



Setting the Standard for Automation™

Wireless – Real World Applications

Eric Rotvold - Emerson

Standards
Certification
Education & Training
Publishing
Conferences & Exhibits

- Distinguished Technologist at Emerson Process Management and has been working in process automation for over 20 years. He has been involved in the development of many HART®, Profibus and Foundation™ Fieldbus devices during his career. Recently Eric has been engaged in the development of the IEC 62591 (WirelessHART®) standard, products that implement the standard and continues to advance wireless technology in process automation



Why Wireless?

Information is Critical to Decision Making



- Cost and time of traditional wired I/O limits automation to control
- Many plant functions could benefit from automation
- Wireless augments existing systems to provide the right information to the right people to solve problems

Wireless Applications Aren't Niche – They Are Everywhere!

Process / Asset Reliability

- Motor, pump, blower monitoring
- Valve monitoring
- Filter monitoring

Efficiency / Throughput

- Tank level monitoring
- Heat exchanger monitoring
- Rotating kiln / moving equipment monitoring
- Steam trap monitoring
- Oil & Gas / Steam injection

Personnel Productivity

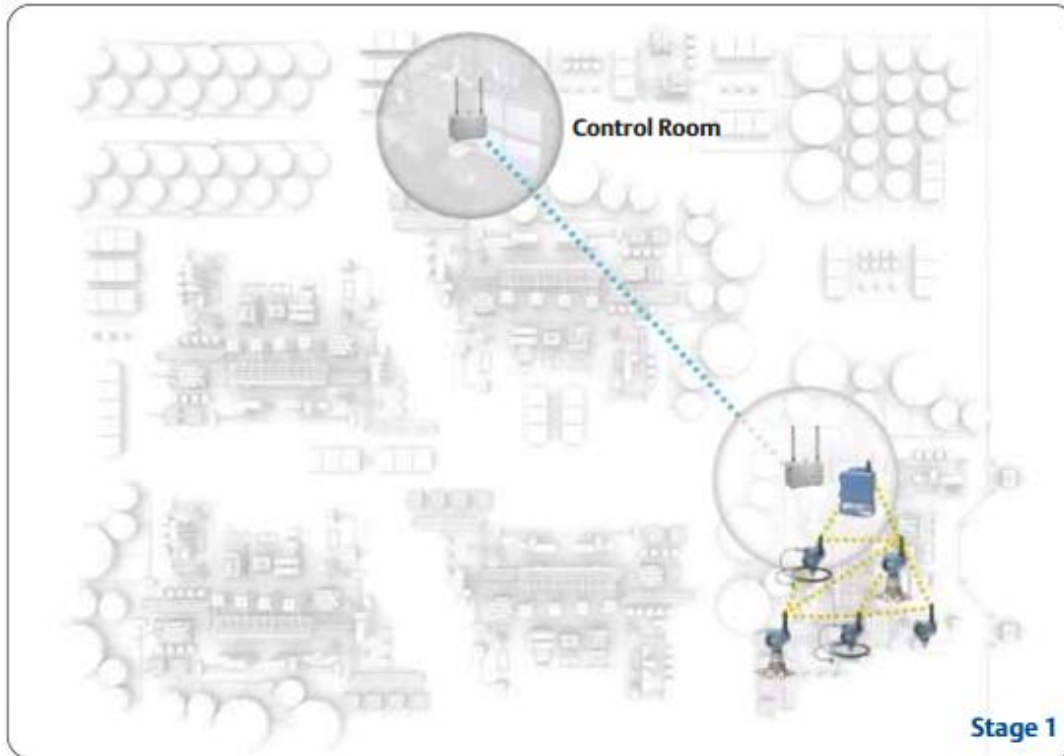
- Manual gauge replacement
- Reduced operator rounds
- Mobile workers

Health / Safety / Environment

- Emissions / discharge monitoring
- Eye Wash / Safety shower monitoring
- Pressure relief valve monitoring
- Secondary level measurements
- Video
- Mustering

WirelessHART Enables Sites To Start Small

– Wireless Field Network



- Install *WirelessHART* instruments to solve specific problems
- Mix and match to create comprehensive solutions
- Add a wireless backhaul if there is no local gateway connectivity

