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Manufacturing Insights:

RFID: Tool Tracking Solutions

SCENE 1. CG: FBI warning white text centered on black to blue gradient	WARNING Federal law provides severe civil and criminal penalties for the unauthorized reproduction, distribution or exhibition of copyrighted video media © SME 2008
SCENE 2. SME logo with music	
SCENE 3. CG: Title of video	MUSIC UP AND UNDER MANUFACTURING INSIGHTS, MANUFACTURING ENGINEERING MAGAZINE'S RADIO FREQUENCY IDENTIFICATION FOR PROCESS IMPROVEMENT. THIS PROGRAM WILL EXPLORE RADIO FREQUENCY IDENTIFICATION TECHNOLOGY, ALSO KNOWN AS RFID TECHNOLOGY, AND HOW IT IS HELPING COMPANIES IMPROVE PRODUCTIVITY AND QUALITY.
SCENE 4.	FIRST, WE VISITED TRAXLE MANUFACTURING. TRAXLE IS USING RFID TECHNOLOGY ON PRECISION TOOLS TO MAINTAIN AND COMMUNICATE ACTIVITY HISTORY.

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SCENE 5.	NEXT, WE WENT TO ABSKY, A LEADING MANUFACTURER OF WHEELS, BRAKE CONTROL AND RELATED SYSTEMS FOR THE COMMERCIAL, MILITARY AND GENERAL AVIATION MARKETS. ABSKY IS USING RFID TECHNOLOGY RESTOCK THEIR MAINTENANCE, REPAIR AND OPERATING OR MRO CRIB ITEMS.
SCENE 6.	NEXT, WE WENT TO WITTMANN WHO HAS INCORPORATED RFID TECHNOLOGY INTO ITS ROBOTICS SYSTEMS TO AUTOMATICALLY IDENTIFY THE TYPE OF MECHANICAL HAND THAT IS ATTACHED TO A ROBOT'S ARM.
SCENE 7.	AND FINALLY, WE WENT TO NORDAM, WHO HAS INCORPORATED RFID TECHNOLOGY IN ITS MANUFACTURING PROCESS TO TRACK HIGH-VALUE MOLDS USED IN THE MANUFACTURING OF HIGH-END ENGINE COMPONENTS. -- TOUCH TO BLACK --
SCENE 8.	NARRATION (VO): RADIO FREQUENCY IDENTIFICATION TECHNOLOGY, OR RFID TECHNOLOGY, IS THE PROCESS AND PHYSICAL INFRASTRUCTURE IN WHICH A UNIQUE IDENTIFIER, AND POTENTIALLY OTHER DATA, IS TRANSFERRED FROM A DEVICE, (ALSO KNOWN AS A TAG) TO A READER, VIA RADIO FREQUENCY WAVES.

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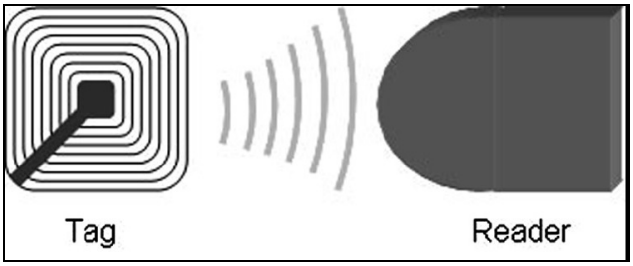
SCENE 9.	NARRATION (VO): TODAY, RFID TECHNOLOGY IS USED IN A WIDE VARIETY OF APPLICATIONS BOTH IN THE SUPPLY CHAIN AS WELL AS MANUFACTURING. MOST RFID TAGS DEAL WITH THE TRACKING OF ASSET TRACKING.
SCENE 10.	NARRATION (VO): THE SIMPLEST RFID SYSTEM (OR INFRASTRUCTURE, AS IT IS COMMONLY REFERENCED) HAS THREE MAJOR COMPONENTS: 1. • AN RFID TAG 2. • AN RFID READER 3. • AND A NON PHYSICAL PREDEFINED PROTOCOL FORMAT FOR THE INFORMATION BEING TRANSFERRED 

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SCENE 11.	NARRATION (VO): THE TAG IS A VERY SMALL RADIO TRANSCEIVER THAT HAS AT A MINIMUM OF TWO COMPONENTS: A MICROCHIP WHICH HOLDS DATA AND THE ELECTRONIC CIRCUITRY REQUIRED TO PROVIDE THE TRANSCEIVER FUNCTIONALITY, AND AN ANTENNA USED TO SEND, AND POTENTIALLY RECEIVE RADIO SIGNALS.
SCENE 12.	NARRATION (VO): THE READER IS USUALLY A LARGER RADIO TRANSCEIVER THAT HAS AT A MINIMUM THE SAME TWO TYPES OF COMPONENTS AS THE TAG; THE READER IS CONNECTED TO A COMPUTER NETWORK OR SYSTEM TO WHICH IT TRANSFERS THE INFORMATION FROM THE TAG.
SCENE 13.	NARRATION (VO): THERE ARE TWO PRIMARY RFID SYSTEMS: PASSIVE RFID AND ACTIVE RFID.
SCENE 14.	IN PASSIVE RFID SYSTEMS, THE TAGS CONTAIN NO POWER SOURCE AND INSTEAD RELY ON THE MAGNETIC FIELD PROVIDED BY THE READER TO POWER THE ELECTRONICS OF THE TAG’S CHIP. BECAUSE THERE IS NO INNATE POWER SOURCE IN PASSIVE RFID SYSTEMS, THE RANGE OF COMMUNICATION IS USUALLY SHORT – LESS THAN 10 METERS NORMALLY.

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SCENE 15.	NARRATION (VO): IN ACTIVE RFID SYSTEMS, THE TAG CONTAINS A POWER SOURCE; USUALLY A BATTERY. THIS POWER SOURCE IS USED TO POWER THE CHIP'S CIRCUITRY AND THEREFORE THIS TYPE OF SYSTEM HAS A MUCH LONGER TRANSMISSION RANGE THAN THAT OF PASSIVE RFID SYSTEMS: UP TO 2 KILOMETERS IN OPEN FIELDS.
SCENE 16.	NARRATION (VO): THE ADVANTAGE OF PASSIVE RFID SYSTEMS IS SIZE. PASSIVE RFID TAGS CAN LOOK LIKE A STICKER OF JUST A FEW CENTIMETERS IN SIZE. BECAUSE THEY REQUIRE NO EMBEDDED POWER SOURCE, ALL WHICH IS REQUIRED IS THE HOUSING FOR THE MICROCHIP, THE SIZE OF A PIN HEAD, AND THE ANTENNA WHICH IS A SMALL COIL OF METAL, USUALLY COPPER. THE PRIMARY DISADVANTAGE OF PASSIVE RFID SYSTEMS IS THE SHORT RANGE OF TRANSMISSION AND THE RELATIVE HIGH SENSITIVITY TO RADIO INTERFERENCE; THE LATTER DUE PRIMARILY TO THE STRENGTH OF THE SIGNAL.

