Predictive Maintenance - Wireless Control and Monitoring
Wireless for Predictive Maintenance
- Where do you need to go?
Predictive Maintenance in Municipal Environments

- Integrate with Existing Equipment
- Scalable Across Large Facilities
- Resistant to Interference and Harsh Environments
- Power Efficient for Remote Deployment
Some Current Wireless Options

Start with a radio having little or no I/O

Add: DIN Rail
Some I/O
Terminal strips

Mount all your stuff

Stick it in a box and then install the box

And finally... Wire your I/O
Wireless for Predictive Maintenance
- Flexibility in I/O

**Multiple Types of I/O**

- Digital
- Analog
- Thermal
- Communication
- Transparent Serial
Wireless for Predictive Maintenance
- One Package
Wireless for Predictive Maintenance - Robust Radios

- Bidirectional Transceiver Broadcasting in Industrial, Scientific, Medical (ISM) Band:
  - 902-928 MHz ISM Band
  - 2.4 GHz ISM Band
  - No license required (but, it is certified by the FCC)

Mega-Hertz = $1 \times 10^6$ cycles/sec.

Giga-Hertz = $1 \times 10^9$ cycles/sec.
Wireless for Predictive Maintenance - Robust Radios

Frequency Hopping Spread Spectrum (FHSS)

- Allows for many radios to operate in confined spaces

150 mW or 1 Watt Radios
Time Division Multiple Access (TDMA)

- Every Transmitter & Receiver is Guaranteed a time slot
- Minimizes possibility of packet collisions
- Contention Approach – Different? Better?
Radio Design: Wireless Control

- Sensor
- Node 1
- Node 2
- Gateway
- Valve ON
- PLC
- High Level
Wireless for Predictive Maintenance - Robust Radios

Safe Harbor Scenario

Sensor -> Node 1 -> Valve Shut-Off

Node 2

Gateway
Banner’s Solution

- Small Battery 3.6V
- Big Punch
- Lots of Endurance
- External Battery Box

Gives Us the Peel-n-Stick Solution

**FlexPower™ BATTERY CONSERVATION**

Cycle On

Cycle Off

0V

0 1 2 3 4 5 6...

*Multi-Year Battery Life*
Power Design: “Peel-n-Stick”

- Flexible and Mobile
- No Hassle Installation
- Unlimited Expandability
- No Software Required
- Access Remote Locations
Wireless Solutions - Predictive Maintenance and Facilities
Predictive Maintenance – Temperature, Vibration, & Current

- Mission Critical Component Monitoring
  - Motors, Fans, Pumps, Etc.
  - Many customers monitor them in a temporary fashion
  - Many want to monitor the same, additional or remote equipment continuously
  - What stops them?
    - You need special software ($$$)?
    - Too costly to “get” the information?
    - Need to use special equipment (like their temporary monitoring methods)?
Predictive Maintenance – Temperature, Vibration, & Current

• Temperature (Motors, Bearings, Rooms, etc.)
  • Direct Contact
    • Thermistor, Thermocouple or RTD
    • Low cost sensors, very simple
    • Thermocouple or RTD Nodes
    • Great battery solution
  • Non-contact
    • Infrared (T-GAGE M18T)
    • Higher cost sensors, tough applications
    • Mixed I/O Node or Analog Nodes
    • Good battery solution
Predictive Maintenance – Temperature, Vibration, & Current

• Vibration
  • Many manufacturers available
  • Numerous styles (RMS, True RMS, Peak, etc.)
  • Example Tested: Wilcoxon Research PC420VP
    • 30 second warm-up, 10 min. Sample/Report
  • Estimated Battery Life
    • DX81 = 0.75 Years
    • DX81P6 = 4.5 Years
  • Use Standard DX80 Mixed I/O or Analog Node
Predictive Maintenance – Temperature, Vibration, & Current

- **Current**
  - Many manufacturers available
  - Numerous styles (RMS, True RMS, Peak, Fixed etc.)
  - Example Tested: Veris Industries Hawkeye (4-20 mA)
    - 2 second warm-up, 10 min. Sample/Report
  - Estimated Battery Life
    - DX81 = 3.7 Years
    - DX81P6 = 22 Years
  - Use Standard DX80 Mixed I/O or Analog Node (0-10 Vdc?)
Predictive Maintenance – Temperature, Vibration, & Current

- Mission Critical Component Monitoring
  - Wireless is the least costly method for “getting” the information on temporary or constant installations
  - Battery Powered helps you with a standard solution for temporary or constant monitoring applications
  - No need for specialty software... monitor the critical component in their existing controllers... set thresholds, alarms, etc.
  - Use radios with your temporary/portable probes (most are producing a 4-20 mA signal)
  - Use one radio Node for monitoring multiple criteria (current, vibration, temperature)
Winning the Maintenance Battle with Wireless
Wireless Solutions:
Failed Conduit
Wireless Solutions:
External/Remote Tank Monitoring
Wireless Solutions: Preventative Maintenance
Wireless Solutions: Video Monitoring
surecross™ wireless network

sensing unplugged™

www.bannerengineering.com/wireless