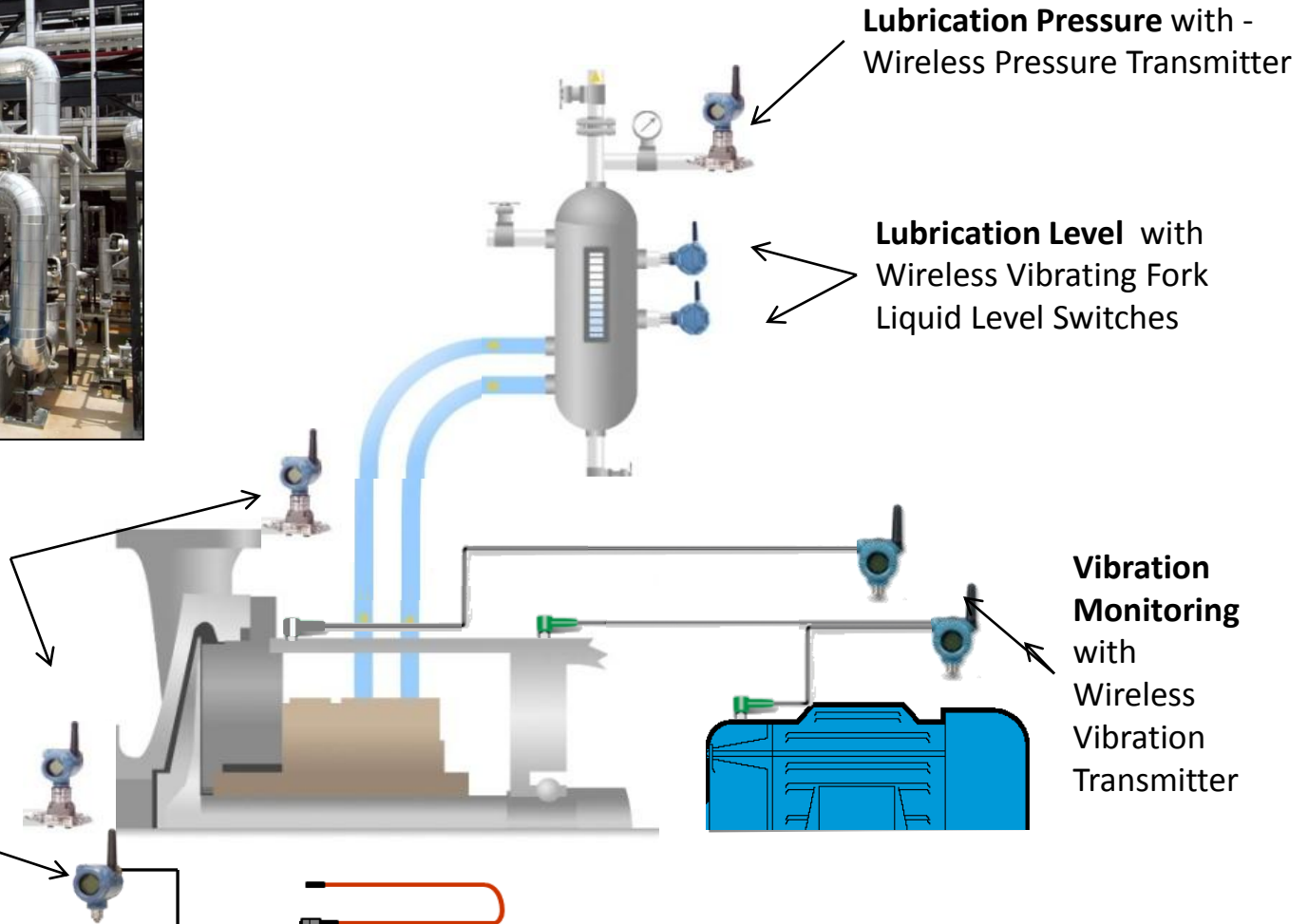
Install ONLY What You Need – No Extra Infrastructure

Pump Applications



Filter Monitoring with
Wireless Pressure
Transmitter

**Monitor Hydrocarbon
Leaks** with Wireless Leak
Detection





Smart Wireless Combines Pump Protection with Process Monitoring at Dyno Nobel Inc.

- **Challenge**
 - Hazardous duty ammonium nitrate pump protection outmoded
 - Operators unaware of pump temperatures
 - Maintenance could not troubleshoot problems
- **Solution – WirelessHART network:**
 - 20 WirelessHART temperature transmitters
 - 20 WirelessHART discrete switches
 - 1 Smart Wireless gateway
- **Results**
 - Saved \$30,000-\$40,000 on installation costs
 - Improved personnel safety
 - Increased operator efficiency
 - Decreased risk of plant/environmental damage
 - Improved instrument maintenance

“All the factors of security, reliability, ease of installation, and ease of use were considered in our selection of this technology and our confidence in the solution.”

— Sam Correnti, Operations Manager

Improving Centrifugal Pump Performance at Samarco



- **CHALLENGE**

- Centrifugal pumps break weekly due to abrasive materials; operators lack online flow and pressure data to anticipate and deal with problems
- Congested area, flooding, high installation costs made hard-wired network impractical

- **SOLUTION**

- Wireless Network: 10 WirelessHART pressure transmitters, 32 WirelessHART flow transmitters, 2 WirelessHART temperature transmitters used as repeaters, 1 Smart Wireless Gateway
- Reliable data delivered to automation system using WirelessHART protocol

- **RESULTS – Plant availability, output up 12%**

- Improved process monitoring and asset protection

“We can now monitor the process online and integrate the data into our system to produce reports and trigger alarms. We avoid reactive maintenance and plant shut downs. We’re also able to see how much clean water we’re using in the process.”

– Luis Carlos, Technician, Germano Mine, Samarco

Compressor Monitoring: Petrobras Sao Mateus



- **CHALLENGE**
 - Improve compressor maintenance by automating monitoring of compressor temperature, pressure, vibration
 - Instrument cabling too expensive, area subject to flooding
 - Operator rounds 3x per day
- **SOLUTION**
 - Network of 56 pressure, temperature, and vibration transmitters
 - Integrated with plant's automation system, and predictive maintenance software
- **RESULTS –**
 - Continuous data online for trending, problem diagnosis, alarms
 - Installed cost savings of \$200,000

