



# RFID Delivers the Goods

**Intel manufacturing pilot shows  
RFID systems offer substantial business value**

To learn more about the benefits of radio frequency identification (RFID) systems in a complex semiconductor manufacturing environment, the Intel Technology and Manufacturing Group deployed a high-volume track-and-trace RFID pilot at a Malaysian assembly and test facility. The pilot yielded many valuable findings, showing that RFID systems can be extremely reliable, deliver accurate data in real time that can help improve internal business processes, and provide productivity benefits to customers.

## The Challenge

- Evaluate the operational and business benefits of an advanced RFID system in a large-scale, real-world manufacturing environment
- Follow the flow of product across multiple environments from the Intel manufacturing facility to a customer's factory floor

## The Solution

- Intel deployed an advanced RFID pilot in its Malaysian assembly and test facility
- To fully evaluate the benefits of RFID, a major customer participated
- The pilot provided an increased understanding of RFID systems in real-world manufacturing conditions and the benefits they can provide

**“RFID tracking provides data that enables enterprises to streamline their businesses – particularly their supply chains – in ways no other technology can. We know because we saw the results in our Malaysian facility.”**

Tom Gibbs  
Director of Strategy and Planning  
Customer Solutions Group  
Intel Corporation





Seeing enormous benefits for its own manufacturing operations, Intel is investing heavily in standards-based RFID.

## Assessing the Situation

Manufacturing and retail companies, government agencies, and other organizations that track and trace vast quantities of items have found the benefits of RFID systems too compelling to dismiss. Providing greater flexibility and more accurate tracking than traditional systems, RFID systems reduce manual tracking and the number of lost and misplaced items. Another key benefit is increased visibility into inventoried items, which can help lower inventory levels and reduce costs. Finally, RFID systems supply real-time data about items in the supply chain, which can further reduce the size and cost of inventories as well as help ensure that items are available when customers need them.

## Intel supports RFID on many fronts

Intel has made a major commitment to exploring the potential of RFID to transform the way organizations can conduct business. Currently, the company has RFID-oriented efforts underway on a range of fronts. For example, Intel is studying how its products can be used to build better RFID systems. Intel's professional services organization, Intel® Solution Services, has been highly successful in designing and deploying advanced RFID systems for worldwide companies and is widely acknowledged as an expert in this field. In addition, Intel – as the world's largest semiconductor manufacturer – is investigating how RFID can streamline the company's own supply-chain operations.

## Intel acquires first-hand RFID knowledge from real-world pilot

As part of its exploration, Intel conducted an internal RFID pilot, tracking the movement of 80,000 microprocessors in one month at its manufacturing facility in Penang, Malaysia. Leading the effort was the Intel Technology and Manufacturing Group, which introduces new systems into the company's manufacturing facilities. The Intel team selected Tyco/ADT\*, a company with more than 20 years of experience with radio frequency applications and related services, to supply RFID hardware and assist in the pilot test.

"We had many reasons for conducting this pilot," says Rick Tyo, Research Integration Engineer, Intel Technology and Manufacturing Group. "We wanted to see how we could streamline our operations. We also wanted to apply the lessons learned in Malaysia to our other RFID-related initiatives."

The Penang facility was chosen because it is a complex, real-world environment – one of the world's largest semiconductor manufacturing operations. In addition, the team wanted to include an Intel customer because the benefits of RFID can extend across the supply chain from one company's manufacturing operation into the heart of its customer's operation. To help achieve this objective, a major original equipment manufacturer (OEM) with PC notebook manufacturing facilities in Malaysia agreed to participate. "This broad view was essential to learning the most about the benefits of RFID," notes Tyo. "The pilot tracked the product (microprocessors) at various points in the process, beginning with assembly and testing in the Intel factory, moving to the Intel warehouse, and continuing all the way to the customer's factory floor. In all, eight different RFID readers were used."

