

YEAR END TECHNICAL REPORT

September 29, 2017 to September 28, 2018

Waste and D&D Engineering and Technology Development

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Addendum:

This document represents one (1) of four (4) reports that comprise the Year End Reports for the period of September 29, 2017 to September 28, 2018 prepared by the Applied Research Center at Florida International University for the U.S. Department of Energy Office of Environmental Management (DOE-EM) under Cooperative Agreement No. DE-EM0000598.

The complete set of FIU's Year End Reports for this reporting period includes the following documents:

Project 1: Chemical Process Alternatives for Radioactive Waste
Document number: FIU-ARC-2018-800006470-04b-262

Project 2: Environmental Remediation Science and Technology
Document number: FIU-ARC-2018-800006471-04b-261

Project 3: Waste and D&D Engineering and Technology Development
Document number: FIU-ARC-2018-800006472-04b-251

Project 4: DOE-FIU Science & Technology Workforce Development Initiative
Document number: FIU-ARC-2018-800006473-04b-281

Each document will be submitted to OSTI separately under the respective project title and document number as shown above. In addition, the documents are available at the DOE Research website for the Cooperative Agreement between the U.S. Department of Energy Office of Environmental Management and the Applied Research Center at Florida International University: <http://doeresearch.fiu.edu>

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PROJECT 3 OVERVIEW

The Waste and D&D Engineering and Technology Development Project (Project 3) focuses on delivering solutions under the waste, D&D and IT areas for the DOE Office of Environmental Management. This work is also relevant to D&D activities being carried out at other DOE sites such as Oak Ridge, Savannah River, Hanford, Idaho and Portsmouth and international efforts being conducted by EM with the Nuclear Decommissioning Authority (NDA) in England and the International Atomic Energy Agency (IAEA). This project included the following tasks during the September 29, 2017 to September 28, 2018 period of performance:

Task 1: Waste Information Management System (WIMS)

This task provides direct support to DOE EM for the management, development, and maintenance of a Waste Information Management System (WIMS). WIMS was developed to receive and organize the DOE waste forecast data from across the DOE complex and to automatically generate waste forecast data tables, disposition maps, GIS maps, transportation details, and other custom reports. WIMS is successfully deployed and can be accessed from the web address <http://www.emwims.org>. The waste forecast information is updated annually. WIMS has been designed to be extremely flexible for future additions and is being enhanced on a regular basis.

Task 2: D&D Support for DOE EM for Technology Innovation, Development, Evaluation and Deployment

This task provides direct support to DOE EM for D&D technology innovation, development, evaluation and deployment. For FIU Performance Year 8, FIU expanded its research in technology test and evaluation in the following key areas: 1) Assist/support SRNL in addressing high priority fire resiliency, protection and safety requirements in support of the SRS 235-F risk reduction project and across the DOE EM complex by conducting fire testing on intumescent coatings and foams; 2) Identify broader applications for intumescent coating technologies to mitigate the impacts of contingency scenarios across the DOE complex; 3) Execute a phased approach for the standards development, testing, evaluation, and deployment of D&D technologies; 4) Support for an onsite demonstration at SRS of the intumescent coating; and 5) Collaborate with ASTM to continue development of standards and testing protocols in support of D&D technologies. FIU further supported the EM D&D program by participating in D&D workshops, conferences, and serving as subject matter experts.

Task 3: Knowledge Management Information Tool (KM-IT)

The Knowledge Management Information Tool (KM-IT) is a web-based system developed to maintain and preserve the EM knowledge base. The system was developed by Florida International University's Applied Research Center with the support of the D&D community, including DOE-EM, the former DOE ALARA centers, and with the active collaboration and support of the DOE's Energy Facility Contractors Group (EFCOG). The KM-IT is a community driven system tailored to serve the technical issues faced by the workforce across the DOE Complex. The KM-IT can be accessed from web address <http://www.dndkm.org>. The mobile version of the system can be accessed from <https://m.dndkm.org>.

