



The Modern Manufacturer's Guide to Industrial Wireless

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It's hard to imagine an effective smart factory without industrial wireless. However, the path to reliable wireless on the factory floor hasn't always been smooth.

Historically, operations teams have been skeptical about industrial wireless. In fact, some have deployed miles of cable to avoid it. This approach is expensive and time-consuming. And with a growing number of devices to connect to the network, an all-cable model is no longer viable.

But operations' skepticism exists for a good reason. In some instances, IT teams have deployed wireless solutions meant for enterprise environments. These solutions can be unreliable and frustrating in an industrial environment. Often, they sour operations teams on the idea of wireless in a manufacturing setting.

This creates tension between the IT and operations teams, and can leave manufacturers with a solution that's behind the curve.

The fact is, deploying wireless in manufacturing is not nearly as simple as deploying it in an office. Industrial environments face unique challenges and conditions, including building structure, temperature, and signal propagation. Overcoming these challenges requires a different approach.

Reliable and effective industrial wireless is possible, but it requires careful planning. The process is more complex than in enterprise settings, but purpose-built industrial wireless products and design can aid in making it successful.

In this guide, we'll share practical tips for how companies can bring their IT and operations teams together to make wireless work on the factory floor. We'll cover:

01. | The business benefits of deploying industrial wireless
02. | The top 4 misconceptions about industrial wireless
03. | Tried and true tips for getting it right the first time
04. | How wireless and cable work together in industrial environments

01. The business benefits of deploying industrial wireless

Manufacturing is a competitive and constantly changing industry.

To keep up, manufacturers are upgrading their facilities and network infrastructure. Ultimately, their goal is to build a connected factory that is more responsive to customer needs, shifts in demand, and operational conditions.

These changes increase the need for data gathering, control, analytics, connectivity of machines and people, network capacity, and security. And in turn, those new demands create more complexity and require more advanced manufacturing networks.

Today's industrial wireless tools can help support these new requirements, paving the way for business benefits such as:

- Uptime and productivity
- Cost reduction
- Real-time decision making



In this section, we'll explore these benefits and their impact on the connected factory.

01. The business benefits of deploying industrial wireless

Uptime and productivity

Production issues are costly. In some cases, a facility might lose as much as \$20,000 a minute. That's why uptime and productivity are critical success factors for manufacturing. But how can wireless contribute to improving them?

- **Connecting people and machines.** With effective wireless technologies, operations workers are no longer confined to a control room. Instead, they can track critical data on hand-held devices, and receive real-time alerts from equipment. This allows operations leaders to respond quickly to actionable information. They can immediately contact the right expertise, collaborate securely, and address any issues. This accelerates decision making, decreasing downtime.
- **Adding redundancy.** Wireless can add a layer of redundancy for the network. This helps ensure that critical data gets through, and that outages do not take down an entire network. Quality of Service (QoS) features enable manufacturers to prioritize critical traffic, helping ensure that it is not delayed or dropped due to network congestion.

Cost reduction

One of the most obvious benefits of wireless is its cost: it is significantly more affordable than cable. However, the cost difference is not the only way wireless can help manufacturers save money. Other benefits include:

- **Faster time to market.** Wireless enables more flexibility in configuring the plant floor, which is critical when introducing new product lines or changing processes. This flexibility creates a financial advantage for manufacturers, improving time to market, fostering greater scalability, and enabling innovation.
- **Increased efficiency through analytics.** Real-time wireless analytics help operations manage asset and worker utilization for greater efficiency. Connecting machines, databases, and people is not only possible with wireless, it is often more efficient than cable.
- **Reduced complexity.** Today's manufacturer wants to align enterprise business systems with production technologies. The reason is simple: it reduces operational costs and complexity. However, this is possible only with a unified wireless infrastructure that supports both IT and operations. Uniting these systems will save money, improve operations, reduce maintenance, and allow for increased automation.