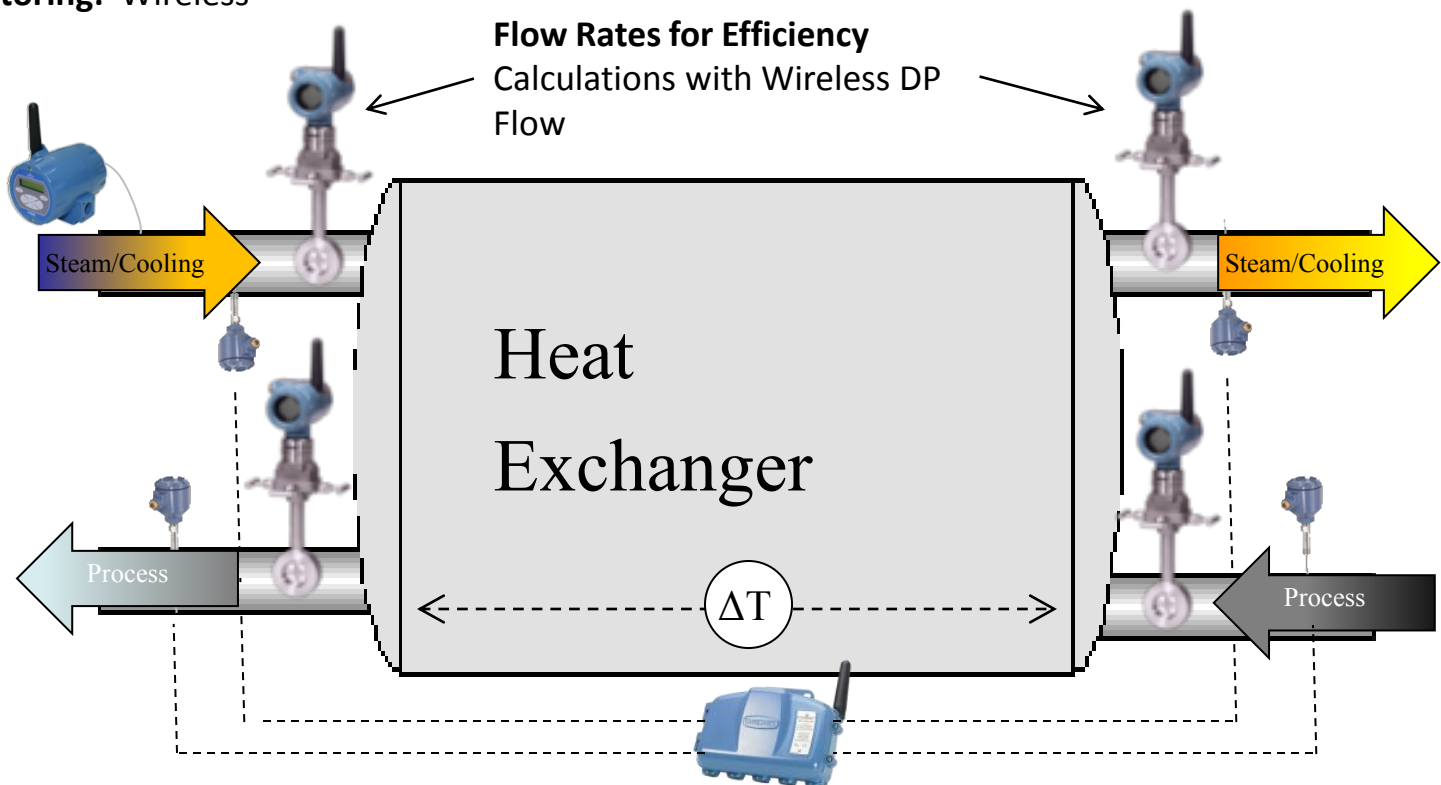


“Connecting the existing monitors on the compressors to the central control system with cables was not financially feasible because of installation costs and maintenance costs,”

– Weldon Araújo, Petrobras Sao Mateus maintenance operator

Heat Exchangers

pH Monitoring: Wireless
PH/ORP



Temperature for Efficiency Calculations
 -Wireless High Density Temperature
 -Wireless Temperature



WirelessHART Improves Heat Exchanger Performance at EnCana Oil Sands Facility

- **CHALLENGE**

- Improve efficiency of heat exchangers in energy intensive steam injection process, prevent downtime
- Cost-effective way to measure heat transfer in HE's for boiler feedwater
- Predict tube fouling to improve heat transfer and prevent tube rupture

- **SOLUTION**

- WirelessHART transmitters measure boiler feedwater inlet and outlet temperatures
- Wireless network installed and operating in 2 days

- **RESULTS**

- Improved efficiency of several key heat exchangers
- Saved \$40,000 versus wired installation
- Optimized cleaning schedules to prevent tube ruptures
- Boiler fuel consumption reduced



“We are now able to maximize heat exchanger operation and maintain the tubes more effectively to prevent heat losses and avoid devastating tube ruptures. We are pleased with the ease of installing the Smart Wireless network, which is working perfectly.”

—Stephan Meerman, E&I Supervisor

Wireless Enables Korsnäs Gävle to Quickly Meet Environmental Regulations



- **CHALLENGE**

- Heat exchanger leak detection
- pH, DO and temperature monitoring in effluent treatment
- Cabling was expensive and difficult

- **SOLUTION**

- Analytical WirelessHART conductivity transmitter monitors water from heat exchanger
- WirelessHART transmitters connect 22 sensors monitoring aerated basins
- Measurements easily integrated into plant host system

- **RESULTS**

- Fast implementation – less than 2 months from order date
- Mill quickly complied with environmental regulations



“Less than two months after ordering the Smart Wireless devices, the whole system was fully operational. That is very fast for implementing 30 new measurement points. Now that the network is in place, we also have found that adding additional devices becomes very simple.”

— Peter Hallenberg, Project Leader Process Automation, Korsnäs Gävle

Water Treatment / Effluent Applications



Inlet Flow Rate for Regulatory Requirements:

Rosemount 8700 Mag Flow with THUM adapter

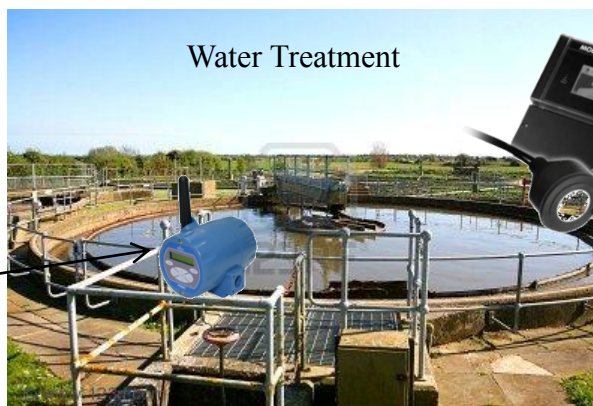


Inlet Temperature for Regulatory Requirements:

Rosemount 648 Wireless Temperature

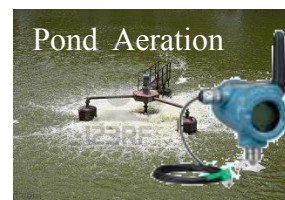
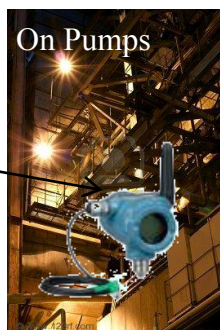
pH/ ORP Monitoring for Water Treatment:

Rosemount 6081 – Wireless PH/ORP



Vibration on Pumps:

CSI 9420 Wireless Vibration



Aerator Vibration Monitoring: CSI 9420 Wireless Vibration

Sludge Blanket Level Monitoring For Sediments: Mobrey MSL600 with 4-20 output to a 648 Wireless

Outlet Flow Rate for Regulatory Requirements: Rosemount 8700 Mag Flow with THUM adapter

Outlet Temperature for Regulatory Requirements: Rosemount 648 Wireless Temperature



Waste Water Monitoring at Lenzing Fibers - Austria



- **CHALLENGE**

- Environmental regulations dictate that inlet and outlet temperatures need to be measured and recorded
- Wired temperature measurement cost prohibitive due to length of cable runs and physical barriers

- **SOLUTION**

- Three WirelessHART transmitters monitor water temperature, communicates with a WirelessHART Gateway 200 meters away; Fourth transmitter used as weather station, and acts as a repeater
- Asset Management system stores calibration information

- **RESULTS**

- Self-organizing network provides a cost-effective and highly reliable solution
- Technology was easy to install and integrate



“When all the transmitters were in place the network offered us a communications reliability of 100%, which is very impressive.”

- Wolfgang Gotzi, Head of Automation and Maintenance Department, Lenzing Fibers

Emerson Smart Wireless Increases Productivity at Wheeling-Pittsburgh Steel



- **CHALLENGE**

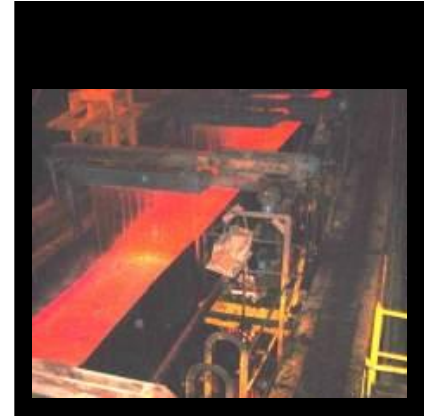
- Needed water flow control to steel on run-out table
- Controlled water volume by look and feel with adjustment to manual valve

- **SOLUTION**

- 4 WirelessHART dP flow meters and gateway to establish coiling temperature control
- 2 wireless pressure transmitters on run-out-table greasing system
- 2 wireless pressure transmitters on cooling water in roughing mill

- **RESULTS – Productivity increased ~10%**

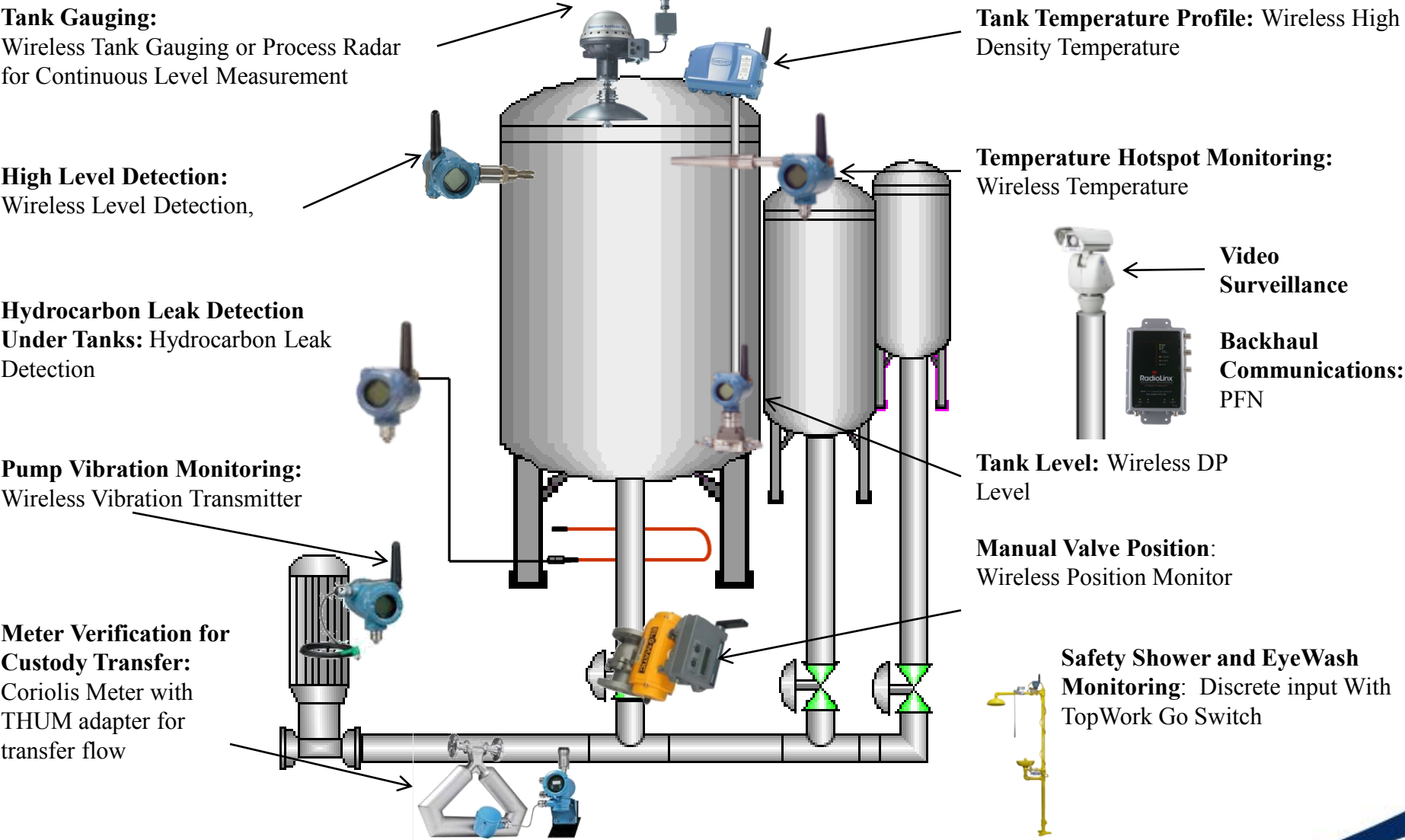
- Reliable operation in both the roughing and finishing sections of the hot strip mill
- Instruments installed and operating in just a few hours with very little manpower



“We are building an infrastructure that opens up opportunities for more applications. The result is better information from difficult-to-reach areas of the mill, and this is helping our personnel prevent unscheduled downtime, meet customers’ quality requirements, and optimize productivity.”

