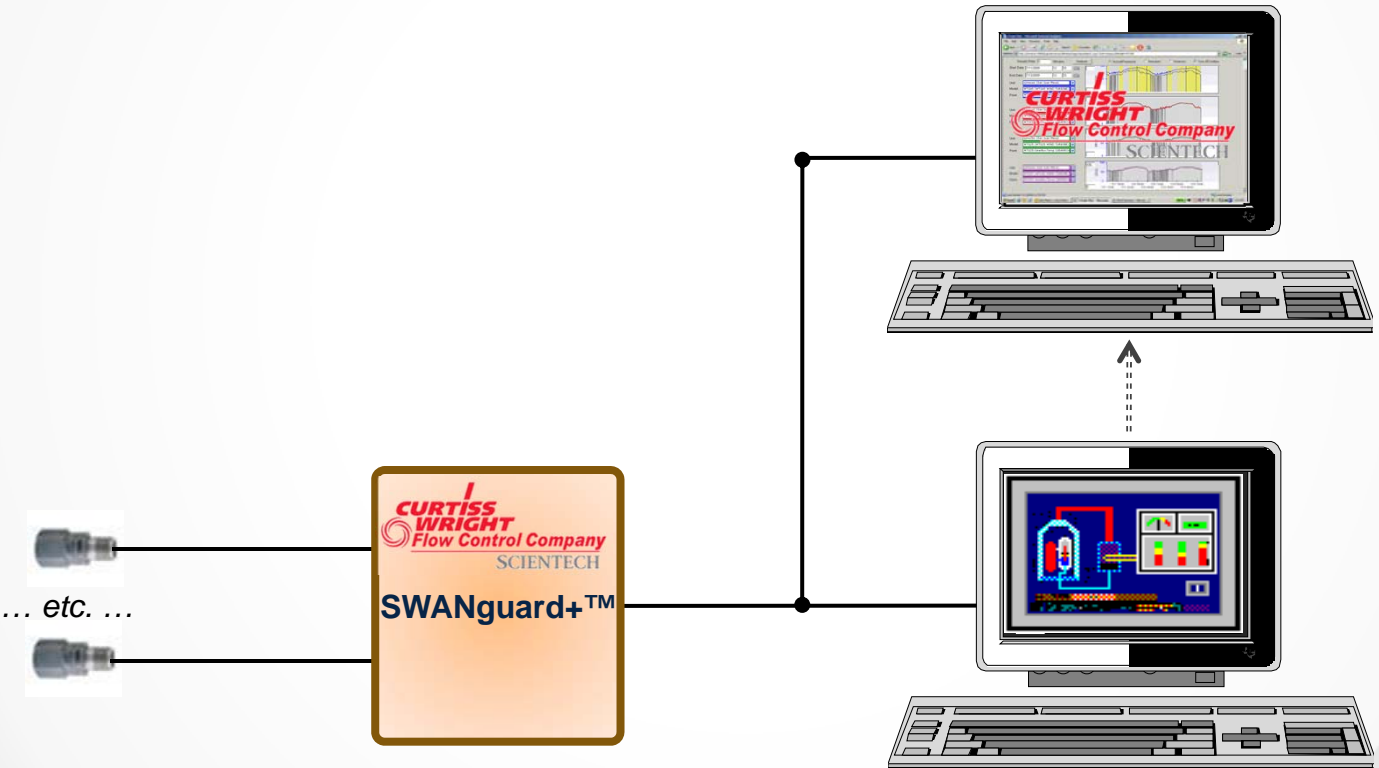


Stress Wave Energy into Process Control Only



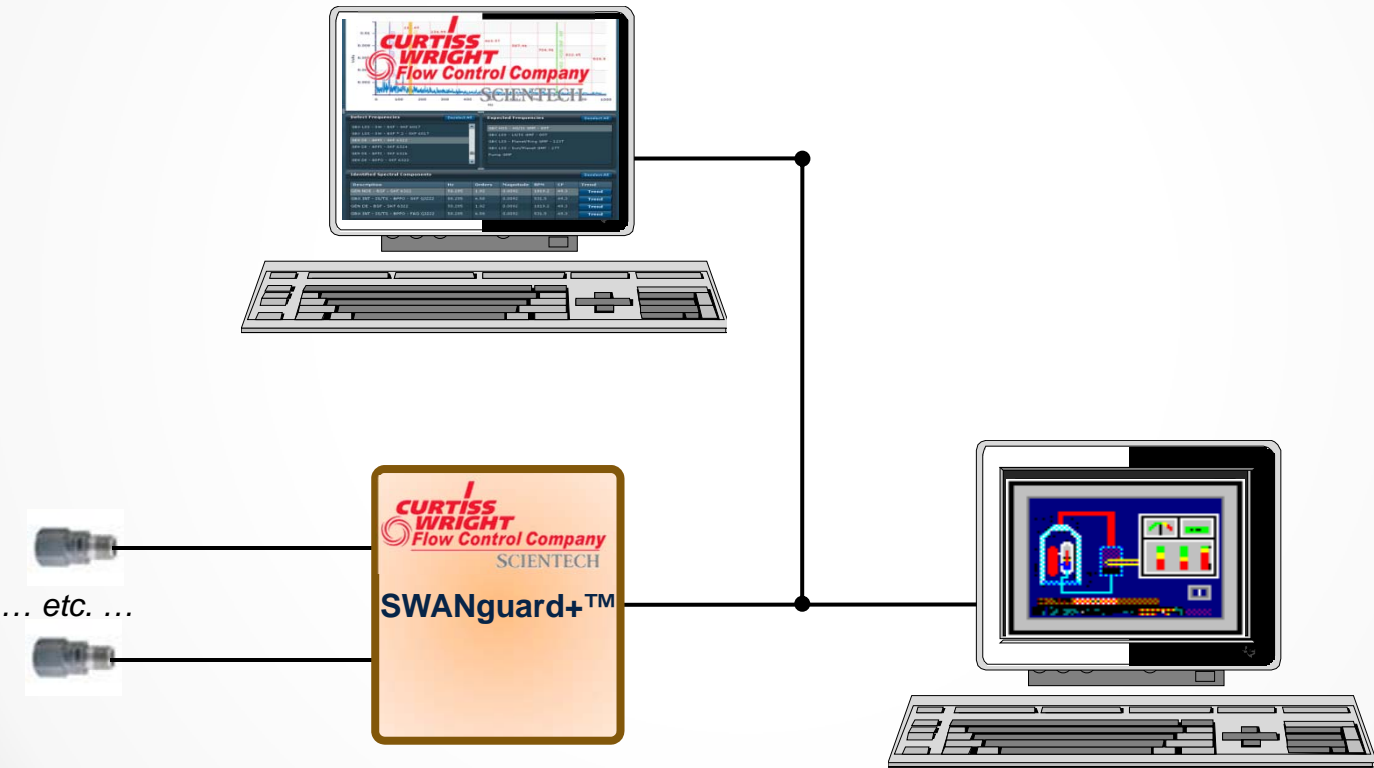
Stress Wave Energy and Advanced Pattern Recognition