Real-time decision making

Wireless networks give operations leaders access to vital production information across the supply chain. This enables more competitive manufacturing through:

- **Remote expert collaboration.** Wireless can support secure, high-definition video conferencing. This helps manufacturers efficiently use off-site experts, speeding problem resolution and lowering costs.
- **Visibility across the factory floor.** Wireless remote sensors help monitor environmental conditions. They can trigger alerts to operations staff if a problem is on the horizon. Then, operations can resolve the issue before it causes a long downtime period.
- **Mobile workforce.** Operations leaders are no longer tethered to their desks. Wireless enables connectivity across the plant. This means operations teams can get the information they need throughout the day on their tablets or handheld devices, while giving them more time on the factory floor.

02. The top 4 misconceptions about industrial wireless

As we have discussed, early forms of wireless technology were not well suited for industrial environments. Unfortunately, perception of wireless hasn't always advanced as fast as its capabilities have.



1 Reliability

Reliability has always been a key concern for manufacturers. However, today's wireless has matured and now supports many mission-critical applications.

Still, one of the lingering concerns regarding these wireless networks is radio interference.

Thankfully, modern wireless technology such as Cisco CleanAir® analyzes and classifies all radio frequency (RF) activity and mitigates interference.

CleanAir® technology operates 24x7, constantly monitoring for interference and air quality issues. This allows for a more proactive approach to wireless spectrum management.

Using multiple antennas also improves link quality and reliability. Features such as multiple-input multiple-output (MIMO) allow manufacturer's to use multiple antennas simultaneously, increasing the reliability of a connection.

2 Security

Security is paramount for industrial operations, and some manufacturers see wireless as a potential security threat. They worry it will create new vulnerabilities in the network. One key concern revolves around rogue access points.

Wireless intrusion detection systems and intrusion prevention systems (wIDS/wIPS) address this issue. They detect, locate, mitigate, and contain wired and wireless rogues and threats at Layers 1 through 3.

Access points can now process over-the-air traffic to a large library of wireless intrusion attacks and anomalies. This allows them to determine whether the network is being attacked or if impersonation is in progress. And this processing occurs on the edge to allow for greater scalability.

Scans can detect rogue access points, rogue clients, spoofed clients, and client ad hoc

connections across all channels without affecting performance.

Real-time visibility across the wireless network allows for authentication, authorization, and accounting (AAA) as well as configuration and investigation. Mitigation actions can be logged and traced. In conjunction with CleanAir® technology, spectrum intelligence can detect rogue devices and traffic behavior.

These improvements help manufacturers experience the benefits of wireless without compromising security.

“Common misconceptions about wireless include concerns about *reliability*, *security*, *bandwidth*, and *latency/throughput*.”

 Tweet this thought

02. The top 4 misconceptions about industrial wireless

3 Bandwidth

Early industrial wireless deployments often focused on lower-bandwidth communications. Wireless technology was limited, so deployments centered on applications with simple data reads.


But times have changed. Manufacturers need support for high-bandwidth applications such as real-time data, collaboration, and video. Wireless can meet those high-bandwidth requirements through a variety of technological advancements.

For instance, intelligent routing allows the access point to sense the best possible path for each packet of data. Newer standards such as 802.11ac with 4 x 4 MIMO technology can offer sustained 1.3-Gbps rates over a greater range. This creates more capacity and reliability.

4 Latency and throughput

Manufacturing settings need low latency and high throughput. These standards were initially hard for wireless to achieve. Because wireless is a “shared” medium, it was more prone to environmental factors that cause interference and delays.

“Today’s wireless networks can offer *consistent* and *reliable* data transmission.”

 Tweet this thought

To achieve low latency and higher throughput within wireless networks:

- Identify the number of nodes, clients, and devices to manage the amount of traffic across the network topology.
- Reserve bandwidth for specific mission-critical applications and peak access hours.
- Identify what industrial protocols are being used and which are better suited for wired or wireless environments.
- Correctly mount access points—ideally away from areas where there is high interference. (Note: 5 GHz frequency bands are generally better than 2.4 GHz for industrial networks. They have more channels and are less prone to interference. 2.4 GHz is an option for noncritical traffic or where latency and throughput are not factors.)

03. Tried and true tips for getting it right the first time

Every industrial environment has its own challenges. From challenging building layouts to harsh environmental conditions, each is different. And if you fail to account for these conditions, your wireless project may fail.