– Gary Borham, Operations Manager

Tank Monitoring Applications



WirelessHART Improves Overspill Protection Compliance in Petrochem Facility

- **CHALLENGE**

- Needed overspill protection on crude, petrol & chemical tanks
- Manual measurements time consuming with risk of injury especially in winter
- Wiring required extensive ground work—costly, and would interrupt operations



- **SOLUTION**

- WirelessHART network, control system and asset management software
- Two wireless level technologies, DP level & Radar w/THUM for all level apps including floating roof; one wireless transmitter for 4 temperature points from 4 tanks

- **RESULTS**

- Eliminated manual measurements
- Improved operator safety
- Automated tank overfill protection

“As well as improving the monitoring of tank levels the new system has provided a fully approved overspill protection solution.”

—Lars Ferm, Site Manager, FH Tank Storage

Remote Tank Monitoring for Nu-West Industries

- **CHALLENGE**

- Needed secure and reliable process data from remote reaction tank

- **SOLUTION**

- Installed 8 WirelessHART pressure and 8 temperature devices on reaction tank ~250 feet from control room

- **RESULTS** – Improved operations

- New information enables operators better control process reactions



“Given the low-risk and simplicity of the application, this seemed an ideal place to try Emerson’s wireless package. The self-organizing architecture was the clincher since less than perfect line-of-sight to each device is not a concern with this system. We already have plans to add more devices to the network.”

— Brian Wood, DCS Specialist

Smart Wireless Benefits Multiple Applications at Technochem in Singapore



- **CHALLENGE**

- Automated level measurement needed on tanks to support inventory, process management and accurate documentation for customers

- **SOLUTION**

- WirelessHART pressure transmitters are monitoring 14 tanks

- **RESULTS**

- Automated inventory management
- Some of the fourteen WirelessHART pressure transmitters are moved from place to place to aid in troubleshooting and new process development
- elimination of “clipboard rounds,” more accurate real-time data for process efficiency, documentation



“If I see a problem in some part of our process, it is fairly simple for me to take a pressure transmitter and move it elsewhere. I can often determine what’s going on in just five minutes, address the issue and quickly return the transmitter to its original application. The flexibility of Emerson’s self-organizing wireless technology makes it much easier to troubleshoot problems as well as evaluate new applications.”

— Jan Huijben, Incineration Manager

Automating Tank Monitoring at Elkem



- **CHALLENGE**
 - Inaccurate means of data collection, toxic gas exposure during manual monitoring of pitch and naphthalene
 - Electromagnetic interference adversely affected wired induction heater control loop
- **SOLUTION**
 - 10 WirelessHART transmitters installed at tank farm, 1 installed on heater
 - Reliable data delivered automatically the automation system
- **RESULTS – Improved data quality, operations**
 - Personnel safety, data accuracy, process control improved
 - Damage to heater coils prevented

“We saved 70% in installed costs compared to using a conventional network.”

– Felipe Brandão dos Reis, Elkem Automation Technician

Oil & Gas Production Applications

Temperature of Flow Lines: Wireless Single Point Temperature & Clamp-on Sensor

Steam Injection Flow: Pressure With DP Flow

Corrosion / Erosion Monitoring: Roxar CorrLog

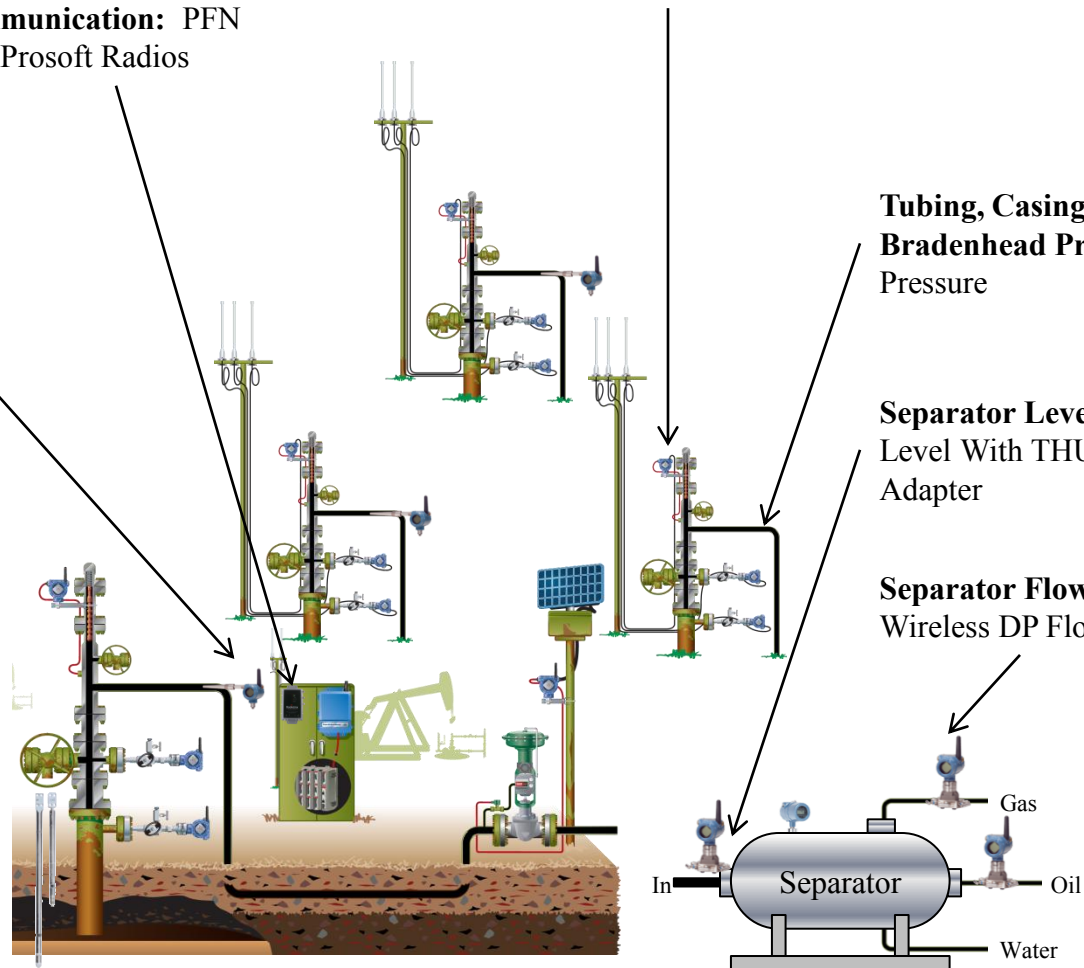
Backhaul Communication: PFN with Prosoft Radios

