Cosasco® Wireless Systems

Cosasco® Wireless Best Practices: A Guide for Planning, Installation, and Commissioning.

Rohrback Cosasco Systems, Inc.
11841 E. Smith Avenue
Santa Fe Springs, CA 90670
E-mail: sales@cosasco.com
Website: www.cosasco.com

Bulletin # AN-119
Date Issued 5/11/2011

Cosasco® Wireless Systems

INTRODUCTION

Rohrback Cosasco Systems family of wireless products has joined the self-organizing wireless world of Emerson Process Management to allow for a simple and easy method for planning, installing, and commissioning of wireless devices.

This document is a best practices guide that will cover all the essentials for a well planned wireless network. The following categories are to be considered when using best practices:

1) Network Planning
2) Network Installation
3) Data Integration

HARDWARE CONSIDERATIONS

Wireless Devices

Rohrback Cosasco Systems has made it easy for users to be able to mount or connect wireless devices without having to deal with the mess of wires. The transmitters have earth ground terminals for easy grounding access. The devices use intrinsically safe power modules and connection ports to allow for the extra peace of mind when out in hazardous locations.

- Cosasco Wireless Systems MWT-3905 (Microcor Wireless Transmitter)
- Cosasco Wireless Systems MWT-3905-WE (Wireless Extender)
- Cosasco Wireless Systems MWT-3905-QS (Quicksand Wireless Transmitter)
- Cosasco Wireless Systems CWT-9020 (Corrater Wireless Transmitter)

Smart Wireless Gateway

The Smart Wireless Gateway (Model R-1420) connects the self-organizing network to the information system and needs continuous line-powered 24V DC service at 0.5 Amps. An Uninterruptible Power Supply (UPS) is recommended for the gateway.

Lightning protection and earth grounds installed by certified electricians are recommended for gateways with either integral or remote antennas.

Cosasco® Wireless Systems

PART 1: NETWORK PLANNING

Project Scope

Scoping the project is an essential step to having a successful network. The most important questions that need to be answered are: Where do the data points exist? What is the size of my network going to be? And how do I acquire my data effectively?

Once data point locations have been determined. Next, is to determine the size of the process facility. A large process facility with multiple process units can function under one network. This is a typical method to allow data to flow back to the information system via wireless gateway, following the same organizational and physical structure and workflow of the process facility. This method minimizes issues of hardware and data ownership giving a general direction of data flow.

If the facility consists of a smaller operation, then it would be better to treat the wireless network as a single process. The network can be indoors or outdoors. For more complex process units such as an enclosed multilevel facility, it may be optimal to scope a wireless network to each floor of the facility. In the event that process facilities are extremely compartmentalized by steel and concrete, it may be necessary to treat each large enclosure as a process unit.

Key Action: Scope a wireless project by identifying data points and determining the size of the process. Obtain a scaled drawing of the process area to help determine network size.

Plotting Wireless Devices

Once measurement points have been identified, optimize with process design first. Second, allow for the self-organizing network to populate devices and self-navigate through complex process environments. Make sure to consider future measurement points as well.

The wireless devices listed above with the exception of the Smart Wireless Gateway are rated for Class I, Division 1. They can be planned for any hazardous location with those ratings. The devices are not restricted to only hazardous locations and can be used in non-hazardous areas as well since the radio signals pose no danger for ignition

Key Action: Plot the planned locations of the wireless devices on to the scaled drawing of the process area.

Cosasco® Wireless Systems

Plotting Device Connection and Guidelines

There are five potential causes of connectivity issues when designing a self-organizing network:

1. Wireless device is programmed with incorrect gateway Network ID or Join Key.
2. Wireless device is due for power module replacement.
3. Wireless devices are out of communication range from each other.
4. Wireless connections are blocked by large obstructions.
5. Wireless devices are inside an enclosed area.

In order to plan for a good network infrastructure, utilize the scaled drawing and draw lines between wireless devices and ensure that they meet one of the following criteria:

1. The range for RCS wireless devices is up to 1000 feet (300 m) in optimal conditions when elevated at least 6 feet (2 m) from the ground or large objects in clear line of sight.
2. For moderate to dense infrastructure settings, the range reduces to approximately 300 feet (100 m). There is no clear line of sight in these situations and typically characterized as an area with vehicle support.
3. For extremely dense infrastructures, the signal range drastically drops and is typically near 100 feet (30 m).