TASK 1.

DOE'S WASTE INFORMATION MANAGEMENT SYSTEM

TASK 1: EXECUTIVE SUMMARY

For Task 1, FIU has developed a Waste Information Management System (WIMS) to receive and organize the DOE waste forecast data from across the DOE complex and to automatically generate waste forecast data tables, disposition maps, and other displayed reports.

TASK 1: INTRODUCTION

The Applied Research Center (ARC) at Florida International University (FIU) in Miami, Florida, has completed the deployment of a fully operational, web-based forecast system: the Waste Information Management System (WIMS). WIMS is designed to receive and organize the DOE waste forecast data from across the DOE complex and to automatically generate waste forecast data tables, disposition maps, and other displayed reports. This system offers a single information source to allow interested parties to easily visualize, understand, and manage the vast volumes of the various categories of forecasted waste streams in the DOE complex. The successful web deployment of WIMS with waste information from an initial 24 DOE sites occurred in May 2006. Annual waste forecast data updates are added to ensure the long-term viability and value of this system. Individuals may visit the web site at <http://www.emwims.org/>.

TASK 1: EXPERIMENTAL

The initial requirement from DOE Headquarters was to consolidate waste forecast information from separate DOE sites and build forecast data tables, disposition maps and GIS maps on the web. An integrated system was needed to receive and consolidate waste forecast information from all DOE sites and facilities and to make this information available to all stakeholders and to the public. As there was no off-the-shelf computer application or solution available for creating disposition maps and forecast data, FIU built a DOE complex-wide, high performance, n-tier web-based system for generating waste forecast information, disposition maps, GIS Maps, successor stream relationships, summary information and custom reports based on DOE requirements. This system was built on Microsoft.net framework 1.1 and SQL server 2005. Visual Studio 2003, SQL server reporting services, Dream Weaver and Photoshop were also used as development tools to construct the system. Since the initial requirements were met, additional features have been developed and deployed on WIMS.

FIU receives revised waste forecast data and transportation data as formatted data files from DOE EM on an annual basis. To incorporate these new files, FIU builds a data interface to allow the files to be received by the WIMS application and imports it into SQL Server. SQL server is the database server where the actual WIMS data is maintained. Once integrated, reviewed and verified, the new waste data replaces the existing previous waste data and becomes fully viewable and operational in WIMS.

TASK 1: RESULTS AND DISCUSSION

FIU performed day-to-day maintenance and administration of the application and the database servers to ensure a consistent high level of performance of the WIMS application system. Security tasks were performed, including antivirus engine and definitions updates on both the web and database servers. System updates and patches were also downloaded and installed. In addition, FIU performed routine maintenance in order to keep the WIMS database and server in a stable condition as well as monitored the network and server traffic to optimize the application performance.

Once the new annual waste forecast data set was received from DOE EM, FIU completed the data import and all the necessary code updates to the back-end and front-end of the application to accommodate the new waste streams. The application was moved from a development server to a staging server where FIU staff and DOE Fellows performed quality assurance reviews to ensure that all of the data displayed matched the raw data that was imported. FIU also performed performance unit and integrating testing on the staging server prior to moving it to the production server. After all the internal testing was completed, the staging testing URL was forwarded to DOE and they performed a second review of the application. The application was then moved to the production server and became publicly available on May 14, 2018. The updated WIMS application with the 2018 data can be publically accessed at <http://www.emwims.org>. Screenshots of the WIMS application reflecting the updated data are included below.

