Building a Business Case for Wireless at Your Industrial Facility


October 2011

One of the most fundamental measures of success for any investment is the degree to which the investment delivers a positive return over time. As a manager, return on investment or ROI is a concept that you are very familiar with. You also know that your ROI on any investment is often determined by the work you do up front – the quality of the research you complete, the strategy you develop, and the experience and knowledge you bring to bear in making key decisions – all before you have even invested the first dollar.

This white paper provides you with some best practices, core economic benchmarks and performance metrics that you can use when developing your strategy and plans for deploying wireless at your plant. We include case study examples with proven real-world data of the positive ROI of industrial wireless applications systems. Wireless technologies now have enough of a track record in industrial plants that these measurements and guidelines can be applied more broadly. While we can’t cover all aspects of the subject, in the next few pages, we have captured what we have learned so far about the economics of wireless. We hope you find it informative.

**The Economics of Wireless**

If implementation or lost opportunity costs (plant downtime and production disruptions) are too high, technologies that boost productivity and efficiency may never make their way into the plant. Due to the nature of production, introducing new technology into a plant is often only considered when a plant must, out of necessity, implement a solution to solve specific problems such as a safety issue, compliance requirements, new construction or a threatening halt to production.

This conservative approach to new technologies is changing, however, with wireless. With the emergence of industrial wireless technologies and standards, plants can improve plant efficiency, safety, security, and productivity. In addition, wireless radically changes the economics of the financial investments in new technology with its lower implementation costs and total cost of ownership, and its rapid return on investment.

Many early adopters of wireless at industrial plants have realized that wireless applications add value and long term benefits, both economic and technological. As pioneers of wireless adoption, these managers have learned through the wireless implementation process how to determine a strategic wireless roadmap, to develop a framework for justification of the expense of implementing a wireless network, and how an open infrastructure approach changes how one should think about the Return on Investment (ROI) and how this return continues for many years into the future, if done properly and not in an ad hoc fashion. This white paper will address the economic benefits of wireless by presenting the numbers and value points to develop a business case around implementing an open, cost-effective wireless infrastructure.
**Approaching Wireless**

The cost-savings and operational improvements of going wireless at industrial plants have been proven by the hundreds of wireless applications that are already operational. These implementations were often led by visionary operational managers who chose to adopt wireless before it was widely accepted. Often these wireless champions found it difficult to sell their wireless ideas to upper management or other departments and managers within the plant. Proposing the move to wireless and clearly mapping out the short and long term benefits – both financially and operational – requires a strategic approach.

1- Determine the goals and operational improvements for implementing wireless at your facility – gathering a cross-functional team together to compare priorities is essential.

2- Gather comparative data – what would it cost to implement a wired solution to accomplish the same objectives? In some cases, there won't be a wired alternative.

3- Choose which wireless approach will work best for your plant.

4- Choose a trusted partner to help you gather business case data and vendor selection. Many wireless system providers like Apprion can help you map out a site plan and wireless strategy.

5- Research economic benchmarks for industrial wireless implementations at similar environments – the system and numbers will not be exactly the same at your plant – but it will help you build a realistic cross-functional model that will help you secure an organizational commitment to wireless.

6- Select your wireless product, systems and vendor – once again, an experienced wireless vendor that offers preliminary site plan analysis is critical for strategic planning.

**Developing the Business Case for Wireless**

In this white paper, we will be looking at the economics of wireless. The objective is to help you with the fifth step above - to better understand and utilize some of the economic benchmarks that have been established by industrial facilities who have already adopted wireless technologies. If the goal is to understand the potential ROI on a project – then let’s start with the “I” – the **investment**. How do you achieve your objectives for the lowest possible investment?

A good start is to go back to steps two and three above – understand your options. First, whenever possible, start by developing a business model and project plan using wired technologies. This will almost always be required in order to answer an inevitable question when justifying wireless investments. Projecting budgets for wired projects are usually easy to develop as you probably have models in place that allow you to estimate project costs based on historical expenses of implementing wired.
If you can produce a project estimate based on wired technologies, established metrics can help you determine an approximate cost for implementing the same project with wireless technologies. Here is your first benchmark – a project done with wireless technology will usually cost 50-70% LESS than the wired option. If we break down a project into four quantifiable investment areas that are easily quantified we can see how we come to this number:

<table>
<thead>
<tr>
<th>Investment Area</th>
<th>Wireless Cost</th>
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<tbody>
<tr>
<td>Hardware/Materials</td>
<td>30-40% Less than wired</td>
</tr>
<tr>
<td>Engineering</td>
<td>45-55% Less than wired</td>
</tr>
<tr>
<td>Installation</td>
<td>80-90% Less than wired</td>
</tr>
<tr>
<td>Administration/Management</td>
<td>55-70% Less than wired</td>
</tr>
<tr>
<td><strong>Total Potential Savings with Wireless</strong></td>
<td><strong>50-70% LESS THAN WIRED</strong></td>
</tr>
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What the precise savings with wireless will be for you will depend on the application you are implementing. The type of application you are implementing will also determine your opportunity to maximize your return – the "R" in ROI. In prioritizing your spending and projects for the year, you have already taken into account what you are required to do in order to keep the plant operational and in compliance with regulatory agencies. You have also assessed which projects will most likely enhance the operations of the plant.

Depending on the project, there are many benefits worth taking the time to quantify. These benefits include increasing operational reliability and system uptime, enabling operators and engineers to be more productive, improving asset utilization, improving personnel safety, enhancing the security of the entire plant, and many others. Some of these benefits are specific to the type of project being implemented, most are specific to the situation at your facility and difficult to generalize. We will cover one customer’s experience in a case study later in this paper. One thing is certain – by leveraging wireless to reduce your investment, you will be able to define a greater return on virtually any project.

**Your Wireless Options**

You will find that not all projects have a wired alternative, such as asset tracking or a man-down safety application. In other cases, you will find that wireless is the economical approach to the project. Now you have a choice. How to move forward with wireless? You basically have three choices when choosing how to implement a wireless network:

1. Install an integrated, but proprietary wireless system that is dependent on one vendor
2. Install a series of ad hoc point solutions that solve immediate needs or
3. Implement a standards based, vendor neutral, secure, reliable managed wireless network.
The first choice, working with a single vendor, gives you the advantage of an engineered system that is designed to integrate various wireless technologies into a single, seamless system. This lets you take advantage of shared wireless infrastructures and achieve economies of both scale and scope. Unfortunately, this choice also locks you into a limited set of lowest-common-denominator proprietary “standards” that will leave you locked in for a very long time to that single vendor. As new applications emerge and wireless technologies evolve, your dependence on that single vendor will limit your options and ultimately hold you back while competitors move forward. The near-term risks seem less but the return on that investment is limited as different vendors step up and innovate with new products over time.

The second option, implementing a series of wireless point solutions, has a good chance of delivering performance and reliability for specific applications. But each best-of-breed point solution you deploy will demand its own infrastructure and management system – requiring an investment in technology and manpower. The individual solutions require separate investments in technology and manpower, so you do not gain any economies of scale or efficiencies. Each point-solution, wireless technology and application will also require its own wireless infrastructure, network management, and security approach. There will be no re-use of a common infrastructure. Each additional wireless application will be much more expensive to deploy and manage – making it difficult to establish a positive return on your investment in any single wireless technology or application.

This organic, point solution approach is appealing, however, because it allows you to add wireless devices and prove incremental value over time. Keep in mind, however, that no matter what the application, the wireless option will almost always be just as effective and cost much less to implement and manage than a wired implementation. This allows you to cost-effectively solve the immediate problem, check the box, and move on to the next. Now do that again, three or four times, and you have saved yourself money and addressed several operational issues. But what kind of problems have you created for yourself in the airwaves – and what happens when you add the next application? Without any ability to manage the wireless spectrum and how it is utilized across wireless systems and applications, there is no way to ensure the security, performance and reliability of any of your wireless applications. At some point, your wireless networks will bump into each other and that is a collision you want to avoid.

The third option is to have a single shared wireless network that allows “plug and play” interoperability, management, and security of any wireless device and application. A truly open wireless infrastructure will allow you to choose exactly the right wireless devices and applications for your plant, regardless of their radio frequency, protocol, or vendor. An engineered approach that creates a network of systems
based on open standards, best practices and vendor neutrality across all wireless applications offers the best risk/return for the investment. Risk is very low with the ability to leverage all wireless technologies and applications, both present and future, and unlimited returns come with the flexibility to choose the best solutions on the market.

**Developing the Business Case for an Open, Integrated Wireless Infrastructure**

In addition to the enhanced flexibility and risk mitigation, an open, integrated wireless infrastructure provides significant economic advantages that are already well-understood. We will look at three of these advantages:

1. **Do more with less** - repurpose your wireless infrastructure for multiple wireless applications.
2. **Freedom of choice** – your ability to choose the best, and most cost-effective, tool for the job.
3. **Scalability** – centralized management and security allows you to easily and reliably scale your use of wireless while managing costs and risks.