Plunger Arrival: Wireless Discrete

Tubing, Casing, Bradenhead Pressure: Pressure

Separator Level: Radar Level With THUM Adapter

Separator Flow: Wireless DP Flow



WirelessHART Improves Oil Production at PXP by Optimizing Steam Injection Wells



- **CHALLENGE**

- Local gauges and chart recorders did not provide information necessary to optimize SOR
- Over steaming caused cut liners at a cost of \$90k - \$500, and losing 600 barrels per month
- Customer has 120 wells in a one square mile area; wiring not an option



- **SOLUTION**

- 249 WirelessHart pressure with 3 backhaul network radios for steam injection
- 27 8800 MultiVariable vortex meters with WirelessHART Adapters added to Gateway to measure oil production

- **RESULTS**

- Reduced cut liners (at a cost of \$90K - \$500K each) and saved production up to 600 barrels per day
- Higher production by optimizing SOR and improving reservoir modeling

“When weighted against what was to be gained from this project, the total project cost, including installation services and customized user interface software, seemed quite reasonable given the project’s payback. —Michael Fischback, Facilities Engineer, PXP

Offshore Wellhead Monitoring For StatoilHydro Grane Platform



- **CHALLENGE**

- Monitor wellhead annular pressure and heat exchanger pressures in harsh, difficult to reach environment

- **SOLUTION**

- 22 wireless pressure transmitters relay data back to operator consoles in the control room
- WirelessHART delivered 100% reliability & stability in the crowded metal wellhead environment

- **RESULTS - Operational improvements**

- Eliminated need for daily visits to the wellhead to manually record gauge readings
- Continuous monitoring enables unusual readings to be identified earlier



“ We are delighted with the performance of the Emerson Smart Wireless network in these challenging conditions. ...our instrument engineers are very confident about adding more wireless devices to our installation as required. These typically take around two hours to install compared with up to two days for a conventional wired unit.”

— Geir Leon Vadheim, Instrument Lead, Grane Platform

Calculating Gas Balance at Tecpetrol

- **CHALLENGE**
 - Product tracking, environmental compliance
 - Areas congested by pipes, equipment
- **SOLUTION - Smart Wireless network with**
 - 10 WirelessHART pressure transmitters, 10 WirelessHART DP 3051 transmitters, and 10 WirelessHART temperature transmitters
 - 3 WirelessHART gateways sending data to automation system
- **RESULTS – Improved product tracking**
 - Installed cost savings of 27 percent over wired solution
 - Continuous gas balance data
 - Eliminated clipboard rounds to well heads



“Smart Wireless was the solution for us. One of the advantages in using this equipment is that our process is very variable and involves piping modifications, compressor layouts and primary separation, among others. We can move the measurement points when we need to and do not depend on pipes, cabling, etc.”