Waste Information Management System

Welcome Admin Admin to WIMS

Forecast Data | Disposition Map | GIS Map | Transportation | Reports

Waste from: Idaho National Laboratory

Waste to: All Facilities

Fiscal Year: From 2018 To 2048To 2050

Waste Type: All Materials

Display Forecast Data

Waste forecast to be disposed from Idaho National Laboratory to All Facilities for All Materials Material(s) in m³ (Fiscal Year: 2018 --2048To 2050)

Row No	Reporting Site	Disposition Facility Name	Waste Stream Name	Field Stream ID	Managing Program	Classified Flag	Waste Type	Treatment	Physical Form
1	Idaho	Area 5 LLW Disposal Unit (NTS)	ICP Core - CHLLW SNF	ICPCH002a	Environmental Management	No	Low Level Waste	None	Solids
2	Idaho	Area 5 LLW Disposal Unit (NTS)	ICP Core - AMWTP CH-LLW	AMWC002	Environmental Management	No	Low Level Waste	None	Debris Waste
3	Idaho	Area 5 LLW Disposal Unit (NTS)	ICP Core - U-239 LLW	ICPCH002x	Environmental Management	No	Low Level Waste	None	Solids
4	Idaho	Area 5 LLW Disposal Unit (NTS)	INL Classified CH-LLW	INLCLL002	Nuclear Energy	Yes	Low Level Waste	None	Solids
5	Idaho	Area 5 LLW Disposal Unit (NTS)	ICP Core - CH LLW WM	ICPCH002iv	Environmental Management	No	Low Level Waste	None	Solids
6	Idaho	Area 5 LLW Disposal Unit (NTS)	ICP Core - CH LLW WM from RH TRU processing	ICPCH002i	Environmental Management	No	Low Level Waste	None	Debris Waste
7	Idaho	Area 5 LLW Disposal Unit (NTS)	ICP Core - CHLLW HLW	ICPCH002b	Environmental Management	No	Low Level Waste	None	Solids
8	Idaho	Area 5 LLW Disposal Unit (NTS)	INL RH-LLW	INLRH002	Nuclear Energy	No	Low Level Waste	None	Solids
9	Idaho	Area 5 LLW Disposal Unit (NTS)	INL CH-LLW	INLCH002	Nuclear Energy	No	Low Level Waste	None	Solids
10	Idaho	Energy Solutions-Clive (formerly Envirocare)	INL CH-LLW for Direct disposal	INLCH004	Nuclear Energy	No	Low Level Waste	None	Solids
11	Idaho	Energy Solutions-Clive	INL excess materials			No	Low Level Waste	None	To Be

Disclaimer: Disposition facility information presented is for planning purposes only and does not represent DOE's decisions or commitments. Any selection of disposition facility will be made after technical, economic, and policy considerations.

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Figure 1. WIMS waste forecast module with 2018 data.