**More with Less** – With an open integrated wireless infrastructure, you build one network and add additional applications as needed. There is one up front investment; each additional application can then be deployed at a small fraction of what it would cost to deploy it with its own stand-alone network. By utilizing this common infrastructure, these second, third, or fourth applications can be deployed at 80% less than it would cost to deploy them independently.

**Freedom of Choice** - With the availability of pricing and performance information available at your fingertips, you can almost instantly come up with an example of a comparable proprietary solution costing considerably more than an open alternative. General estimates are that over an application’s lifespan, proprietary systems cost 150% to 300% more to maintain and operate than open solutions.

**Scalability** - Numerous surveys of process manufacturers have determined that within five years many expect to have hundreds or even thousands of wireless instruments, handhelds, and other devices operating in their plants. Only by having each of these devices integrated into a common network will you be able to cost-effectively manage and secure this network. One current adopter of wireless technologies who plans to rapidly accelerate wireless implementations over the next five years has estimated that sharing security and management services across numerous wireless networks and applications will save him over 80% in labor costs alone.
The following case study explains how implementing an open industrial wireless network enabled one plant to realize a solid return on investment in wireless. The production manager at this plant faced the challenge of integrating two separate facilities under one communication system. After evaluating the costs of implementing a wired solution, this manager decided to look into wireless.

A comparison developed with variables of material cost, installation costs and downtime required, engineering time cost comparisons, drafting costs, administrative costs required of a project of this magnitude, and general overhead. The results of the comparison were sobering. Wireless had the clear advantage in all areas.

The initial capital investment to replace the older, wired communication system with a VoIP system plus a wireless infrastructure that provides an “umbrella” of wireless coverage over the entire facility was justified. It showed the wireless solution to be 40% lower cost than the wired option with an initial savings of over $400,000 - these savings coming from reductions in costs in all the variables used in the comparison.

The fixed costs/percentages and variables are listed in the table below.

<table>
<thead>
<tr>
<th>Fixed Costs</th>
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<tbody>
<tr>
<td>Field Device Average Cost</td>
<td>$1,200</td>
</tr>
<tr>
<td>Labor Hour Cost</td>
<td>$35</td>
</tr>
<tr>
<td>Wiring 1000 ft/Per Device</td>
<td>$0.17 ft</td>
</tr>
<tr>
<td>Conduit 500 ft/Device</td>
<td>$2.00 ft</td>
</tr>
<tr>
<td>Engineering % of Materials/Labor Cost</td>
<td>20%</td>
</tr>
<tr>
<td>G&amp;A (Overhead) % Cost Per Materials, Labor, Engineering</td>
<td>7%</td>
</tr>
</tbody>
</table>

Along with the savings realized on the initial replacement of the communications VoIP system, the facility now has a wireless infrastructure that can be leveraged for all additional installed applications at an incremental cost on a per point basis. This is the most intriguing aspect of the installation of an open, vendor neutral, managed infrastructure. At the time of implementation, the possibility of continuing to reap benefits in costs savings and increased efficiencies were promising, but very difficult to quantify because data did not exist for accurate comparisons.
The Apprion ION System provides the invisible umbrella of WiFi and WiMAX coverage and the desired integrated communication system over the two plants. The ION system was chosen because it can accommodate applications from different vendors using differing protocols for many years to come. This alone provides a foundation for financial return as applications are added at smaller, incremental costs.

An industry leader’s wireless sensors were added (Vendor A). Vendor A’s transmitters are used to bring in levels from a tank farm hundreds of yards from the plant site utilizing WiMAX and the successful integration of Vendor A’s gateways with the ION System. Two protocols are now successfully utilized within one common infrastructure. Vendor A’s wireless contacts and sensors were also added to plant equipment to take advantage of already existing but stranded diagnostic information.

Condition monitoring was added to rotating equipment using a different vendor’s (Vendor B) stress wave analyzers. Vendor B’s equipment was selected to provide real-time equipment health data to the control room for increased response time to equipment malfunction. These new applications provide additional alarming functionality of lower priority equipment that would have never have made it into the budget due to the high cost of hardwiring equipment out of the immediate plant boundaries.

