Architecture of the Project

- Construction of three mega-sized industrial projects (typical site population of greater than 5,000 workers) which were located on an island, with limited access to and/or geographically dispersed materials in multiple mainland storage areas (laydown yards), where all materials must be transferred.

- International material workflow process with mainland distribution centers and three separate concurrent projects.

- Difficult to access storage and laydown yards quickly due to locations.

This scenario required an advanced localized material management system to:

- Integrate RFID technology into existing company-developed supply chain software that results in achieving transactional benefits during material handling activities.

- Maintain current locations of materials as they moved through a complex localized supply chain from mainland distribution centers to island (job sites) for three separate concurrent projects.

- Shorten the cycle time and reduce costs for the collection of materials and transfer of those materials to the individual project locations.

Objective of the Curtis Island Project

- Reduce material availability issues

- Track transfer units’ movements across the local supply chain

- Reduce manual, paper-based processes

Results Realized

- Bechtel reduced their indirect labor costs by 5% on a $30 billion project

- Tracked 1.2 million tag movements through the supply chain, which had previously been recorded manually

- Reduced steel delivery from 45 days to 22

- Saved 1 man hour per material withdrawal request, saving > 300 hours per week

The Curtis Island LNG Projects supported multiple mainland storage facilities, a complex, international material flow process, and a time-sensitive cross harbor logistics process. Bechtel incorporated the use of Auto-ID and mobile technology to increase efficiencies in their material control processes. Bechtel engaged a Six Sigma team to document the improvements and dollar savings realized by using these technologies. This document will present some preliminary findings and potential savings over the life of the project.

How Bechtel Reduced Indirect Labor Costs by 5% on a $30 BILLION PROJECT

Using Auto-ID & Mobile Technology

1.2 MILLION TAG MOVEMENTS THROUGH THE SUPPLY CHAIN

recorded by Jovix™ had been previously recorded MANUALLY
For the Curtis Island LNG Projects, Bechtel won a **FIATECH CETI AWARD FOR INTELLIGENT & AUTOMATED CONSTRUCTION JOBSITE**

From RFID Journal, Bechtel won **BEST RFID IMPLEMENTATION**

### Technology Selection

The client’s evaluation process of this technology began with a Construction Industry Institute RFID pilot in 2008, “Leveraging Technology to Improve Construction Productivity”. Bechtel's second RFID field trial was a power project where a limited deployment (20,000 active tags) took place in 2010. Having proven that the technology was feasible, Bechtel sought an experienced solution provider to take it from pilot to commercial viability.

An evaluation committee studied the successes and failures of similar initiatives across the industry. To select a technology partner, the solution had to be scalable, reliable, and configurable in order to support their core business processes.

Bechtel set up a cross-functional team comprised of corporate and project based groups including Automation, Materials Management, Procurement, Expediting, Traffic and Logistics, as well as management and team members from the proprietary internal procurement system, Construction Management and the Owner/Operator.

As the world leader in Auto-ID solutions for the industrial construction market, Atlas RFID and its Jovix™ solution were selected for use of this project.

### Hardware & Software Solution

The following system components were implemented at sites throughout the global supply chain in Turkey, China, Thailand and Australia:

- 13 Gate readers were installed at the entry/exit of all facilities (five mainland-based laydown yards, one spool fabricator, four mainland port facilities for cross-harbor movement, and three Curtis Island-based port facilities at each project site spread over a 20 square kilometer area (7.7 miles).

- 4 Vehicle mounted readers were used at four different locations, including one dynamic mainland laydown yard where the vast majority of pipe spools were stored, and at each of the three project sites.

- 37 Mobile devices were dispersed to users at all project locations on the mainland and Curtis Island in Australia, the steel fabricator in China, the module fabricator in Thailand, as well as at the pipe spool fabricator in Turkey.

- 60,000 Active RFID tags and barcode labels were applied to various material types.

The integration of Jovix™ with Bechtel’s internal procurement system provided users with a graphical, easy-to-use interface for managing data that was collected from the field during the receiving, warehousing, picking and issuing processes.
The Initial Integration Deployment

**DESIGN**
- Gather business requirements
- Write design specifications
- Ensure seamless integration with proprietary Bechtel procurement system

**DEVELOP**
- Internal QA process
- Tested information exchange between Jovix™ and BPS in test lab environment

**DEPLOY**
- Adapt technology to current work process requirements
- Made RFID a tool vs. an obstacle

Field Test Lessons Learned
When Bechtel designed the business process requirements, it was done at the home office under corporate management direction. The first attempt at the actual production deployment consequently turned into a field trial. The deployment failed, but provided lessons learned that were vital to developing better processes and additional functionality to support those processes when the system was successfully redeployed three months later.

Project Implementation

**Structural Steel Receiving**
Receiving processes moved from a manual collection of data and post collection data entry to an automated method using the tablets and RFID tags. Changing this process reduced the time of completing a structural steel receipt from 45 days (start to finish) to 22.

**Locating Materials with a Mobile Tablet**
The average time required to locate and pick materials using the tablet and RFID tags was significantly reduced. Searching for individual spools, cable reels, instrumentation, or a bundle of steel was reduced from days to minutes after the decision was made to tag all inventory as part of the receiving process. With inventory for three separate mega projects spread across several laydown yards, material locations proved to be fairly dynamic. The RFID tags combined with the use of a VMR (Vehicle Mounted Reader) automatically captured new locations as materials moved.

Several CII and Fiatech studies have shown that using GPS and RFID reduces the time required to located materials by a factor of eight. Bechtel believes those studies to be accurate and potentially a bit conservative on the results. Using the tablet to locate these items, laydown crews were able to walk directly to materials in the yard, completing pick lists much faster than is possible using a manual approach.