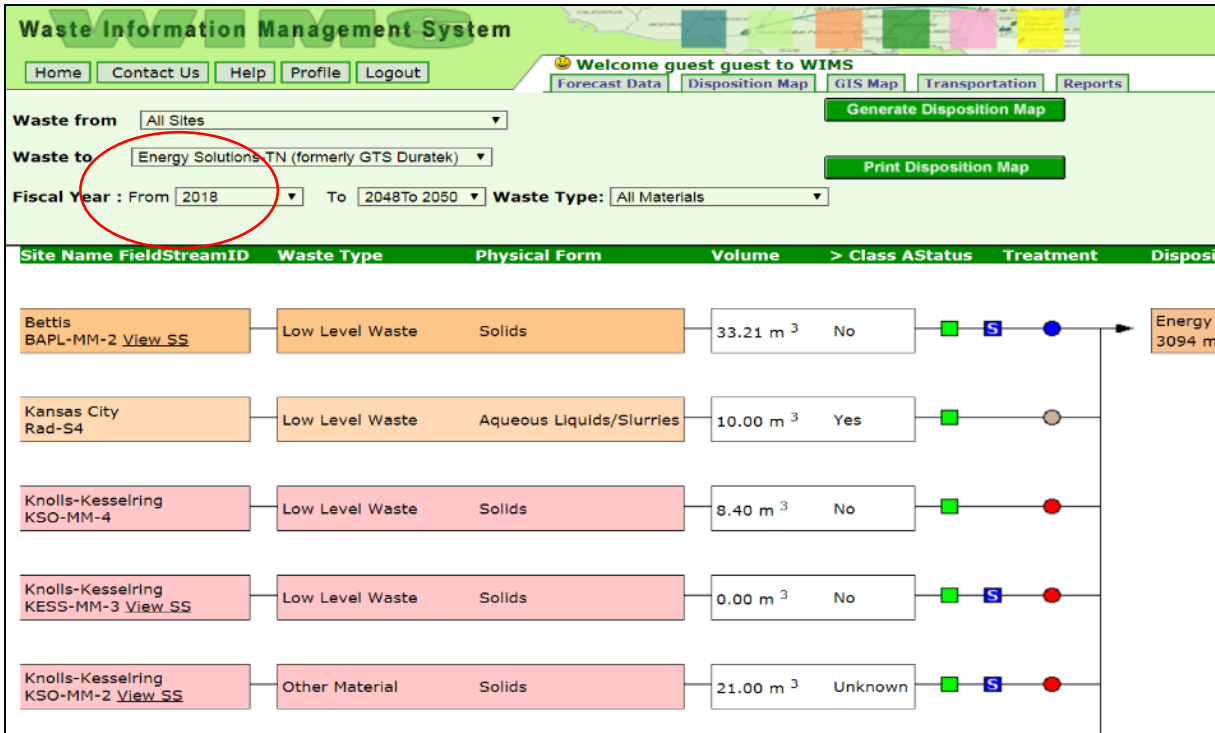


Figure 2. WIMS website showing new disposition map data for 2018.