— Odin Fernández, Automation & Energy Head, Tecpetrol

Steam Injection Monitoring at Chevron San Ardo, California

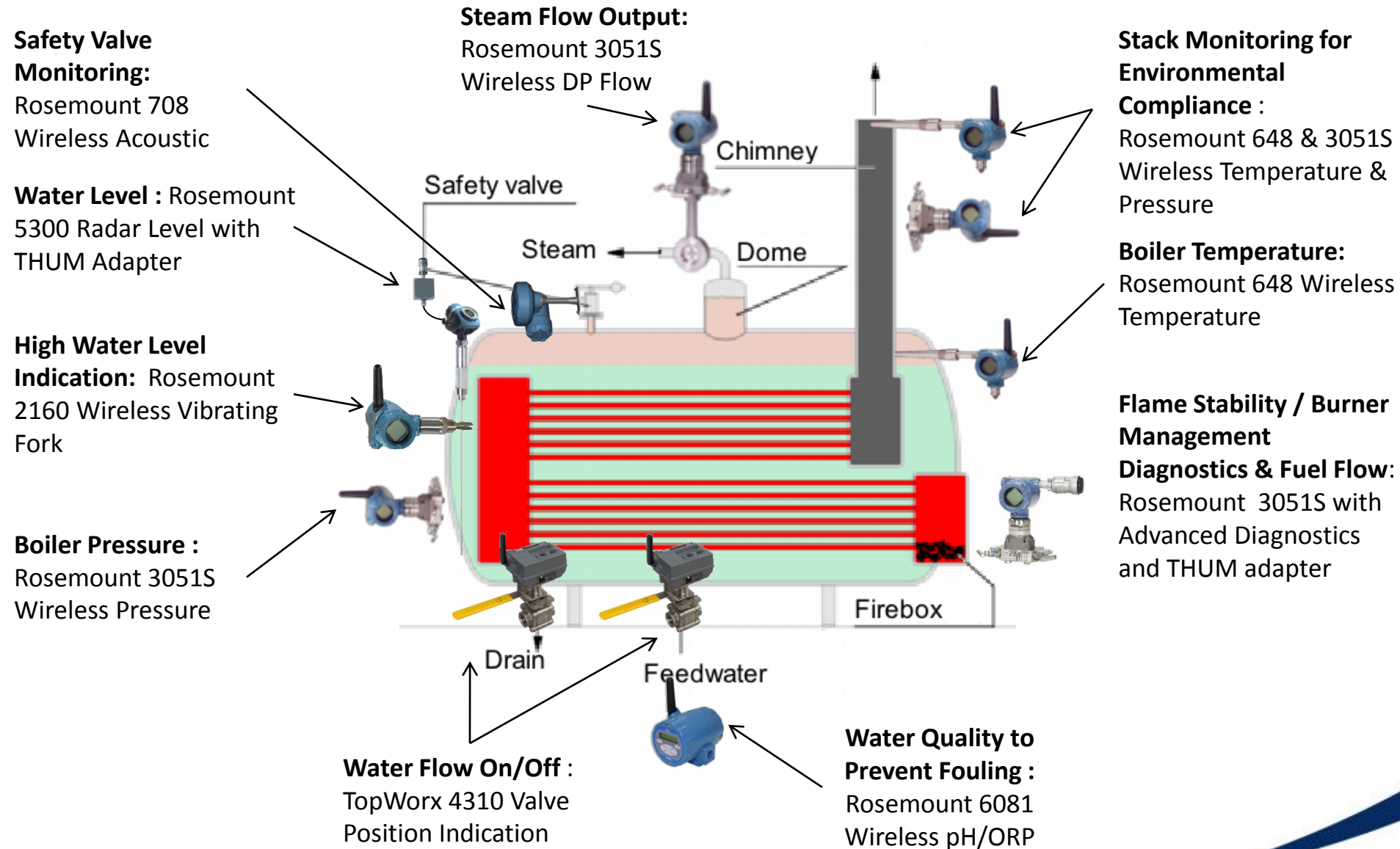


- **Application:**
 - Pressure transmitters monitor steam injection on out-of-service wells
- **Challenge:** Over steaming caused lost production, increased wastewater discharge; field visits required
- **Solution:** WirelessHART network improves personnel safety, increases production, reduces wastewater discharge
- **Application:**
 - Pressure transmitters check down-hole well pressure
- **Challenge:** RTU network obsolete, required hard wired power
- **Solution:** Battery-powered transmitters collect reliable production strategy data, less maintenance, installed for \$60,000 savings

“It only took three hours to install all the instruments, configure and establish the network IP address, and make the Ethernet connection to the control room,” Kinne said. “We have eliminated the excess steam usage and now have a reliable steam injection measurement at eight stations.”

— Paul Kinne, Chevron head operator

Boiler Applications



Boiler Monitoring at Total Petrochemicals, France



- **CHALLENGE**

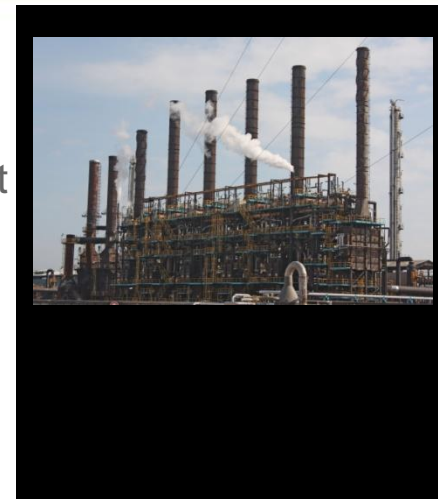
- Better understand the condition of steam cracker boiler and anticipate when it might need to be replaced
- Find alternative methods to carry data throughout the plant due to rising cost of copper and ageing existing wiring

- **SOLUTION**

- Measure internal and external boiler wall temperatures, identify heat loss to calculate wall material's resistance, infer boiler wall thickness and monitor changes over time
- 8 wireless temperature transmitters installed directly onto the exterior of boiler drum

- **RESULTS**

- Improved availability through better understanding of boiler condition
- Saved cost of installing around 1km of new wiring
- Increased safety due to reduction of movement of personnel into and around at-risk areas



"We believe in wireless technologies and Emerson is a pioneer that is on the right track to offer a solution that meets our needs. We were very pleased with Emerson's responsiveness with regards to fulfilment times. Delivery, installation and a successful set up was completed within just ten days of our order."

—Jean-Michel Glad, Control & Regulation Reliability Engineer, Total Petrochemicals

WirelessHART Is Growing in All Industries Because it's Easy, Ubiquitous and Proven



8,700+

Networks that use our IEC 62591 (**WirelessHART**) technology to gain new insight into processes and assets

934,000,000+

Nine hundred million hours of operation of IEC 62591 (**WirelessHART**) solutions