To ensure you get it right the first time:

- **Start with a site survey.** Software makes deploying factory wireless considerably easier. However, those tools can't stand alone. They may miss nuances related to layout, critical locations, coverage, and planning. That's why every industrial wireless deployment should start with a site survey. This simple first step sets your wireless project up for success. An effective site survey helps determine critical elements of a wireless plan. These include antennas, access point placement, security, availability, and any potential obstructions.

Important equipment standards

- [Ingress Protection¹](#)
- [Electrical Equipment Classifications²](#)

03. Tried and true tips for getting it right the first time

- **Choose the right equipment.** Enterprise-grade wireless equipment is not built with extreme conditions in mind. In an industrial setting, that equipment could fail. Even worse, it could interfere with day-to-day manufacturing operations. There's a good reason almost everything in an industrial setting meets ruggedized standards. The same should be true for your industrial wireless infrastructure.

Off-the-shelf wireless equipment might seem like a more cost-effective answer at first. However, equipment that does not meet industrial standards may be unreliable, and could cause the network to fail or become difficult to manage. Ensure that your equipment meets industrial ratings and is certified for industrial environments (Class 1, Div2, IP66, and IP67 are examples). You should also consider the proper antennas that will meet the range, coverage, and connectivity you need.
- **Select the right partner.** The right wireless partner helps you reduce risk and provides support throughout the process. They should have expertise with both industrial and enterprise IT networks. They should also leverage reference architectures, best practices, and consistent models. Also, ensure that the partner has considered security at every level of the solution. Work with your partner to assess, plan, design, deploy, and care for the lifecycle of the wireless solution, so you can get the most from your technology investment.
- **Bring IT and operations together.** Historically, operations and IT have seen little convergence. They often manage different, segregated networks. However, it is critical to any wireless project that operations teams and IT teams collaborate. Together, they can coordinate priorities, overcome organizational inertia, and prepare for change management. IT and operations should work together on all aspects of network design, deployment, and management. This collaboration ensures that the wireless project will meet the needs of the factory floor. At the same time, it can build trust between the two functions and help operations leaders understand the capabilities of IT.

04. How wireless and cable work together in industrial environments



Wireless is increasingly prevalent in industrial settings. However, walk through almost any manufacturing plant today and you will still see miles of cable.

Why? Much of the remaining cable is legacy infrastructure. It was installed before wireless was a viable option, or during a period when operations teams were skeptical of it.

However, industrial wireless has come a long way. Today, wireless and cable are complementary solutions.

Wireless can save manufacturing companies a lot of money, in addition to other business benefits. However, most factories still need both.

For instance, machinery is typically hard-wired. This balances the network and ensures that mission-critical machines run effectively.

However, in some settings cable is not a practical solution. Generally, wireless is a better choice for tasks that are more tolerant to variable access time, such as:

- Location-based services to find people
- Tracking assets using tags for safety and accountability
- Monitoring hard-to-reach

locations such as machinery in motion

- Mobilizing workers

And wireless redundancy protocols now come close to matching the reliability of a wired infrastructure.

Still, every manufacturing facility is unique. There are no hard-and-fast rules—only a thorough site survey can determine the best blend of wireless and wired connections.

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Conclusion:

Until recently, deploying wireless across the plant floor may not have been a viable option due to technology restraints. But over the last decade, advancements in wireless technology have changed the way people operate in their daily lives. Now those same advancements are transforming manufacturing.

Today's industrial wireless networks are more cost-effective and easier to deploy. These advancements support higher data rates and throughput, and help create coverage across a connected factory.

Still, in many cases, factory wireless deployments are just beginning to scratch the surface.

The future of manufacturing is linked with the potential of wireless. As manufacturers upgrade their networks to take advantage of today's industrial wireless capabilities, they can expect to experience significant business benefits. And they'll be on the forefront of a wireless revolution that is propelling manufacturing forward.

Cisco is committed to helping manufacturers tap into the potential of industrial wireless.

For more on our solutions in this area, visit:

Factory Wireless - Cisco

1. <http://www.webcitation.org/6DGYoRMwp?url=http://www.ce-mag.com/archive/06/ARG/bisenius.htm>
2. https://en.wikipedia.org/wiki/Electrical_equipment_in_hazardous_areas



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