Reducing Signal Noise in Process Environments
Agenda

1. What is signal noise?
2. What causes signal noise?
3. What problems does high signal noise cause?
4. Best practices to reduce noise
5. What about isolators/conditioners?
Takeaways

Learn what environmental issues can cause signal noise so you can identify potential problems and take corrective action.

Learn what to look for in process signals to determine if noise is an issue.

Learn how to install signal process infrastructure to minimize noise problems.

Learn how to mitigate signal noise issues with isolators and conditioners.
Getting to know you

- Where are you located?
- What is your industry?
- What is your experience with noise?
Noise is any unwanted modification or interference that degrades the desired communication signal.

Noise can happen during capture, storage, transmission, processing or conversion of the signal.

All process signals have some type or level of noise at all times.
What causes signal noise?

Ground loops
Poor wiring practices
Improper grounding
Close proximity to other equipment
Long wire leads picking up RF
Poorly design product circuitry
What problems does signal noise cause?

- Apparent loss of signal
- Distorted signal causing wrong interpretation or display of a process condition
- Improper control of an industrial process
Questions?

• Please enter your questions in the ‘Questions’ window
Best practices - installation

- Avoid running signal wires near power wires
- Keep signal leads away from AC magnetic field sources
  - Motors
  - Transformers
  - Large relays
  - Wire at 90 degree angles if necessary – parallel lines cause noise
- Use twisted pair wiring
  - Wire to avoid ground loops
Best practices - installation

• Use shorter wire runs when possible
• Use shielded cable with proper grounding (one end only)
• Continuous grounding through all enclosures, conduits, etc.
Best practices – planning & design

- Choose the best type of analog signal
  - Low level voltage are more susceptible to noise than current signals
- Convert analog signals to digital signals as close to the process as possible
- Use a software filter
- Use a hardware filter
Isolators

- Isolators
  - Isolate the input and output circuits
  - Solves the ground loop issue
  - Prevents the further transmission of large voltage/current transients

- When to use isolators
  - Ground loops are a problem
  - High noise could potential damage the system

- When to avoid isolators
  - Noise is due to an installation problem that a signal isolator can not solve
Conditioners

- Conditioners
  - Convert signal from analog to digital
  - Convert signal from voltage to current
  - Signal amplification

- Pros
  - Changes signal for less susceptible signal
  - Relatively low cost
  - Easy to use

- Cons
  - Complexity
Practical Case 1

Grade Level Display and Control

- **Problem**
  Erratic display causing false alarms. Grounding properly installed. No nearby noise sources.

- **Possible Reason**
  4-20 mA level signal and AC power share the same conduit.

- **Next Steps**
  1. Use shielded cable
  2. Separate field wiring

![Diagram showing a tank, 115 VAC radar level transmitter, grounded conduit, 60 Hz noise coupling, 115 VAC (twisted pair), 4-20 mA signal (twisted pair), grade level display, ground, steel enclosure, flexible conduit, and 115 VAC (source).]
Upgrade of a Flow Totalizer System

- Problem
  Rate/Totalizer occasionally jumpy. Recording incorrect totals. Pulse counts correct from flowmeter.

- Possible Reasons
  RF interference possible, but all reasonable steps taken.
  Could be ground loops present.

- Next Steps
  1. Use software filtering
  2. Use a loop isolator to prevent ground loops.
  3. Consider using digital rather than analog transmission for long wire-runs
Summary

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2. What causes signal noise?
3. What problems does high signal noise cause?
4. Best practices to reduce noise
5. What about isolators/conditioners?
Q & A

• Please enter your questions in the ‘Questions’ window

• Apologies if we do not get to your question today. We’ll contact you offline with a response as soon as possible.
An Introduction to Modbus®

- This webinar is a back-to-basics review of Modbus communications. Topics covered include:
  - What is Modbus?
  - What are the advantages of Modbus?
  - What key information do you need to work with a Modbus device or system?

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