18

WirelessHART measurement types available today

7

New products coming soon

6



Plant productivity solutions including safety, data backhaul and video

13

Tools to help EPCs implement wireless

Proven integration with all

8

major automation suppliers

Certification and approval in over countries **120**

4,100+ Emerson wireless experts



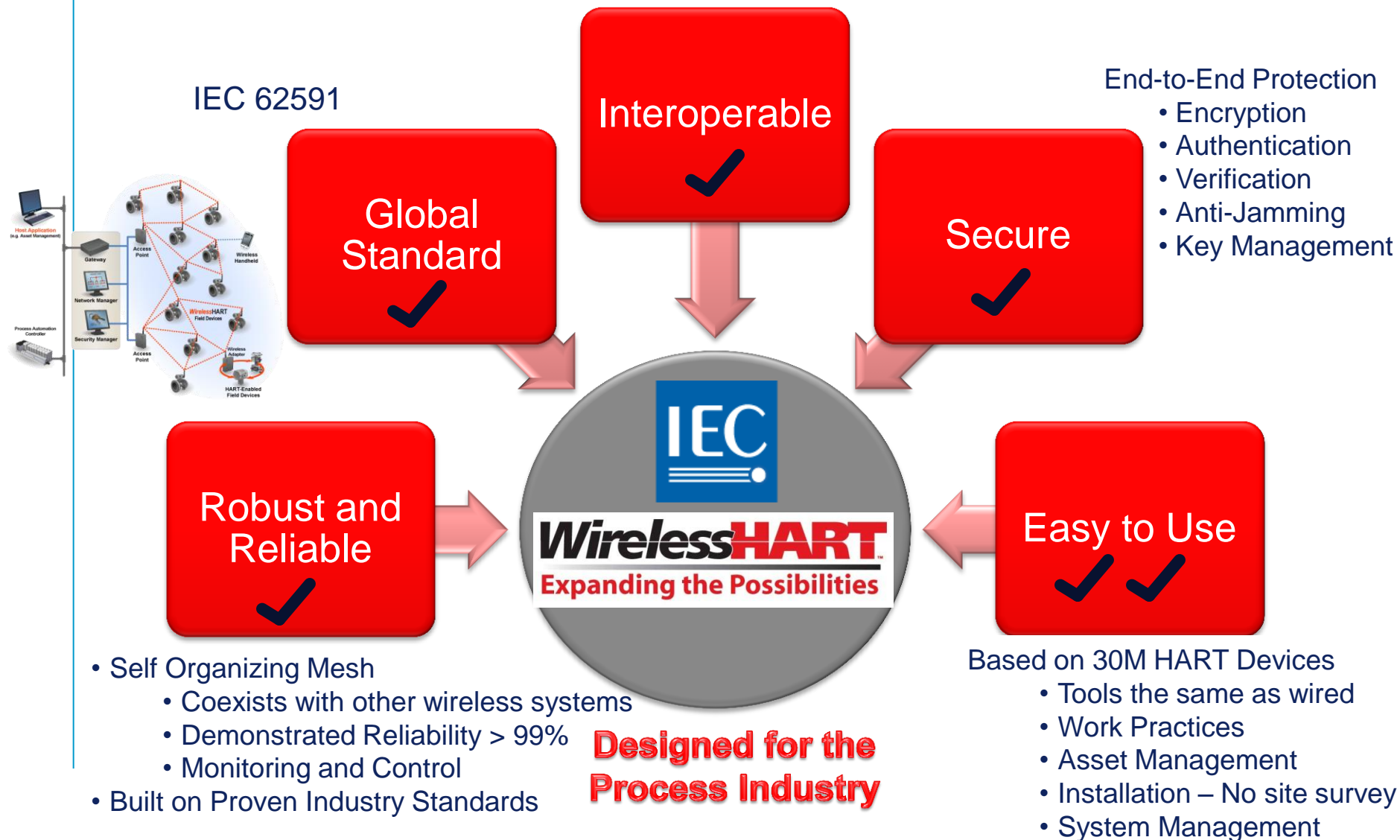
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Global standard for wireless in automation

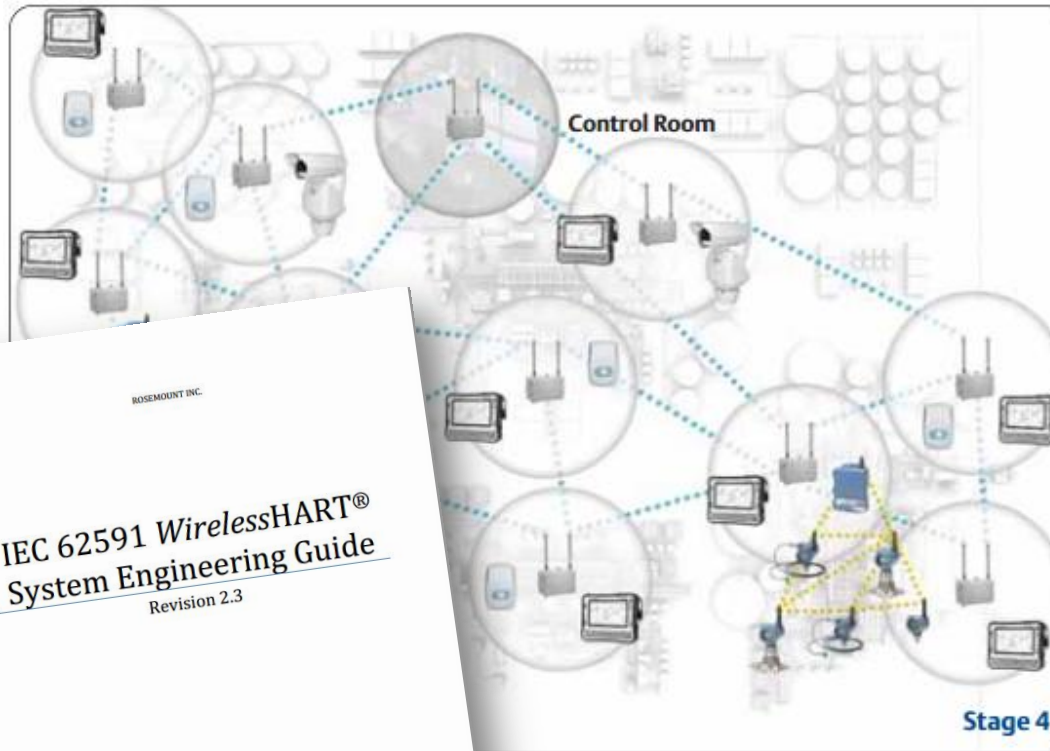


WirelessHART

ABB – E+H – Emerson – MacTek – Pepperl+Fuchs – Siemens – ProComSol – PhoenixContact – And More



Plant Wide Solutions



- This is the Wireless Plant of the Future
- Start here today
- Or start small and scale to here tomorrow

ROSEMOUNT INC.
IEC 62591 WirelessHART®
System Engineering Guide
Revision 2.3

WirelessHART
IEC Approved Standard (IEC 62591-4, 1.0)

This document provides guidelines for implementing WirelessHART systems in the project process
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FACT: Applying best practices can reduce automation costs up to 35% and reduce commission time by weeks.

Questions?



- If you have time, I have an extra 76 slides on how real customers are using WirelessHART Solutions today.
FACT.

SEE MORE. DO MORE.

- www.emersonprocess.com/smartwireless
 - See over 140 documented applications and end-user successes
- www.hartcomm.org