EM Environmental Management
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DOE Packaging Certification Program

ARG-US: RFID System for Management of Nuclear Materials


Model 9975 Drums in Storage

Features:

Secure – The system can monitor thousands of drums 24/7 via secured RF/Ethernet links. The system can also track and monitor drums during transport. Any abnormal situation will trigger an alarm for immediate action. Alarm situations include seal tampering, unauthorized move, high temperature, humidity, or shock.

Drum information is stored in tags and archived in local and central servers.

Reliable – Tags resistant to radiation (≥ 30 kR); battery life (≈ 10 yr)

Sensors (seal, temperature, humidity, shock) provide environmental history data and event logs.

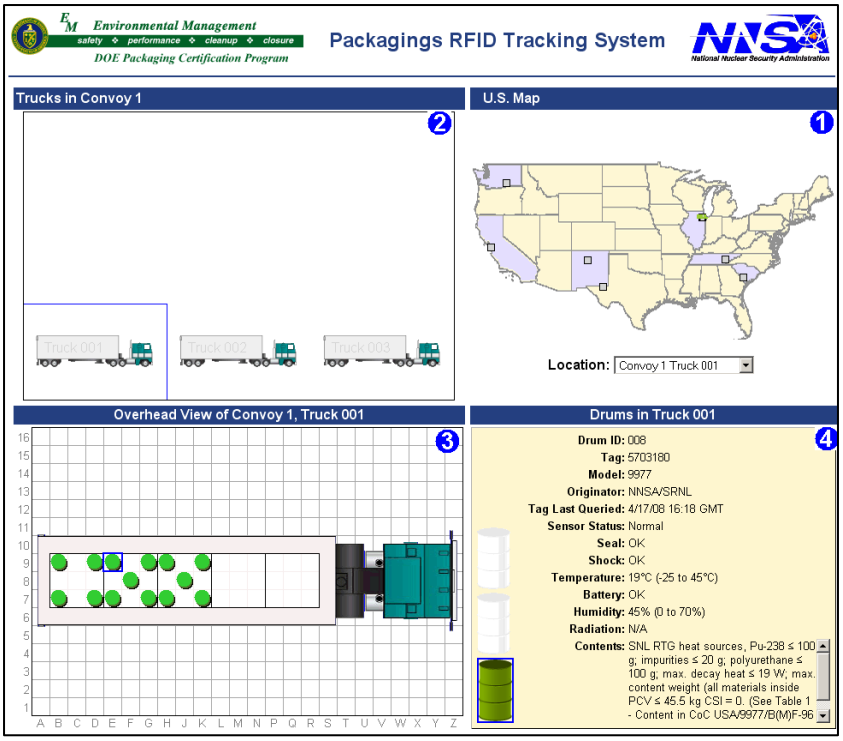
Versatile – Custom software modules (storage and transportation) are user-friendly and can be easily integrated into existing on-site databases.

Drum information can be retrieved remotely and shared with authorized off-site users via a secured network.

Modest Cost – The system employs mature technology and a commercially available platform from Savi Technology. (≈ 200 USD per RFID tag)

The DOE Packaging Certification Program (PCP) of the U.S. Department of Energy's (DOE's) Environmental Management (EM), Office of Packaging and Transportation (EM-63), has developed a **Radiofrequency Identification (RFID)** tracking system for the management of nuclear material packages during storage and transportation. The system, developed by Argonne National Laboratory, involves hardware modification (e.g., form factor, seal sensor, and batteries), application software development, secured database and web server development, and irradiation experiments. Argonne tested key features of the RFID tracking system of nuclear materials packagings in a recent week-long, 1700-mi demonstration. Both the hardware and software platforms were verified to be stable and meeting the performance requirements. The DOE PCP and national laboratories are working on several RFID system implementation projects at DOE sites, along with continuing device and system development and widening applications.

RFID tags mounted on Models 9975, 9977 and ES-3100 drums



Sample web page for tracking packages in transportation

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RFID Tag Specifications

Developed in collaboration with Savi Technology

Physical	Width:	200 mm (7.9 in)
	Length:	150 mm (5.9 in)
	Thickness:	30 mm (1.2 in)
	Weight:	860 g (1.9 lbs)
Environmental	Temperature:	-32°C to 70°C (-26°F to 158°F)
	Humidity:	100% non-condensing
	Vibration and Shock:	MIL-STD-810E Method 514.4, Category 10
UHF RF transceiver	Frequency:	433.92 MHz
	Range:	91 m (300 ft) line-of-sight
	Data rate:	27.8 Kbps
	Protocol:	Savi EchoPoint Air Protocol 2.1, Draft standard for ISO 18185
LF RF receiver	Frequency:	123 KHz
	Range:	3.7 m (12 ft)
	Protocol:	Savi EchoPoint Air Protocol 1.1
Network	Wireless:	RF read/write capable
	Wired:	Sensor expansion port and serial read/write capable
Memory	User memory:	128 KB non-volatile
	Sensor memory:	32 KB non-volatile
Power	Battery type:	3.6 V primary lithium (Li-$SOCl_2$), A-size
	Battery number:	4
	Battery life:	>10 yr, depending on usage
	Battery status:	Report normal or low
Sensor	Seal:	Detect tampering via change in electrical resistivity
	Shock:	Record and detect acceleration above threshold
	Temperature:	Record and detect abnormal thermal condition
	Humidity:	Record and detect humidity above threshold
	Radiation	Under development

Web: http://rampac.energy.gov

About the DOE Packaging Certification Program

Dr. James M. Shuler
Manager, Packaging Certification Program
U.S. Department of Energy
EM-63, CLV-2047
1000 Independence Ave., SW
Washington, D.C. 20585
301-903-5513
301-903-9770 fax
James.Shuler@em.doe.gov

Contact

Dr. Yung Y. Liu
Manager
Safety Analysis Report for Packaging Review Group
Argonne National Laboratory
9700 S. Cass Ave., Bldg. 900
Argonne, IL 60439
630-252-5127
630-252-5715 fax
yyliu@anl.gov