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SCENE 17.	NARRATION (VO): ON THE OTHER HAND, ACTIVE RFID TAGS ARE USUALLY BIGGER, PRIMARILY BECAUSE THEY REQUIRE AN EMBEDDED POWER SOURCE – NORMALLY A BATTERY. THIS, HOWEVER, ALLOWS FOR A MUCH LARGER TRANSMISSION RANGE WHICH IS THE PRIMARY BENEFIT OF ACTIVE RFID TAGS. ANOTHER BENEFIT OF ACTIVE RFID TAGS LIES IN THE FACT THAT THEY USUALLY CAN HOLD MUCH MORE MEMORY THAN PASSIVE RFID TAGS.
SCENE 18.	NARRATION (VO): ACTIVE RFID TAGS NORMALLY TRANSMIT A SIGNAL (ALSO KNOWN AS A BEACON) EVERY SO OFTEN. THE FREQUENCY OF THE BEACON IS INVERSELY PROPORTIONAL TO THE LIFE OF THE BATTERY; THE MORE BEACONS PER UNIT OF TIME, THE SHORTER THE BATTERY LIFE. THEREFORE THE MAJOR DISADVANTAGES OF ACTIVE RFID TAGS ARE TWO FOLD: SIZE AND BATTERY LIFE.

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SCENE 19.	NARRATION (VO): SEMI-ACTIVE RFID TAGS CONTAIN AN EMBEDDED POWER SOURCE, JUST LIKE ACTIVE TAGS, BUT THE TRANSMISSION OF THE BEACONS IS NOT INITIATED UNTIL A READER'S MAGNETIC FIELD ACTIVATES THE CIRCUITRY INSIDE, JUST LIKE IN THE PASSIVE TAGS. ONCE THE SEMI-ACTIVE TAG ENTERS THE MAGNETIC FIELD OF A READER, THE POWER FROM THIS MAGNETIC FIELD ACTIVATES THE CIRCUITRY WHICH THEN FORCES A SIGNAL TO BE SENT FROM THE TAG USING THE TAG'S INTERNAL POWER SOURCE, THUS ALLOWING FOR A MUCH STRONGER SIGNAL TO BE GENERATED.
SCENE 20.	NARRATION (VO): ALTHOUGH RFID HAS BEEN AROUND FOR QUITE SOME TIME, IT IS NOT UNTIL RECENTLY THAT PROTOCOL STANDARDS HAVE BEEN DEVELOPED. IN THE UNITED STATES, EPCGLOBAL IS THE ORGANIZATION TAKING THE LEAD ON THE DEVELOPMENT OF STANDARDS FOR PASSIVE, SEMI-ACTIVE AND ACTIVE RFID SYSTEMS.
SCENE 21.	NARRATION (VO): THE INTERNATIONAL ORGANIZATION FOR STANDARDIZATION, OR ISO, IS A GLOBAL ORGANIZATION ALSO DEVELOPING RFID STANDARDS. ISO STANDARDS HAVE MUCH MORE ACCEPTANCE OUTSIDE THE UNITED STATES BECAUSE OF ITS GLOBAL NATURE.

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SCENE 22.	NARRATION (VO): SIMPLE RFID TAGS ARE SIMILAR IN CONCEPT TO BAR CODES IN THAT THEY CONTAIN NOT INTRINSIC INFORMATION ABOUT THE ASSET TO WHICH THEY ARE ATTACHED. A BACK-END INFORMATION SYSTEM IS NECESSARY TO PROVIDE THE TAG-ASSET ASSOCIATION AND ANY OTHER INFORMATION RELATED TO THAT ASSET. THE DIFFERENCE IS THAT WERE BARCODES IN SYSTEMS LIKE THE UNIVERSAL PRODUCT CODE (ALSO KNOWN AS UPC) GENERALLY IDENTIFY A TYPE OF ASSET; RFID TAGS, USING STANDARDS LIKE THE ELECTRONIC PRODUCT CODE (ALSO KNOWS AS EPC), UNIQUELY IDENTIFY EACH ASSET. THIS IS COMMON TO ALL RFID SYSTEMS.
SCENE 23.	NARRATION (VO): MEMORY-BASED RFID TAGS HAVE THE CAPABILITY TO STORE INFORMATION ABOUT THE ASSET TO WHICH THEY TAG IS ATTACHED. -- TOUCH TO BLACK --
SCENE 24. **TRAXLE**	NARRATION (VO): TRAXLE, LOCATED IN ONTARIO, CANADA IS A LEADING DESIGNER AND MANUFACTURER OF PRECISION-METALLIC COMPONENTS THAT GO INTO VEHICLE TRANSMISSION AND DRIVELINE SYSTEMS. TRAXLE IS USING RFID TECHNOLOGY WITH THEIR TOOLING IN ORDER TO MAINTAIN AND COMMUNICATE THEIR MACHINE INFORMATION AND LIFE ACTIVITY HISTORY.

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SCENE 25.	Mark Sippal: Any time you involve that human element, there are a number of positions at which errors can take place. The most common is the information being carried with the tool is typically done in a paper format, so you have problems with paper being lost, being destroyed, or being illegible. But there is also the interaction between the human being and the machine, and entering that information into the machine or entering the information from the presetter to a piece of paper.
SCENE 26.	NARRATION (VO): FOR TRAXLE'S CASE IT WAS IMPORTANT TO CREATE A SOLUTION THAT WOULD BE EASILY INCORPORATED IN THEIR CURRENT MANUFACTURING PROCESS…

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SCENE 27.	Mark Sippal: In the case of the presetter, what a company like Zoller would do is they measure the tool, they get all the profiles and information about the tool itself, and that is collected within the presetter. That information is then stored in a common format that the user's machines can understand, as well as any type of database that's being used. That same information is also loaded into the tag on the tool itself and is carried with the tool on each individual tool itself.
SCENE 28.	NARRATION (VO): THE AUTOMATION LEVEL REACHED BY THIS PROCESS ALLOWS FOR A MORE USER FRIENDLY ENVIRONMENT THAT IS PRONE TO FEWER ERRORS FOR PART OF THE OPERATOR…