Advanced Predictive Pattern Recognition System

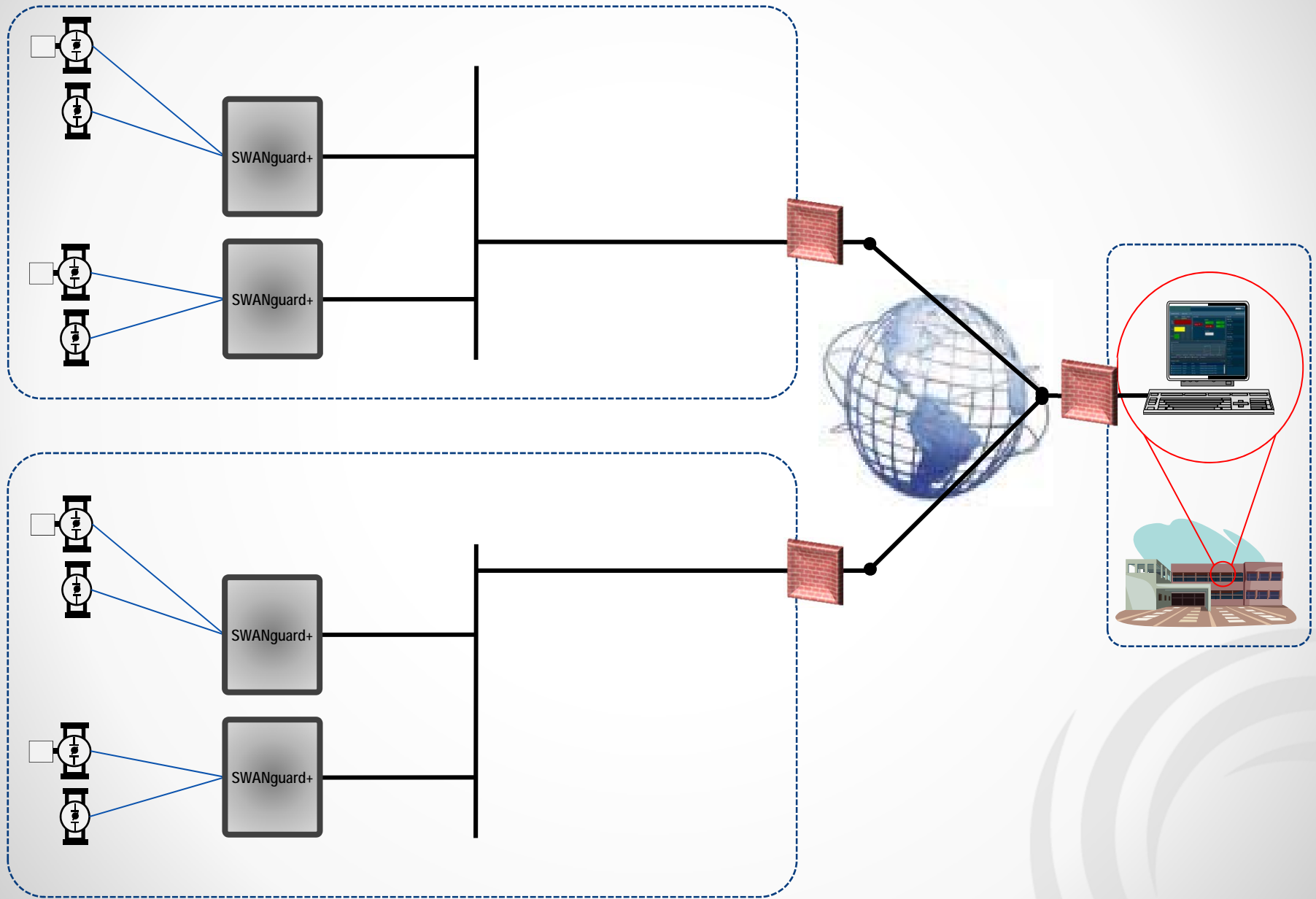


Stress Wave Energy with Mechanical Diagnostics

Condition Monitoring Software



Globally Deployed, Centrally Monitored



Questions, Comments, Concerns, ???



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