Almost two years later, the facility continues to integrate diversified wireless applications into the ION
System, and the list of planned wireless applications continues to grow. Unmanaged growth of wireless infrastructure introduces the likelihood that interference will compromise network reliability, performance, and security, almost mandating the need for network management full time. In contrast, data used from integrating additional wireless projects into the Apprion ION wireless umbrella was used to develop a wired vs. managed wireless calculator. This calculator is shared with you here so you can compare the incremental and continued ROI between wired and managed wireless applications.

Variables used in the wired vs. managed wireless calculator include:

- material price
- installation labor by discipline at known rates for the area where the work was being performed
- engineering costs
- drafting costs
- and general administration and overhead.

A cost analysis was performed using values derived from actual data from the company's financial and work management systems. An average cost of each point added to the wireless network was calculated on an incremental basis that leveraged the wireless infrastructure already in place. On a point per point comparison of wired vs. managed wireless, this facility was able to realize a 61.06% savings per point added to the managed wireless network.

Using this logic, and based on the savings of $400,608 on the initial capital investment of the communication system replacement, it was determined that 50 additional points added to the wireless network at a savings of 61.06% per point would provide additional savings of $200,336.43. Taking the sum of these two numbers equals the entire cost of the initial project: $600,944.43, or 50 additional points!

A graphical representation of the individual areas of cost reductions by comparison is shown below.

### Wired vs. Managed Wireless System Comparison

<table>
<thead>
<tr>
<th>Inputs Added</th>
<th>Managed Wireless</th>
<th>Wired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>$71,331.78</td>
<td>$110,918.00</td>
</tr>
<tr>
<td>Installation</td>
<td>$28,190.40</td>
<td>$158,571.00</td>
</tr>
<tr>
<td>Engineering</td>
<td>$19,904.44</td>
<td>$37,167.92</td>
</tr>
<tr>
<td>Administration</td>
<td>$8,359.86</td>
<td>$21,465.98</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$127,786.48</td>
<td>$328,122.90</td>
</tr>
<tr>
<td><strong>Incremental Savings</strong></td>
<td><strong>$200,336.43</strong></td>
<td></td>
</tr>
</tbody>
</table>
Turn your Turnarounds Around with Wireless

Turnarounds have become critical to a plant’s long-term sustainability and a company’s compliance with increasingly strict government regulations. Yet it’s common knowledge that the vast majority of turnarounds still don’t meet all performance standards, and about 25 percent significantly underperform in more than one success criteria. It’s also no secret that labor costs, capital budgets and pre-planned time frames are still regularly exceeded. Leading companies are looking to new state-of-the-art tools to help them turn around their turnarounds by staying on track and even coming in under planned financial and time budgets.

As a percentage of the cost of a turnaround, an all-inclusive wireless infrastructure is miniscule. For example, if a $400,000 investment in plant infrastructure for wireless is required for a $50 million turnaround - that amounts to less than 1% of the budget. Usually, turnarounds are the largest part of any company’s capital budget process or, in some cases, turnarounds are done as a completely separate budget process. Either way, the company is able to add a very small cost to a very large budget and get an enormous return.

In fact, in most cases, the cost of the infrastructure fits within the + or -5% for project success. Often, the ability to make decisions via real-time wireless data reduces the turnaround by two or three days. If a turnaround is scheduled for 45 days with a budget of $45 million and the cost for wireless infrastructure of
$450,000 (1%), and the use of wireless data allows for the project to come in one day early, it has paid for the infrastructure times two immediately. If the company can then add any other application (post turnaround) for operational, maintenance, reliability, compliance or other improvements, the financial returns can be dramatic.

**Benefits Not Quantified**

Aside from the direct economic cost comparisons of a wired vs. managed wireless network, other benefits will be realized as the system grows and more points are monitored and additional applications added. Local data for vibration, temperature, pressures and levels will be incorporated into the DCS system in real time. Instruments will be calibrated without the need to send personnel into the field; equipment diagnosis can be performed remotely and improve the mobility of staff to multi-task -- armed with more information while in the field. This will provide additional maintenance and operational enhancement for increased productivity.

Operational benefits are improved as well. Whereas monitoring devices in the traditional hard wired fashion would have been cost prohibitive, with managed wireless, more equipment can be monitored more often. The plant anticipates this enhanced information will reduce equipment damage, failure, or forced system shutdowns.

This all translates into labor hours saved ($), reduced personnel required ($$), and reliability improvements by reducing unplanned outages ($$$). Wireless points and applications can be usually implemented faster, cheaper, and without outages for installation requirements needed for wired installations. Regulatory requirements can be satisfied faster and safety of personnel improved.