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SCENE 29.	Alexander Zollar: Every tool holder has a tool identification chip, an RFID chip. It doesn't matter if it's a steep table tool, if it's an HSK tool, if it's a cut-to tooling or kinematic tooling for example, every tool is equipped with a tool identification chip. All the operator needs to do is put the tool into the presetter itself. On a CNC controlled presetter the operator has to hit one button to activate the tool identification system. Then the machine, the spindle will automatically rotate to the read-write position. The reader head will retrieve the tool geometry data off the tool ID chip. Then the CNC controlled presetter will measure fully automatically, independent of an operator, with an accuracy of +/- 2 micron, a cutting tool. After that's done the machine will automatically write the tool geometry information back to the tool identification chip, and the tool is ready to go.
SCENE 30.	NARRATION (VO): THE SYSTEM ALSO RELIEVES THE WORKER FROM HAVING TO KNOW TOOL-SPECIFIC INFORMATION THAT COULD BE CRITICAL FOR A SPECIFIC TASK…

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SCENE 31.	Mark Sippal: Typically when you track data for a machine tool, you're tracking a considerable number of parameters. These parameters can be any of the profile, or what's also known as offset information, about the individual tools… But it also contains other information relevant to the process itself. That information can be the actual number or type of machine the tool is being placed into. It can include the actual pocket or the placement of the tool in the tool drum or tool chain. It also can include things like the lifetime of the tool, how long the tool has been used, what the maximum lifespan of the tool is, and it can also carry updated information as well.
SCENE 32.	NARRATION (VO): THE DRIVING FACTORS FOR TRAXEL'S IMPLEMENTATION OF AN RFID SYSTEM IN THEIR MANUFACTURING PROCESS WERE BORN FROM STRICT REQUIREMENTS FROM TRAXLE'S CUSTOMERS

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SCENE 33.	Don Kraemer: In this case, our customer was Chrysler. They had a history of projects where the biggest problem they experienced was receiving parts into their plant with either features missing, or features that were out of specification… So they were looking for something that they could be assured that, for volumes that they needed daily, that we had controls in place for it.
SCENE 34.	NARRATION (VO): THE RFID SYSTEM USED BY TRAXLE WAS DESIGNED AND ADAPTED TO THE EXISTING ENVIRONMENT IN ORDER TO BE IMPLEMENTED AS TRANSPARENTLY AS POSSIBLE WITHIN THE MANUFACTURING PROCESS…
SCENE 35.	Don Kraemer: The actual bailiff itself is a hockey-puck style chip that is glued onto our tool bodies. The size is probably a quarter inch, and essentially it’s epoxied on. With that information, the information will come from the Zoller presetting system that will transfer it onto the chip itself. Then in turn when we put it on the machine, it will read from that chip based on the reader that’s installed on the machine

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SCENE 36.	NARRATION (VO): HOWEVER, AS ANY INTRODUCTION OF NEW TECHNOLOGY IN EXISTING PROCESSES, THERE WERE CHALLENGES THAT HAD TO BE MET DURING THE IMPLEMENTATION PROCESS.
SCENE 37.	Don Kraemer: With this particular application we were talking about being able to communicate between Zoller and Makino, and there were various strings, as they called it, that needed to be able to translate from one machining system to another. During that time, that was where most of the development came into play, and there was a lot of back and forth correspondence because of that.
SCENE 38.	NARRATION (VO): HOWEVER, THE BENEFITS THAT TRAXLE HAS EXPERIENCED HAVE MADE THE PROJECT A SUCCESS FOR THEM…

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SCENE 39.	Don Kraemer: The whole intent with using this was to insure that if I put a tool on the machine that it was a first part-=good part. That was the selling point we made to our customer. We knew based on some of the tolerances and requirements that they had for this particular part, that we could not make it perfect in a capability world. They look at it as being if it's say 1.67 or higher, the tolerances didn't allow it. But with the ability to track and develop what our tool lives were supposed to be and then tie that into the Zoller system and the Bailiff system, we could predict when the tools would need to be changed. That was the selling feature.
SCENE 40.	NARRATION (VO): THIS TRANSLATES TO QUICK REACTION TIME AND IMPROVED CUSTOMER SATISFACTION…
SCENE 41.	Mark Sippal: I think the biggest advantage to RFID for machine tools is the fact that it doesn't rely on any type of optical technology, because it's a radio based technology, and because the tags are designed in a more robust way and also mounted in the tools to minimize its vulnerability. -- TOUCH TO BLACK --

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SCENE 42. **CG:ABSKY**	NARRATION (VO): ABSKY, LOCATED IN DANVILLE, KENTUCKY IS A LARGE MANUFACTURER OF CARBON COMPOSITE THAT ARE USED FOR THE FRICTION COMPONENT IN AIRCRAFT BRAKES. AS A WHOLLY-OWNED SUBSIDIARY OF AIRCRAFT BRAKING SYSTEMS CORPORATION, ABSKY SERVES PRIMARILY THE COMMERCIAL AVIATION INDUSTRY.
SCENE 43.	NARRATION (VO): ABSKY IS CURRENTLY EXPERIENCING SUBSTANTIAL GROWTH AND FOUND THE NEED TO HANDLE AN INCREASED AMOUNT OF VOLUME AND DIFFERENT OF MAINTENANCE, REPAIR AND OPERATING OR MRO ITEMS. HOWEVER, AS MANY COMPANIES, ABSKY WOULD LIKE TO KEEP THEIR OVER HEAD AS LOW AS POSSIBLE WHILE MAINTAINING A HIGH LEVEL OF QUALITY IN THEIR MRO OPERATIONS.
SCENE 44.	Steven Henry: Our items in the crib, the variety of things we have here is going to grow very rapidly over the next three or four years, so I wanted a system in place that was going to grow with the company as we continue to expand.

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SCENE 45.	NARRATION (VO): ABSKY, IDENTIFIED RFID AS A COMPLIMENTARY SOLUTION FOR SOME OF THE ALREADY EXISTING SYSTEMS THEY HAD IN PLACE TO MANAGE THEIR MRO INVENTORY PARTS…
SCENE 46.	Steven Henry: We implemented our RFID here in conjunction with a Cribmaster system we use for tracking inventory parts, primarily disposable MRO stores type items. Cribmaster was a no-brainer for us, since we already use it at our main plant. We've already implemented it and already have a database in place. The challenge here was we have a much broader base of products we wanted to put in our crib. We needed a way to tag items anywhere from tooling cutters, end mills, to large boxes of filters and white suits that our people use.