Switching from manual to **automated** data collection knocked **23 days** off the receipt of structural steel.
Tracking MWR and Picking Progress Automatically

One of the major business processes that was changed involved picking requested pipe spools, getting them through cleaning, and loading them onto trailers to be delivered to Curtis Island. Before the system implementation, laydown crews would take a paper pick list into the field, manually record ‘flagged’ pipe spools, and turn their list over to a Data Entry Administrator at the end of each day. The Administrator would then enter the flagged spools into the internal procurement system.

Each step in the workflow repeated the same paper-based process of manual data collection, followed by manual data entry. The cleaning documentation process required two full-time equivalents (FTEs). Using the mobile tablets, a VMR, RFID tags, and barcodes, the laydown yard team created a process to automatically collect the data by GPS location and update the status to ‘Flagged’, ‘In Preservation’, ‘Preservation Complete’, or ‘Dispatched’ as the material moved through the delivery process. Using the data, a twice daily report was automatically generated and distributed, providing data entry clerks with accurate, actionable information that allowed them to focus on their core responsibilities.

This represents a significant soft savings, allowing your data administrators to use this time to complete other critical tasks, or potential hard savings if you can justify reducing FTEs. Other soft savings include data quality improvements from the reduction of manual data entry errors.

Using Tablets to Generate Packing List for Transfer Units

Additionally, a manual process recorded which spools were loaded onto a transfer unit. Using Jovix™, Bechtel was able to use the tablets to compile and load spools and other materials onto transfer units and automatically generate packing lists.

Bechtel’s Six Sigma study showed a time savings of 1 man-hour per Material Withdrawal Request (MWR). With over 300 MWR’s generated per week, over the life of the project Bechtel will realize hundreds of thousands of dollars in cost savings from this single process optimization.

Transfer Unit Tracking and Reporting

Prior to implementing Jovix™, personnel had to manually track the location of several hundred transfer units as they moved to and from the mainland storage facilities and the workfaces on the island.

Using RFID and strategically located gate readers, Jovix™ automates the process, providing a real-time snapshot of where the transfer units are on the project site as well as the contents of each transfer unit. Bechtel leverages a Jovix™ report showing the transfer units’ current location, previous location, contents, and the length of time since last movement in order to provide visibility into asset utilization to ultimately drive more efficient use of the equipment.
One of the biggest contributors to the successful implementation of this program was the culture of innovation from management to craft. Organization leaders made a commitment to change management. They continually followed up personally with supervisors and craft, urging users to challenge themselves to try something new and provide feedback for how the program could further improve. The laydown yard managers all adopted the concept of improved efficiencies and ensured that craft completed tasks and transactions according to the outlined processes. Craft quickly began to recognize how the new technology would make their lives easier and help them to do a better job. Leadership’s goal was to train and support a team of people who would adopt the technology, ensure its success and take that knowledge with them to future projects.

An unexpected outcome was craft’s sense of excitement around a new high-tech tool to help them work smarter. As Bechtel continues to improve the current deployment and plan for future implementation, the “Culture of Innovation” will be a key component in further success. A commitment to move away from outdated, inefficient processes and rely on proven technology will pave the way for the organization and the entire construction industry to grow and prosper in the future.

**Total Commitment and Support**

A key to successful change management is achieving small wins early. By starting with a manageable scope, the project was able to establish a core group of champions who then served as ambassadors as the scope was expanded through a “Crawl, Walk, Run” phased approach.

- Organization
- Management
- Supervisors
- Craft Labor
Results

Visibility
Using 60,000 RFID tags, Bechtel has been able to track and trace over 100,000 components and counting. Jovix™ has collected over 6 Million tag reads providing visibility into the location and status of all of these materials.

Automation
Additionally, Bechtel automated over 1.2 million material location updates which would have previously been recorded manually, resulting in significant labor savings.

Optimization
Without Jovix™, processing a delivery of steel could take up to 45 days. Jovix™ reduced the total time to 22 days. “That’s a real savings that you can obviously look at and understand in terms of labor and having the materials available at the workplace,” said Ed Koch, Automation Specialist and Software Product Manager for Bechtel.

Productivity
Several Six Sigma studies are underway regarding the implementation. Initial estimates show a significant impact on labor. Bechtel believes digitizing these processes could potentially reduce their labor costs by 5 percent on a ~$30 billion project.

Recommended Best Practices
Bechtel has collected a set of best practices to be used to enhance the implementation of Jovix™ on future projects.

- Align all stakeholders across the project
- Set defined goals for the implementation
- Include Construction early in the process definition
- Develop a detailed work process flow diagram
- Implement an effective tagging strategy
- Create and document easy to follow work instructions
- Develop a crawl-walk-run implementation plan
- Assign a dedicated Jobsite System Coordinator
- Train all users and track competency, retrain if needed
- Implement a mock deployment

Next Steps
According to Bechtel, implementing Jovix™ will have a long term impact on their business. The company plans to continuously expand the Curtis Island implementation as well as deploy on additional capital projects both large and small. Bechtel has found the positive material control provided by Jovix™ to be a “need to have” to combat the increasing complexity of modern global mega projects. Since implementing this project, Bechtel has also recognized the value of deploying Jovix™ on small projects, including a rail expansion project that tracked only 900 cable reels.

Bechtel intends to expand the integration between the internal procurement system and Jovix™ to enable the use of the combined solution further upstream in their supply chain and downstream through construction.

Spool and steel fabricators are already tagging and barcoding items before they are shipped. Future plans include expanding this to additional suppliers and fabricators.

Bechtel also plans to utilize Jovix™ further downstream on the construction side to ensure continuity of material tracking and to assist in the recording of work progress through installation and the recording of quality inspections through plant startup.

Contact us today to learn more.
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