**Apprion’s ION System**

Apprion specifically developed its ION System to enable process manufacturers to cost-effectively deploy the best possible wireless applications for your plant. This vendor-neutral approach to industrial application implementation insures that plant operation managers are able to cost effectively deploy the best wireless solution for any given application. As the only provider of multi-vendor, multi-standard, multi-frequency wireless technology in a unified architecture, Apprion is helping companies filter through the growing noise around industrial wireless products and move forward with a purposeful, cost-effective and engineered approach to industrial wireless.
The financial and operations benefits of industrial wireless are most effectively realized with choice 3, which gives you an open architecture capable of utilizing the best technologies and applications available – from any vendor. By using the best tools for the job and an open wireless infrastructure like Apprion’s ION System, you will avoid the limitations of a single vendor solution and the constraints imposed by numerous point solution wireless applications. Instead, you will enjoy the full breadth of benefits of wireless in all areas of plant operations.

In addition, Apprion delivers its ION System as an integrated program that includes ION Network Management Services. With ION Network Management Services, Apprion continuously monitors and optimizes your wireless networks and applications performance, security, and reliability. Performance problems, degradation trends or security issues are reported automatically and immediately identified by Apprion’s Wireless Management Center (WMC) and immediately prioritized for appropriate action. Critical issues are red-flagged for immediate corrective action and proactively communicated back to the plant’s operations, maintenance and IT staff. All incidents are continuously monitored and with status updates reported back to the customer at regular intervals – as often as every 30 minutes for emergencies to every 12-24 hours for informational updates.

This proactive approach to ensuring the complete security, reliability, and performance of your wireless networks and applications brings an added dimension to the economics of wireless. Plant management’s job is to operate and maintain the plant to ensure a quality product is profitably delivered on time to customers by engineers, operators, and contractors that are operating in a safe and secure environment. Management of a plant’s wireless networks and wireless applications is not your primary area of expertise. You do not have the time or budget to hire and manage skilled (and scarce) wireless technology experts to manage, secure, and optimize wireless networks. Even Plant IT will be challenged if not overwhelmed by the myriad of wireless applications running in a real-time, harsh, hazardous plant environment. So wireless offers a significant opportunity to enhance a plant’s efficiency and safety, but wireless by its very nature is vulnerable to unchecked environmental interference and unmanaged “airspace” congestion. It’s well known that even hard-wired networks left unmanaged can typically diminish in their performance to the point of being unusable in a matter of a year or two.

But without professional and continuous management, the same degradation can happen to wireless networks in a matter of months. Through active management of your wireless networks and applications, Apprion addresses these issues and ensures that your wireless applications maintain their performance, reliability, and value. In addition, because they are share a common open wireless infrastructure, with ION’s easy extensibility, these applications are easily integrated and visualized in ways that can create additional value.
Apprion’s approach to an open, integrated, standards-based wireless infrastructure guarantees that your first wireless application will meet and exceed your performance and operational objectives – and each subsequent application will only further enhance the value of your investment in wireless. This approach allows you to lower costs, lower risk, and increase the value of your wireless applications. From an economic perspective, it makes sense.
In Conclusion

Every major DCS and field device manufacturer is developing products for the wireless marketplace that will revolutionize the industry similar to the transition from analog to digital technologies decades ago. Wireless is a proven technology that influences the entire industry in a way not seen since the transition from analog to digital technologies. Implementing a managed wireless network will provide valuable returns for years to come and is limited only by the imagination.

As we have discussed in this white paper, there are three ways to improve your ROI:

1.) Lower your investment costs without compromising the value you expect to receive in return;
2.) Increase the value you receive, without increasing your investment costs; or
3.) Simultaneously increase the value returned AND lower your costs.

Clearly, we have seen how wireless can accomplish the first objective over wired alternatives. Once you look at wireless technologies, you see that selecting an open and integrated wireless infrastructure allows you to achieve the second objective by allowing you to support many “best of breed” applications for the same investment as proprietary or point solution approaches. Combining this with a comprehensive wireless network management system such as Apprion’s ION System ensures that you will be able to achieve the unusual situation where you can both increase the value returned and lower your investment costs – and be able to sustain this level of return for many years to come.

About Apprion

Apprion delivers industrial wireless application systems and services for the process manufacturing industry. Whether it is the need to address safety or security concerns, meet compliance mandates, or improve productivity, a wireless application system from Apprion will assure that any industrial application is easier to deploy and manage while delivering value faster, more efficiently. For more information, visit www.apprion.com.