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SCENE 47.	NARRATION (VO): TRADITIONALLY, THIS INVENTORY MANAGEMENT PROCESS HAS RELIED ON FULL-TIME MAINTENANCE STAFF WHOSE SOLE PURPOSE IS TO DISPENSE, ORDER AND MANAGE THE INVENTORY OF PARTS USED IN THE MRO OPERATIONS OF THE MANUFACTURING PLANT. BY IMPLEMENTING AN RFID-BASED INVENTORY MANAGEMENT SYSTEM, ABSKY COULD ACHIEVE THEIR RAPID GROWTH WHILE MEETING PRODUCTION AND STAFFING OBJECTIVES…
SCENE 48.	Steven Henry: I wanted one system that we could put in place in a crib that was comparatively hands-off, so we don't have someone administering the crib full time, to cover basically anything and everything we might need to put in the crib as the plant grows. At this point we don't even know what all that might be. We've got several hundred items in the crib already, and that's going to grow pretty quickly to several thousand.
SCENE 49.	NARRATION (VO): EVEN WHEN COMPARED TO ABSKY'S SISTER FACILITIES, ABSKY DANVILLE BELIEVES THEY HAVE THE UPPER HAND WHEN IT COMES DOWN TO MRO INVENTORY MANAGEMENT.

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SCENE 50.	Mark Cherrington ABSKY is tracking all their expendable tooling, all their white suits, durables, MRO items, that they have brought into the shop. They are expanding, so it's a never ending job for us to continually add new items to the system to manage their inventory so they don't stock out. They have anywhere from inserts type of cutting tools, to floor cleaners, to thermocouples. They have a miscellaneous array of tooling that we manage for them.
SCENE 51.	Steven Henry The crib up in Akron, we have vending machines that are automatic dispensing and automation part subtraction. But we also have a lot of items—rubber gloves, white suits, respirators, things like that, that a production operator would go to the crib and some person would issue them and then debit that from the inventory. WE don't have luxury down here. So in case our RFID tags debit that system. The operator goes in, takes his respirator. When he walks out of the Accuport system, which is our RFID system, it automatically subtracts from inventory.

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SCENE 52.	NARRATION (VO): THE RFID SYSTEM IMPLEMENTED AT ABSKY TACKLES THE SAME WORK AS IN OTHER MANAGED INVENTORY FACILITY BUT IN A WAY THAT REQUIRES NO DEDICATED OPERATOR.
SCENE 53.	Mark Cherrington The employee can go to the crib, unmanned, obtain a part, a MRO item, tooling, anything that's in the crib, and it will be issued out to him and the quantity will be adjusted through the Cribmaster system
SCENE 54.	NARRATION (VO): TO ACHIEVE THIS LEVEL OF FUNCTIONALITY, THE RFID SYSTEM REQUIRES TAGGING BOTH THE PARTS IN INVENTORY AS WELL AS THE PERSONNEL ACCESSING THE PARTS CRIB.
SCENE 55.	Mark Cherrington: The RFID system is set up with an Accuport that has the PC set up in it. An employee can come and actually manually log onto the system, and walk through with a tag that we assign that has an RFID tag in it. We assign it to his name, and he can walk through. All the parts have RFID tags also.

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SCENE 56.	NARRATION (VO): THE SYSTEM IS RELATIVELY SIMPLE. THE WHOLE PHYSICAL INFRASTRUCTURE IS MADE OF PARTS AND PERSONNEL TAGS, THE ANTENNAE EMBEDDED IN THE GATES AND A COMPUTER THAT COLLECTS AND PROCESSES THE INFORMATION GATHERED…
SCENE 57.	Mark Cherrington: What we have are the tags. The Accuport has the antennas in it, and the PC where all the data is controlled and gathered. Aside from that it's nothing more than the RFID tag
SCENE 58.	NARRATION (VO): UNEXPECTEDLY, THE CHALLENGES FOUND IN THIS PROJECT HAD LITTLE TO DO WITH THE ACTUAL RFID IMPLEMENTATION. IN ABSKY'S CASE, MOST OF THE CHALLENGES CAME FROM FAMILIAR SOURCES – DATA GATHERING AND CLEANSING…

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SCENE 59.	Mark Cherrington: During the implementation process, the hardest part is gathering information from the engineers, the mins and maxes and how to order the parts. We had to set up all the EDP numbers in the Cribmaster system, and then we had to establish order points. What we found mainly is they don't realize the inventory they do go through. So we go through setting up mins and maxes.
SCENE 60.	NARRATION (VO): SINCE MOST THE RFID SOLUTIONS ARE TYPICALLY MESHED WITHIN COMPANIES' NETWORKS, THEY BECOME SUSCEPTIBLE TO NETWORK ISSUES JUST LIKE ANY OTHER SOFTWARE…
SCENE 61.	Steven Henry: Probably our biggest one has been between the Accuport software and our MIS department and our firewalls. One of the issues we continually have is MIS pushes down a new firewall or a new viral protection thing, and sometimes that messes up communications between our Accuport and our servers up in Akron, and we have to contact MIS and get that squared away. That's been our biggest hurdle.

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SCENE 62.	NARRATION (VO): EVEN WITH THESE CHALLENGES, ABSKY HAS FOUND THE RFID SOLUTION TO BE VERY SUCCESSFUL.
SCENE 63.	Steven Henry: The big advantage we have here is our staff down here is very lean. At our main plant I think we have three people full time to administer the crib. Down here there's a couple of us part time that do that. So this is by and large a hands-off system for us. It allows us to track inventory levels and reorder points, which is always important when you're ordering parts, but the main thing is we're not running out of items we need. We're putting production stores in here. Some of these items, if we run out of, we're down. We can't track our inventory levels accurately with the people we have. Cribmaster does that for us.

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SCENE 64.	Mark Cherrington: The types of things they will see will be no manning of the tool crib, stock outs will be eliminated. We have mins and maxes after we gather enough history, and as the RFID system issues quantities out, when min is reached orders are generated, so we don't actually have a purchasing department generating PO's. -- Touch To Black --
SCENE 65. **CG: WITTMAN**	NARRATION (VO): WITTMANN INC, LOCATED IN TORRINGTON, CT, IS A MANUFACTURER OF AUTOMATION SYSTEMS FOR THE PLASTICS INDUSTRY. WITH OFFICES WORLDWIDE, WITTMANN HAS TAKEN ITS AUTOMATION ROBOTIC PRODUCTS TO THE LEADING EDGE OF TECHNOLOGY BY ADDING PASSIVE RFID TAGS TO ITS END-OF-ARM TOOLING.
SCENE 66.	NARRATION (VO): WORKING WITH SOME OF ITS CUSTOMERS, WITTMANN REALIZED THAT THERE WAS AN OPPORTUNITY FOR IMPROVING THEIR ROBOTIC PRODUCTS TO MAKE THEM MORE ERROR-PROOF AND SIMPLER TO USE.