To exercise good practices during the design phase, plan for each device to have at least two neighbors (including gateway) ensuring alternate routes for devices to send data back to the gateway. Although the distances may vary, meeting any one of the criteria listed above will likely create solid alternatives for the wireless devices. If for any reason each device does not have more than one alternate route, plan for additional measurement points or utilize a Wireless Extender to strengthen alternate options. The existing Wireless Extender model is MWT-3905-WE.

Expect communication failure with the following situations:

1. A large object or process unit is between the two wireless devices. For example, a building or tank.
2. Installing the wireless device in an enclosed area isolated from everything by a concrete or steel wall will greatly reduce a signal leaving the enclosed area. In most cases, every additional concrete or steel wall will decrease the signal strength by half.

Solutions and connectivity options for wireless devices in heavily dense infrastructures or enclosed areas:

1. Utilize RCS 10 or 15 foot flexible probe adaptors allowing for improved mounting locations. This will allow for devices to be mounted at least greater than 3 feet from large objects in more desired locations offering better radio signal.
2. Add a Wireless Extender nearby to safely relay the data back to the gateway.

The self-organizing network is highly reliable in detecting other wireless devices and paths if the above guidelines are followed closely. The network constantly evolves and becomes more robust with time. In most circumstances, Wireless Extenders will not be required if proper planning is done.

In the event that Wireless Extenders are needed, the most effective locations for Wireless Extenders are on higher locations. They can be placed on light posts and 2nd or 3rd level catwalks.

Key Action: Plot the wireless devices following the above guidelines.

Cosasco® Wireless Systems

Self-Organizing Network Gateway Integration

Now that the wireless devices have been planned and located accordingly, it is time to determine placement of the Smart Wireless Gateway and integrate it into the self-organizing network. The gateway needs strategic placement to allow for centralized access to the wireless devices while easing into the information system to create corrosion data flow.

Host Integration

The Smart Wireless Gateway cannot be plotted on the scaled drawing of the process area until it is known what data applications on the information system will leverage the data flow from the self-organizing network. It is important to select the gateway connection solution that best fits the process unit. Furthermore, it is important to determine the application user interface and who will be using it such as an operator or corrosion engineer.

If the data application requires a serial connection utilizing Modbus®, a serial connection between the Smart Wireless Gateway and the information system must be planned. Consult the system administrator who operates the serial systems for advice and availability on connection points. Key information required by the administrator will be the number of Modbus registers required for integration. A good estimate for the number of registers will be the number of data points, enough for each process variable (metal loss).

If the data applications like Microcor Tools, Data Historians, AMS® Suite: Intelligent Device Manager, and remote access to the gateway require data in the format of Modbus TCP, OPC, and HTML, then either a wireless or wired Ethernet connection is necessary. Ethernet connectivity provides advanced integration including data flow, as well as remote access to the gateway for diagnostics and configuration. Wireless or wired Ethernet will provide the optimal connectivity, security, and integration.

The Ethernet communication protocols also provide the means for advanced security implementation. These security features allow the user to control access to the gateway as well as manage the gateway like a network device in a secure Ethernet network. With serial systems, the user is limited to physical isolation of the components and is unable to encrypt data or manage access due to Modbus limitations.

Ethernet communications will have fewer restrictions than serial systems, but may require the involvement of your IT department. For these installations, the gateway can comply with the data connection requirements. The IT services can identify the connection point and integrate the gateway through Ethernet firewalls, and provide remote access to the gateway.

Cosasco® Wireless Systems

Smart Wireless Gateway Location, Mounting, Antenna selection

The Smart Wireless Gateway location should provide wireless connections to 25% of the wireless network and a connection to the information system. Choose a location that is convenient for the physical connection to the information system and judge gateway connectivity with the self-organizing network by applying the procedure outlined in Plotting Wireless Devices on page 2. Optimally, the gateway will be centrally located within the self-organizing network. For very small self-organizing networks, less than five devices, the gateway should connect to all devices for optimal reliability and connectivity for future network expansion.
If the Smart Wireless Gateway cannot provide adequate connectivity with the wireless network and a physical connection to the information system, then there are several possible solutions. If possible, extend the physical connection of the information system to a location where the gateway can connect to 25% of the self-organizing network using either wireless Ethernet, wired Ethernet or serial cables. Another option is to add wireless devices, or Wireless Extenders, to bridge the distance between the gateway and the self-organizing network. A third option is to start with a self-organizing network that is centered around a physical connection to the information system.

