



CONSTRUCTION INDUSTRY INSTITUTE

RADIO FREQUENCY
IDENTIFICATION TAGGING

Construction Industry Institute

3M	ABB Lummus Global
Abbott Laboratories	Baker Concrete Construction
Air Products and Chemicals	BE&K
Aluminum Company of America	Bechtel Group
Anheuser-Busch Companies	Black & Veatch
Aramco Services Company	BMW Constructors
Bayer Corporation	Burns and Roe Enterprises
The Boeing Company	Butler Manufacturing Company
BP Amoco Corporation	CDI Engineering Group
Cargill	Cherne Contracting Corporation
Celanese	Chicago Bridge & Iron Company
Champion International Corporation	Cianbro Corporation
Chevron Corporation	Day & Zimmermann International
CITGO Petroleum Corporation	Dick Corporation
Conoco	Dillingham Construction Holdings
Dofasco	Eichleay Holdings
The Dow Chemical Company	Fisher Controls International
DuPont	Fluor Daniel
Eastman Chemical Company	Foster Wheeler USA Corporation
ExxonMobil Corporation	Graycor
FPL Energy	Hilti Corporation
General Motors Corporation	Honeywell International
General Services Administration	Integrated Electrical Services
GlaxoSmithKline	International Technology Corporation
Huntsman Corp.	Jacobs Engineering Group
Intel Corporation	Johnson Controls
Eli Lilly and Company	Kellogg Brown & Root
NASA	Kiewit Construction Group
Naval Facilities Engineering Command	Kværner
Ontario Power Generation	Lurgi PSI
Phillips Petroleum Company	M. A. Mortenson Company
Praxair	Murphy Company
The Procter & Gamble Company	Parsons Energy & Chemicals Group
Reliant Energy	Petrofac LLC
Rohm and Haas Company	Primavera Systems
Shell Oil Company	PSEG Energy Technologies
Solutia	Rust Constructors
Tennessee Valley Authority	S&B Engineers and Constructors Ltd.
Texaco	SAP America
U.S. Air Force Research Laboratory	SMS Demag
U.S. Army Corps of Engineers	VA TECH
U.S. Department of Commerce/NIST	Walbridge Aldinger Company
U.S. Department of State	Washington Group International
U.S. Steel	H. B. Zachry Company
Union Carbide Corporation	
The University of Texas System	

Radio Frequency Identification Tagging

**Prepared by
The Construction Industry Institute
Radio Frequency Tagging Research Team**

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Executive Summary

Radio frequency identification (RFID) technology is currently being used in such areas as agriculture, athletics, manufacturing, security and law enforcement, and transportation, but few applications have been developed that are related to the construction and facility operations environment. This research summary provides current information about RFID tagging.

To foster an exchange of ideas about this technology, the CII RFID research team organized a construction industry–RFID supplier workshop. As a result, potential application areas related to construction engineering and design, material management, maintenance, and field operations were identified.

The workshop also resulted in the research team selecting five application ideas for pilot tests to investigate RFID and its applicability to the construction industry. The pilot tests indicated that RFID potentially reduces costs for both owners and contractors. One pilot test showed that RFID tags provided a time savings, particularly when downloading data into a company's procurement tracking system and when flagging an item to prevent duplicate entries. Results also suggested that RFID lowered rework costs, reduced inventory shrinkage, decreased startup times, and increased positive material identification.

The research team also investigated ways to integrate RFID technology during the project life cycle to improve productivity, cost, schedule, quality, and safety. From the contractor's perspective, inventory control could be vastly improved. From the owner's perspective, asset management would most benefit from this technology. The following chapters describe the research effort and suggest how the industry at large can benefit from RFID tagging.

Introduction

Radio frequency identification refers to a branch of automatic identification technologies in which radio frequencies are used to capture and transmit data. The technology, in existence for approximately 20 years, is currently being used in vehicle access, personnel identification, asset tracking, livestock identification, and toll and fee collection. Application development is currently underway in grocery stores, postage, and airport baggage identification.

The objectives of this research project included collecting information regarding RFID, and promoting a better understanding and wider acceptance of the technology. The final objective involved providing RFID manufacturers with relevant information regarding the needs of the construction industry so future RFID products better address those needs.

The team solicited feedback from CII member companies in terms of their needs, what applications would best meet those needs, and barriers to implementation, was accomplished via a workshop. The researchers then performed pilot tests from both owner and contractor perspectives to assess the technology's capabilities and potential for improving project life cycle costs. As these tests demonstrated, RFID is a promising technology for enhancing construction operations related to material receiving and also possibly other operations related to maintenance and operations.

RFID Technology

An RFID system consists of four basic components: (1) tag, also called a transponder, (2) antenna, (3) scanner, and (4) reader. In some industrial applications where equipment is permanently fixed, each component is a separate item. Where portability is required, some of the components may be combined into one hand-held unit.

Tag

The tag, which collects and manages data in a portable, changeable database, contains a small integrated circuit chip and an antenna encapsulated in a protective shell (see Figure 1). Tags are classified as either active, meaning they include a battery, or passive, meaning they are powered by the reader's energy field, and may have read-write or read-only capability.



Figure 1. RFID Tag Attached to Pipe Support

Active tags contain a battery that powers the tag once the reader has activated it. Because of the battery, they can be read or written to from greater distances. However, active tags are usually more expensive than passive tags and have a 3- to 10-year life. Passive tags have an extremely long life and usually last longer than the object itself. The read-write ranges for passive tags are generally only 8 to 12 inches.

Read-only tags are generally used only for simple identification purposes because they can store only a limited amount of information that cannot be altered. With read-write tags, as their name implies, users can alter the information stored on the tag.

Antenna

The antenna transmits an electromagnetic field that activates the tags when they come within range. When the tag transmits its data, the antenna receives the information. Antennas are available in several configurations and vary in size and shape (see Figure 2).

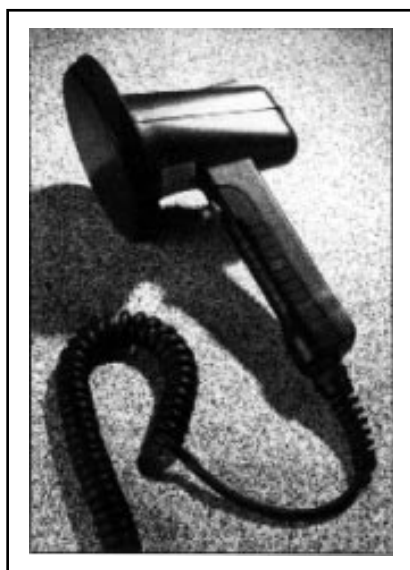


Figure 2 . Portable Antenna