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SCENE 67.	Tom Schaffner: …the customer was looking for a quick change-over, and to take the error-proofing out of this, make it more where an operator can mount this, load it, and they won't do something incorrectly.
SCENE 68.	NARRATION (VO): BECAUSE WITTMANN'S ROBOTS MOVE IN ALL THREE AXIS, THEY MADE IT A PRIORITY TO IMPLEMENT TECHNOLOGY THAT WOULD BE NON-INTRUSIVE, ALLOWING UNCONSTRAINED FREEDOM OF MOVEMENT TO THE ROBOT'S END-OF-ARM TOOLING COMPONENT.
SCENE 69.	NARRATION (VO): WITTMANN RESEARCHED RFID TECHNOLOGY THAT COULD BE INCORPORATED INTO ITS ROBOTS WITH MINIMAL IMPACT TO THE MOLDING TOOLING OPERATION. AFTER INVESTIGATING THE OPTIONS, WITTMANN SETTLED ON PASSIVE RFID TECHNOLOGY FOR ITS WELL ESTABLISHED CHARACTERISTICS.
SCENE 70.	Tom Schaffner: …We chose the passive technology because it's easy, it's reliable, it's cost effective, that's the reason we chose that.

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SCENE 71.	NARRATION (VO): BECAUSE THE TECHNICAL COMPONENTS ARE READILY AVAILABLE, WITTMAN BASED THEIR SOLUTION ON OFF-THE-SHELF COMPONENTS THAT WERE LATER ADAPTED TO THEIR PARTICULAR NEEDS
SCENE 72.	Tom Schaffner: We took a standard product, a Texas Instruments product. We liked the way it worked, it was pretty simple, pretty straightforward. Our whole R&D development team in Austria developed their own system, meaning the electrical department; mechanical, where they embedded it into end of arm tooling; software, so when you mount it automatically loads up the proper software. So there is a whole team involved, Instead of just taking something off the shelf, we developed our own. We made it simpler, lighter, smaller, and it seems to work pretty well.
SCENE 73.	NARRATION (VO): SINCE ONE OF WITTMANN'S GOALS WAS TO MAKE THE SYSTEM EASY TO USE, IT WAS IMPORTANT FOR THEIR CUSTOMERS TO NOT HAVE TO HEAVILY RETRAIN OPERATORS.

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SCENE 74.	Tom Schaffner:: Here's the robot and the receiver right here. When I mount this end of arm tooling, I can lock it in. It will automatically read that end of arm tooling. It will display a picture, and if that is correct, I can confirm it, and that transfers the program. The customer changes molds, we change this end of arm tooling, mount another one, it will read that tag, display a picture of this end of arm tooling with the associated part, confirm, and transfer that program. It's that simple.
SCENE 75.	Tom Schaffner:: On the bottom of our robot arm we mount our quick change end of arm tooling mount. It's a dove tail with a hard stop on the bottom. The tooling plate slides in here and we can lock it in with these levers. Incorporated into this quick change tooling, this is a cover here, but we have PC board embedded in it. It has an antenna, and it transfers the information via this wire back to the robot.

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SCENE 76.	Tom Schaffner:: This is our end of arm tooling side. It's our plate for our quick change end of arm tooling. On this side we embed a little tag. We actually just glued it to our plate here. So we mount this to the end of arm tooling. We just embed it into our quick change connector.
SCENE 77.	Tom Schaffner:: This slides into the quick change mount. We lock it into place, and it will read that tag and transfer it to the antenna through the wire back to the robot.
SCENE 78.	NARRATION (VO): AS SEEN BY THE DEMONSTRATION, THERE IS MINIMAL CHANGES TO THE STANDARD OPERATION. YET THERE IS FLEXIBILITY BUILT INTO THE SYSTEM TO ALLOW THE OPERATOR TO SELECT FROM MULTIPLE PROGRAMS FOR THE TOOL.

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SCENE 79.	Tom Schaffner:: This tag, when we write a robot program and mount it to the end of arm tooling, it sends a signal to the robot. The robot then says do you want to associate that teach program with this particular tag, and you hit enter, yes. This tool is identified with this particular tag alone. You do have a choice to associate this tool with other programs if you choose. But in this application this is specific to this end of arm tooling and this setup.
SCENE 80.	NARRATION (VO): SINCE THE TECHNOLOGY WORKED AS EXPECTED. WITTMANN TOOK THE SOLUTION TO ITS CUSTOMERS WITH THE EXPECTATION THAT IT WOULD BE WELL RECEIVED
SCENE 81.	Tom Schaffner:: We haven’t had any problems selling our RFID to the customer. The customer was looking for ways to make it more error-proof themselves. They have taken it, it’s pretty simple, it doesn’t take up much weight or decrease their payload or require more mold open time. So on their end, there are no issues from them. In fact, they think it will make their job easier.

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SCENE 82.	NARRATION (VO): MANUFACTURING SITES WHICH EMPLOY SOPHISTICATED ELECTRONICS ARE ALWAYS SUSCEPTIBLE TO RADIO INTERFERENCE. THE FACT THAT PASSIVE RFID HAS A RELATIVELY SHORT RANGE, IN WITTMANN'S CASE JUST A FEW INCHES, HAS PROVEN TO BE A PLUS IN THIS PARTICULAR SOLUTION.
SCENE 83.	Tom Schaffner: We don't have any security concerns with this technology. There is no extra noise that floats around from this RFID. We have had no issues from servomotors or servodrives. The transmitter receiver is fairly short range. It only detects it within a few inches. So if the tool is on the bench and something moves by it, it hasn't had any effect on this RFID.
SCENE 84.	NARRATION (VO): PART OF THE IMPLEMENTATION ALSO DEALT WITH THE ACTUAL INTRODUCTION OF THE TAG INTO THE SYSTEM. IN WITTMANN'S CASE, THE INSIDE OF THE END-OF-ARM TOOLING COMPONENT PROVIDED AN IDEAL LOCATION FOR AFFIXING THE TAG.