## Spotlight: Intel Corporation

- Intel® processors, chips, boards, systems, and software support the most advanced servers, networking, and communications products.
- Manufacturing is a well-known strength of Intel; its economies of scale, factory agility, and execution excellence worldwide have contributed to the company's success.
- The Intel Technology and Manufacturing Group explores ways the company can use new technologies such as RFID systems to improve manufacturing quality and visibility within the supply chain.

## Key Technologies

- Tyco Sensormatic\* Agile 2 readers, based on Intel® processors, are easily customized through firmware upgrades.
- Tyco Sensormatic RFID OmniWave\* antennas have installation flexibility for optimal antenna placement and a rugged design for harsh industrial environments.
- Intel® IXP420 network processors based on Intel XScale® microarchitecture combine low power consumption and high performance for wireless applications.
- Systems based on Intel® Itanium® 2 processors manage and process the RFID data.

## Integral Answers

- The impact of RFID on manufacturing information systems can be extensive.
- To stay competitive, manufacturers should explore RFID now and develop an RFID strategy.
- For the best results, work with an experienced, well-resourced RFID expert. It will shorten the learning curve, help solve problems faster and ultimately reduce costs.

## Delivering the Solution

The pilot team conducted the test with Intel employees and a customer in Malaysia, collecting data over a four-week period. When reviewing the results, they saw clear evidence of the benefits of RFID technology.

## Accurate, real-time tracking

Significant benefits emerged from the accurate, real-time item tracking data that RFID systems deliver. During the pilot, planners always knew the location and state of each item both within the Intel facilities and at the customer's facility, greatly reducing the chance that items could be misplaced, lost, or stolen. The planners confirmed product shipments and receipt in real time, and they responded to customer questions or change requests more quickly and efficiently. These benefits resulted both in productivity gains and a more satisfied customer. The RFID data also gave planners greater visibility into Intel inventories, allowing them to manage supply more cost-effectively. In addition, the RFID system provided a much more comprehensive view of the overall supply chain process in Malaysia, enabling planners to establish better processes and exception handling rules to get more products through the supply chain faster, enabling still greater productivity and cost savings.

## RFID delivers fast, highly accurate tag reading process

The pilot confirmed the speed and reliability of the tag reading process. The average time it took each box of microprocessors to pass through each RFID reader check was just two seconds, much lower than the time required for a typical barcode reading. RFID readings could also be achieved at various ranges and throughout all process steps.

"The potential for automation with RFID is exciting for us," says Craig Dighero, RFID Supply Chain Program Manager, Intel Technology and Manufacturing Group. "It shows that RFID systems can speed up the movement of items throughout the supply chain."

## RFID can help improve service to customers

The pilot also showed that RFID data can help companies better support their customers. For example, the RFID pilot uncovered Intel processors that were sitting on the customer's loading dock for three hours. The customer has a just-in-time inventory model, which allows for items to be in inventory for only two hours. The finding from the RFID pilot alerted the customer to a significant opportunity to improve its process.

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Craig Dighero  
RFID Supply Chain Program Manager  
Intel Technology and Manufacturing Group



RFID is changing the way businesses do business. Intel is committed to playing a leading role in this change.

Around the world, innovative companies are working to realize the vision of RFID tracking systems that dramatically improve supply chain efficiencies and visibility into inventory as well as speed operations—all actions that can lower costs. Intel has an ambitious agenda not only to improve its own manufacturing operations using RFID systems but also to support RFID providers with Intel technology and help end-user companies realize the benefits of RFID systems. The company's manufacturing pilot in Malaysia helped further this agenda, collecting data that will benefit participants in future RFID initiatives.

## Return on Investment

The pilot RFID system gave Intel:

- Greater visibility into inventory and the supply chain process
- Capability to quickly locate items
- Fast, highly reliable throughput at each checkpoint
- Ability to supply customers with data to improve their operations
- Reduced operating costs



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