Once the Smart Wireless Gateway's location is decided, select the exact mounting location and antenna type. The gateway is designed for exposure to process elements, including hazardous areas. The gateway may be installed in one of the following options:

1. Mount the Gateway with Integral Antenna.

   The gateway with integral antenna should be mounted in a location for optimal connectivity to the self-organizing network. If all wireless devices are near the ground, then the gateway should be mounted approximately 15-25 feet (4-8 m) above the ground. If mounted on the side of a building or infrastructure, the gateway should be 3 feet (1 m) from the side of the building or infrastructure. If placed above a building, then the gateway should be at least 6 feet (2 m) above the roof or building.

   Be sure to properly ground the housing and install lightning protection for the gateway.

2. Mount the Gateway with Remote Antenna.

   All gateways with remote antenna options come with 50 feet (15 m) of remote antenna cable to comply with global spectrum regulations. Shorter remote antenna cable would not comply with spectrum regulations and longer cables would reduce the range of the wireless signal from the gateway, so 50 feet of remote antenna cable must always be used. If mounted on the side of a building or infrastructure, the remote antenna should be 3 feet (1 m) from the side of the building or infrastructure and 15-25 feet (4-8 m) above the ground. Mount the gateway within 50 feet (15 m) of the remote antenna. If there is excess remote antenna cable, coil and securely mount. Do not use the 50 feet (15 m) of remote antenna cable to place the remote antenna 50 feet (15 m) above the ground.

   Be sure to properly ground the housing and install lightning protection for the Smart Wireless Gateway to ensure proper functioning of the wireless systems.

Cosasco® Wireless Systems

PART 2: WIRELESS NETWORK INSTALLATION AND DATA INTEGRATION

INSTALLATION CONSDERSATIONS

Installation Order

The most optimal installation order would likely be to begin installation with the Smart Wireless Gateway first and work your way out installing the wireless devices. This method is most effective because commissioning of wireless devices and confirmation of successful network joins can be done in parallel.

Installation Resources

Users performing the installation should read the Quick Installation Guide that comes along with the user reference manual. The installation guide provides the latest information regarding wireless device installation.

The user will only need the MWT Install kit and will have the option of using a separately purchased Checkmate DL-W handheld (Wireless Configurator) to program the wireless devices in the field if necessary.

COMMISSIONING CONSIDERATIONS

Commissioning Order

As explained above in the installation order, it is best to commission the Smart Wireless Gateway first, followed by the wireless devices. This allows for users to confirm successful communication to the gateway, as well as allow the self-organizing network to begin populating. As the network expands as a giant sphere, this allows for the ease of expansion of future wireless devices.

Commissioning Wireless Devices

RCS Wireless Devices are configured to your specifications unless specified to leave with factory default settings. In addition to probe selection and installation, each wireless device requires a Network ID, Join Key and Transmit Burst Rate to securely join a self-organizing network. Refer to the reference manual for detailed instructions.

The Burst Rate is how often the wireless device samples the process and transmits new measurements and device diagnostics through the self-organizing network to the gateway. The smaller the burst rate, the more frequently measurements will be made, but with a faster consumption of the power module. Typically corrosion is a process that is detected over a long period of time requiring less frequent readings. The burst rate will be subject to the corrosion engineer's desired frequency. The default burst rate recommended by RCS is 10 minutes. In saying that, for initial join purposes of a wireless device, RCS recommends a two minute burst rate until the wireless device has successfully joined the Smart Wireless Gateway. Thereafter, the rate can be changed to 10 – 60 minutes.

Cosasco® Wireless Systems

Commissioning Wireless Network

Once all wireless devices are online and data can be viewed through the Smart Wireless Gateway, the user can see the connections between all wireless devices. It may take up to a complete day to have the network populate as much as it can. If a wireless device does not have multiple neighbors, it may be necessary to add an additional Wireless Extender to fortify the network.

Application Integration

This portion will be up to the user to select the method of desired data application on the information system. The gateway easily facilitates serial and Ethernet configurations, Modbus registers, OPC tags, and AMS integration. Contact RCS Customer Service for Microcor Tools data application.