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SCENE 85.	Tom Schaffner:: This tag is actually glued on. We were going to screw it on, we were actually going to put a bolt through the back. We were a little concerned about breaking or cracking it. But it really doesn't weigh anything.
SCENE 86.	NARRATION (VO): THE ACTUAL PROCESS OF UPLOAD IS ALSO FAIRLY SIMPLE, THE SOFTWARE WRITTEN BY WITTMANN WALKS THE CUSTOMER THROUGH THE SETUP PROCESS:

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SCENE 87.	Tom Schaffner:: The way this works, the customer will write a robot program. Then when they press "save", it will sense that there is an end-of-arm tooling nearby with an RFID tag. The controller will ask if we would like to associate that particular teach program with this end of arm tooling. When they confirm yes, it automatically links them together. The customer can then associate a picture of this end of arm tooling, and embed it in the program as well… So the next time they load up this particular program, it will come up with a picture of the end of arm tooling, it will sense that this tooling is on here, and automatically link it. Then as a safety, it will ask the technician if this is the program, and _____. When the technician hits confirm, it downloads, and transfers the proper program.
SCENE 88.	NARRATION (VO): THERE ARE HOWEVER, FAILSAFE PROCEDURES FOR WHEN THINGS GO WRONG. IN WITTMANN'S CASE, THE ROBOT WILL NOT OPERATE IF SOMETHING WENT WRONG, THUS PREVENTING POTENTIAL REWORK.

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SCENE 89.	Tom Schaffner: If the robot misreads the tag, or there is no tag associated with it, it won't transfer the program. If you go to mount this end of arm tooling, and there is no tag, or the technician says "does not confirm", maybe it's the wrong end of arm tooling, it will not transfer the program, and the robot will not start automatic operation.
SCENE 90.	NARRATION (VO): THE BENEFITS SHOWN BY THIS SOLUTION HAVE BEEN VERY TANGIBLE IN WITTMANN'S IMPRESSION…
SCENE 91.	Tom Schaffner: The benefits of this technology are, it doesn't take up any weight or decrease our payload. It doesn't take up space. There is nothing to get hung up or caught up when mounting it.
SCENE 92.	NARRATION (VO): WITH THE SUCCESS OF THE PROGRAM SO FAR, WITTMANN BELIEVES THAT THERE IS A BRIGHT FUTURE FOR RFID SOLUTIONS INTEGRATED WITHIN THE PRODUCT LINES…

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SCENE 93.	Tom Schaffner: After seeing how easy this is, adding this tag to this end of arm tooling, how well it works, how easy, we don't see any reason we couldn't add this to other types of automation. --- Touch to Black ---
SCENE 94. **NORDAM**	NARRATION (VO): BASED IN TULSA, OK AND WITH FACILITIES WORLDWIDE, THE NORDAM GROUP MANUFACTURES AIRCRAFT INTERIOR AND STRUCTURE COMPONENTS WHICH ARE RATHER LARGE IN SIZE. BECAUSE OF THE MANUFACTURING PROCESS REQUIRED TO PRODUCE THESE PARTS ARE BASED IN VERY SIZEABLE AND COMPLEX PLANTS, IT IS OFTEN DIFFICULT TO TRACK THE WORK-IN-PROGRESS AS IT TRAVELS THROUGH THE PLANT. TO UNDERSTAND THE CHALLENGES THAT THE NORDAM GROUP FACED, IT IS IMPORTANT TO UNDERSTAND HOW THE TYPICAL PRODUCTION DAY FLOWED:

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SCENE 95.	Mike Metcalf: Before we came to this facility, our operations were spread throughout about five different buildings. Tools were stored wherever they could be stored. Even after we moved to this facility we had them all stored in one nice room, but they were just simply stored in that room. To find them you had to actually know what they looked like. So it took a great deal of tribal knowledge, if you will, to find a specific tool and to put it into operation.
SCENE 96.	NARRATION (VO): THIS TRANSLATED INTO PERSONNEL INEFFICIENCIES AND WASTED PRODUCTION TIME BECAUSE OF OPERATIONAL BOTTLE NECKS AND EXTENDED START-UP TIMES:

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SCENE 97.	Mike Metcalf: Some of the biggest errors or some of the biggest flow problems we had with our process at the time had to do with startup. When the first shift would start, nobody had a tool and could begin work. They would have to go back to the storage room, find a tool, locate it, sometimes pull it down from a rack with a forklift. We only had one forklift, so everybody would wait. At one point I remember going back there and there were 13 people standing around the forklift operator waiting for their turn. Every morning there was a period of startup that was very inefficient, a lot of lost productivity.
SCENE 98.	NARRATION (VO): THE NORDAM GROUP KNEW THAT THEY HAD TO FIND A SOLUTION TO THIS PROBLEM IN ORDER TO STAY COMPETITIVE IN THE WORLD-WIDE ECONOMY. THEY STARTED BY DOING AN ANALYSIS OF THEY MATERIALS THAT NEEDED TO BE TRACKED IN ORDER TO DESIGN A SYSTEM THAT TOOK INTO CONSIDERATION THE DIFFERENT CHARACTERISTICS OF THE MATERIALS:

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SCENE 99.	Mike Metcalf: One of our limits, as any facility has, we're limited by our footprint. We have a fairly new facility with what we consider to be a very large tool storage area. But in a very short period of time we filled that area up. We were using some inefficient storage technologies, finger racks and pallet racks, that weren't really well suited to our needs. The first thing we did was looked at all the tools that we store in that area, and we decided that different sizes of storage facilities, different depths of finger racks, different types of pallet racks, would give us a larger quantity of sheer storage capability.
SCENE 100.	NARRATION (VO): BUT THIS IS JUST ONE OF THE AREAS WHERE THE NORDAM GROUP FOCUSED. THEY ALSO PUT TOGETHER A TEAM TO DESIGN A SOLUTION THAT WOULD ALLOW THEM TO TACKLE THE STORAGE UTILIZATION PROBLEM AS WELL AS THE WIP TRACKING PROBLEM AND STARTUP PROBLEM:

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SCENE 101.	Mike Metcalf: … When we moved to this facility, we brought our existing practices here. Great facility, but we didn't change the way we tracked our tools. It was only once we did a Six Sigma program and looked at the inefficiencies in our composite storage that we made the decision to go to a combination of bar coding RFID and database.
SCENE 102.	NARRATION (VO): WITH THE DECISION MADE, IT WAS IMPORTANT FOR THE TEAM TO PROPERLY UNDERSTAND WHERE IT WOULD MAKE SENSE TO USE RFID AS A SOLUTION AND WHERE IT DID NOT MAKE SENSE:

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SCENE 103.	Mike Metcalf: When we were looking to design the system, we decided to not just build an RFID system for the sake of building one. We knew we wanted to track tools, so we looked at different technologies for different applications. What we decided was that RFID was going to give us a great deal of in process data. The RFID is very good at showing where something is at a given time. But for storage, it’s a fairly expensive technology. So we don’t use RFID to show where a tool is when it’s sitting on a shelf. For that we use a simple barcode system, and a database that keeps track of where each tool is. RFID is used on all the tools we use frequently, and it helps us track them once they’re in work, and it helps us get them back into work faster.
SCENE 104.	NARRATION (VO): THE OTHER ASPECT OF WHICH THE TEAM HAD TO BE CONSCIOUS WAS THAT OF TACKLING THE HARSH REALITIES OF THE MANUFACTURING ENVIRONMENT:

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SCENE 105.	Mike Metcalf: When we looked at all the RFID technologies that we were going to apply, the driving concern was the environment. There is a great deal of metal in our facility. These tags have to go into an oven and be heated up to as high as 400 degrees, so that really defined what RFID technologies would work for us. All of our RFID is passive, because today there isn't an active RFID that can survive that environment.
SCENE 106.	NARRATION (VO): THE NORDAM GROUP DECIDED TO TAKE A SIMPLISTIC APPROACH TO THE RFID IMPLEMENTATION, CHOOSING WELL ESTABLISHED, PROVEN TECHNOLOGY:

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SCENE 107.	Mike Metcalf: The RFID technology is focused around passive tags, which again, have to survive in very harsh environment. Our approach is based on portals. We have choke points in our process. That sounds like a negative term, but in this case it works for us. So we have RFID portals at strategic locations that interrogate the tags as a tool moves from one location to another. At all the portals we use very simple, circular antennae. They don't have directionality, but they have a lot of redundancy, and we are able to tune them to our needs, so we don't get a lot of inadvertent reads. All of our equipment is portal controlled, so there is a reader at each portal. That includes our ovens, which are also RFID capable.
SCENE 108.	NARRATION (VO): IN THE SPIRIT OF PRAGMATISM, THE NORDAM GROUP CHOSE TO IMPLEMENT THE RFID SOLUTION USING PORTALS THROUGHOUT THEIR FACILITY IN A LOGICAL WAY THAT FOLLOWED THE PATH OF THE MOLDS AS THEY TRAVELED THROUGH THE MANUFACTURING PROCESS. THIS APPROACH ALSO ALLOWED THEM TO INTRODUCE REDUNDANT STATIONS TO ENSURE THE HIGH QUALITY OF DATA CAPTURE:

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SCENE 109.	Mike Metcalf: It starts off in the tool storage area, and we refer to that as Portal 1. But we ended up converting that to bar code only, because that fulfilled all our needs. That is the area where all the tools are stored. When a tool is picked, it goes into the area we call clean and prep, and that's scanned in by bar code. After it moves through prep, it moves to Portal #2, that moves it into the layup area. That actually puts it into operation. That means you can't start another job on that tool, because it has already moved into operations. After Portal #2, the part is built on the layup mold. It goes past Portal #3, and that moves it into oven staging. The next step is to actually go into the oven. When it goes into the oven it's read at Portal #4. This is an interesting challenge, because Portal #4 is actually read twice. It reads going into the oven, and it reads coming back out. After the tools come back out of the oven and are read through Portal #4, the parts are removed from the tools, and the tool is moved through Portal #5. Portal #5 is called Tool Return. That's where the process is started all over again. Either the tool is put back into storage, or it's put back to work.

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SCENE 110.	Mike Metcalf: We were excited to find out that almost 60 percent of our tools almost immediately go back into work, something we really didn't know before implementing this system. Portals #6 and #7 are external, if you will. If a part were to leave the layup area, it would go to either Portal #6 or #7. The logic in the database knows what that means and shows that it is in the larger facility if it goes out one door and back the other. So the entire layup facility is perimeter controlled by RFID portals.
SCENE 111.	NARRATION (VO): THIS PROCESS ALLOWS FOR THE EFFECTIVE USE OF A COMBINATION OF RFID AND BARCODING SYSTEMS TO HAVE A TOTAL TRACKING SYSTEM THAT IS CURRENTLY TRACKING A LARGE QUANTITY OR PARTS:

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SCENE 112.	Mike Metcalf: In this system we track about 1,600 composite layup molds. There are about 2,0000 tools in the facility tracked by barcodes, but in this system, in the composite layup area, these 1,600 tools, not all of them are in operation at any given time, and some of them haven't been used for quite a long time. We have a process within the database that tracks how often we use a tool, and as a tool hasn't been used for a period of time, it's moved to a colder and colder storage location if you will. But a lot of people ask why we keep tools. There may be tools in that area that are 40 years old. The reason for that is, the value of the tool is many, many times the value of the part. As Murphy's Law dictates, the moment you get rid of a tool, the customer calls you up and asks for a part on an aircraft that was built 50 years ago. So we keep the tools because the replacement cost is very high relative to storage cost.
SCENE 113.	NARRATION (VO): NATURALLY, THIS SOLUTION DID NOT COME WITHOUT CHALLENGES, THE IMPLEMENTATION TEAM HAD TO FIGHT AND CONQUER MULTIPLE ISSUES, PRIMARILY THOSE CREATED BY THE ENVIRONMENT IN WHICH THEY OPERATED:

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SCENE 114.	Mike Metcalf: One of the major issues we encountered when we designed the system was an area that is very complex. After the part has been laid up on the tool, you have to put it through a cure cycle. Our ovens are all located in one area, and we have tools and parts going into ovens, coming out of ovens, so the part can be returned. It's a very complex area, both for RFID and for the database. We get multiple reads, one read going into the oven, one read coming out, and that caused a lot of complexity that we had to have built into the database. We also determined that we were going to build some redundancy into it to control exactly what that read meant going in and what that read means coming out. But we also decided, during the development of the system, that the existing database we were using to develop our oven logs… of course in our facility we have to track all processes. We have to show exactly what part was built, in which oven log, how long it was cooked, what temperature it reached.

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SCENE 115.	Mike Metcalf: All of that information was maintained in an outside database. We realized that in this tool tracking system we could incorporate a database that builds our oven logs for us. Today our oven logs are semi automated. If a tool is RFID capable, when it's rolled into the oven, it automatically updates the oven log. So we have a guaranteed time that a tool went into the oven, then we have the cure cycle, then we have the time when the part came back out of the oven. This system allowed us to remove another legacy system that we had built to track our processes.
SCENE 116.	NARRATION (VO): THE OVENS REPRESENTED A SPECIAL PROBLEM THAT THE TEAM DID NOT ANTICIPATE. HOWEVER, THE ORIGINAL DESIGN CALLED FOR REDUNDANCY THROUGHOUT THE PROCESS WHICH PROVED TO BE INVALUABLE IN THE SUCCESS OF THE IMPLEMENTATION:

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SCENE 117.	Mike Metcalf: One of the areas we had a lot of complexity in, especially in designing the system and the design of the RFID system, was around our ovens. The ovens are 40 feet deep, 15 feet wide, and 12 feet tall. They have huge sheet metal doors that are important to keep the heat in, but when you have them open they make the RFID environment very hostile. So we had to design portals and tags and methods for operating in this environment, but still get good reads. So what we developed was a self-standing stanchion, if you will, that's mounted just outside the oven, that has a circular antenna on it.

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SCENE 118.	Mike Metcalf: Because our tools are so large, occasionally we have to go in at an angle. We decided to mount those antennas on a swinging arm. We call it a barroom hinge, a saloon hinge. It can actually swing in either direction if it happens to be hit by a tool, and it doesn't damage the antenna. Of course the antenna continues to function at all times, and always returns back to its correct orientation. When tools go into the ovens, we have found we get very good reads. They're very closely placed and everything works fine. When tools come back out of the oven, they're heated. They're still above room temperature. They're anywhere between 80 and 150 degrees, and what we found is that reduces the effectiveness of the overall system.
SCENE 119.	Mike Metcalf: Add to that the fact that you have the large open sheet metal doors that are also radiating heat, which is again interfering with the system. So we found that coming out of the oven we had a drop-off of about 20 percent of our read rates.

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SCENE 120.	Mike Metcalf: … So what we did is we built in two systems, two redundancies, on top of that. One is controlled by the oven log. When the technician closes the oven log, it automatically moves the tool from wherever its location is to the next location. So if a tool is not read coming out of an oven, closing an oven log simulates that portal read.
SCENE 121.	Mike Metcalf: If the oven log happens to still be open, and the tool is finished and they're read to put it back into storage, the last portal, Portal 5, will do the same thing. A read at that portal will automatically reset the system and put the tool back into its storage location. That portal is tuned, it actually has quite bit of power on it, and it is the automatic reset for the system.
SCENE 122.	NARRATION (VO): AFTER DISCOVERING AND RESOLVING ALL THE ISSUES FACED DURING THE IMPLEMENTATION, THE NORDAM GROUP AROSE WITH A SOLUTION THAT YIELDED THE BENEFITS THAT THEY ORIGINALLY EXPECTED:

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SCENE 123.	Mike Metcalf: One of the thing we found, particularly in our oven logging system, is that each part, each work order, each tool number, had to be entered manually, so we had occasion for human error. In our industry, if you have an error in one of these types of documents, that part is basically scrapped. Even though it's perfectly fine, you don't have traceability, it hasn't been done correctly. So human error is one of the things we try to build out of our processes. So when we developed the RFID system, we used that thought process. We use RFID to remove human entry. We don't have to type in part numbers or work order numbers for RFID tools into our oven logs, and all of our bar coded tools are scanned in by hand scanner. So we reduce the opportunity for human error and improve the system.
SCENE 124.	NARRATION (VO): YET, THE POWER OF THE PROJECT IS NOT ONLY THE RFID INFRASTRUCTURE, BUT RATHER, THE HOLISTIC APPROACH TAKEN TO PROVIDE AND OVERALL SOLUTION.

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SCENE 125.	Mike Metcalf: RFID is really an enabler. RFID gives us all of our in-process data. Once a tool is put into work, it tells us where it is at all times, real time data for the production leads in that area. So one of the benefits is the information available to a production lead. For example, if a particular part is needed by one of our customers on a very short turnaround, the production lead can find that tool and can see that it's in oven four, and it's been in there for two hours. So he or she knows that as soon as it comes out, they can put it right back into the system and get another one built. That's something we never had before. We never knew exactly where things were, unless someone physically went and found it.
SCENE 126.	NARRATION (VO): AND WHEN ALL THIS IS PUT TOGETHER, NORDAM REALIZED IMPRESSIVE BENEFITS THAT WERE EASILY QUANTIFIABLE:

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SCENE 127.	Mike Metcalf: This RFID tool tracking system has given us several hard and soft benefits. The hard benefits are just straight productivity. The first shift would lose anywhere from 30 minutes to two hours, depending on the individual, every morning, simply getting the tool they needed to build their part. That time has turned into immediate productivity. We determined that it's about 48 man hours of productivity gained each day, just by adding this system, and without adding a single head. In addition we gained a tremendous amount of storage area by the way this system uses our facility. WE have increased the number of tools by 40 percent from a time when we were convinced we needed a bigger room or additional offsite storage. We have continued to pack tools into the system without increasing the footprint. The other benefits are instantaneous real time information on where our parts are, which has increased productivity.
SCENE 128.	NARRATION (VO): NORDAM IS VERY PLEASED WITH THE INCORPORATION OF RFID TECHNOLOGY INTO ITS MANUFACTURING SYSTEMS:

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SCENE 129.	Mike Metcalf: I'm really proud of the way Nordam approached RFID. We took a very practical approach to it. I have talked to a lot of people in the industry, and a lot of them are frustrated because it doesn't do what they thought it would do. We kind of approached it from a different standpoint. We said what do we need it to do, and which technologies do we need to employ to make it work. -- Touch to Black --
SCENE 130.	NARRATION (VO): AS WE HAVE SEEN, THE MANUFACTURING INDUSTRY HAS EMBRACED RFID TECHNOLOGY IN A VARIETY OF APPLICATIONS. EVEN THOUGH THE TECHNOLOGY IS STILL CONSIDERED NEW, IT HAS SHOWN THAT WITH CAREFUL PLANNING AND A CLEAR UNDERSTANDING OF THE CAPABILITIES ALONG WITH REALISTIC OBJECTIVES, IT IS POSSIBLE TO EXTRACT REAL VALUE FROM RFID TECHNOLOGY.

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SCENE 131.	NARRATION (VO): IT IS IMPORTANT TO REALIZE THAT RFID TECHNOLOGY IS AN ENABLER TO PROCESS IMPROVEMENT, COST SAVINGS AND INCREASED EFFICIENCIES AND NEEDS TO BE CONSIDERED IN THE COMPLETE REALM OF A SOLUTION.
SCENE 132.	NARRATION (VO): LOOKING FORWARD, WE CAN EXPECT TO HAVE SMALLER TAGS THAT CAN HOLD LARGER AMOUNTS OF INFORMATION AND CAN COMMUNICATE OVER SHORTER OR LONGER RANGES DEPENDING. WITH THAT IN MIND, THERE MAY BE AN RFID APPLICATION WHICH COULD YIELD TREMENDOUS BENEFITS WAITING TO HAPPEN WITHIN YOUR OWN MANUFACTURING PROCESS. -- FADE TO BLACK --
SCENE 133.	Produced By: The Society Of Manufacturing Engineers Executive Producer: Steven R. Bollinger Producer/Director/Editing: David Rembiesa Written By: Manuel A. Pachano