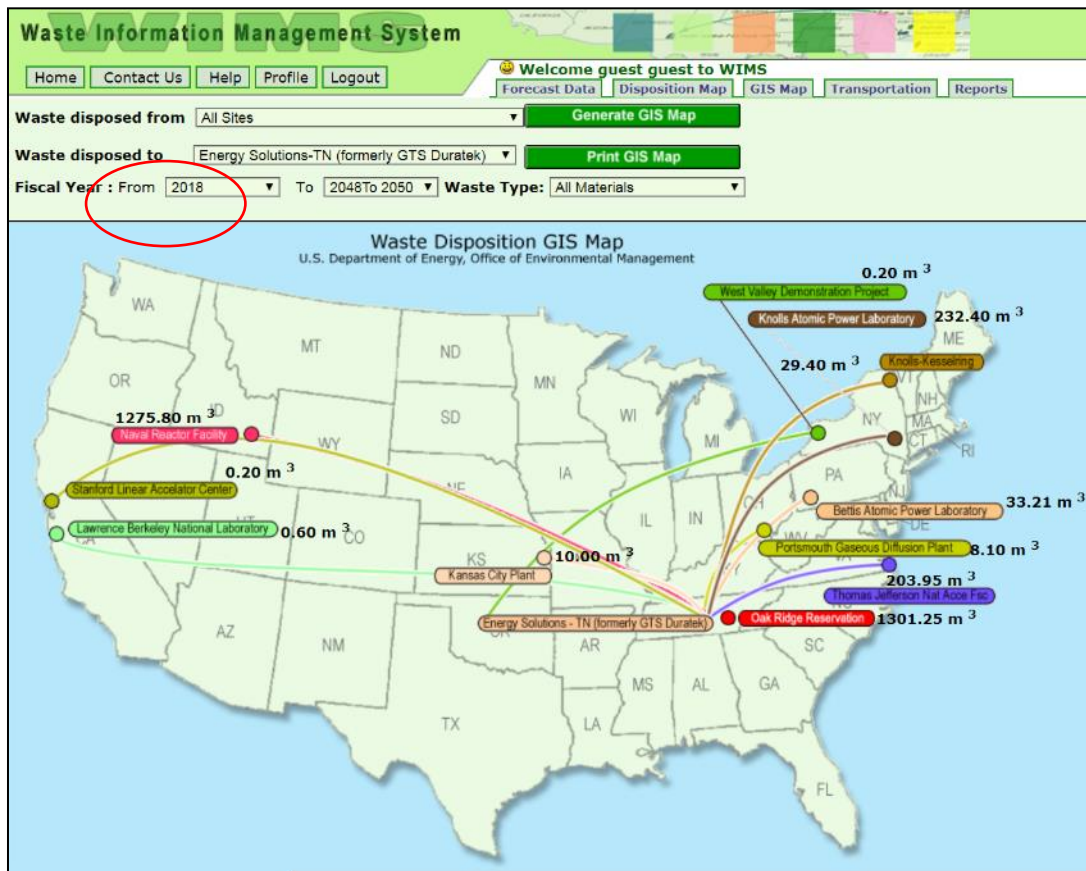


Figure 3. WIMS website showing new GIS data for 2018.

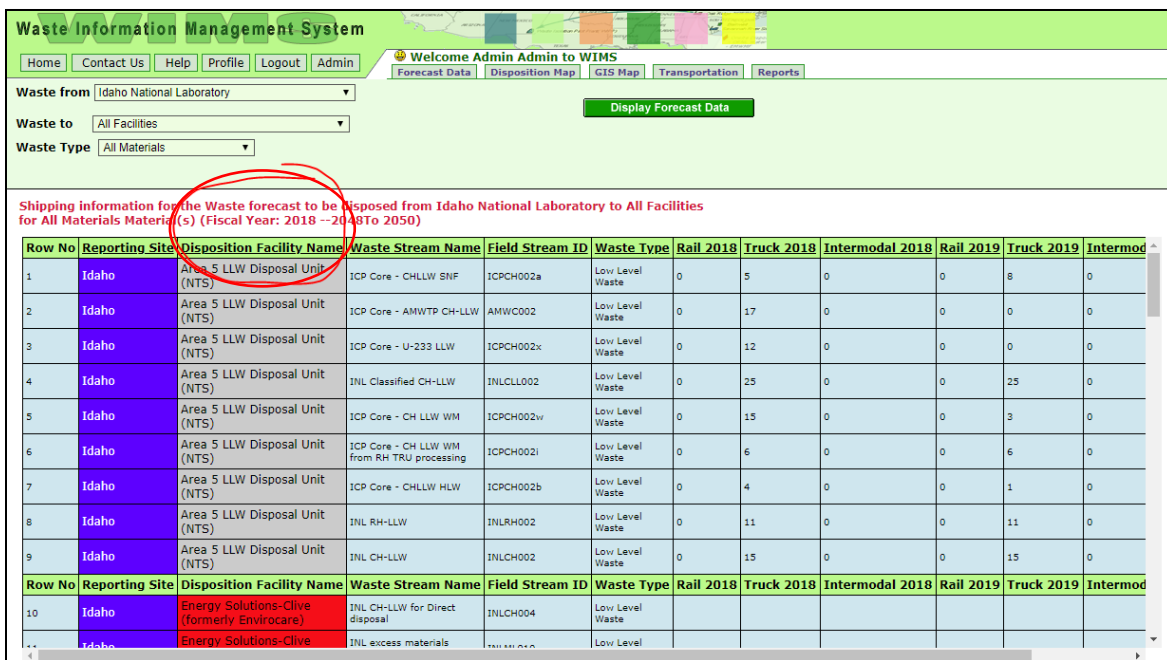


Figure 4. WIMS transportation module with 2018 data.

WIMS Picklists for Querying Forecast Data

Upon entrance into WIMS, the information for display as a forecast data table, a disposition map, or a GIS map can be filtered in many ways through the provided drop-down menus. The updated filtration choices for each field of data are shown in the following lists. The fiscal year ranges are adjusted forward one year with each annual data update.

Waste type:

- All Materials
- Unknown
- Low Level Waste
- Mixed Low Level Waste
- 11e.(2) Byproduct Material
- Other Material

Fiscal Year:

- 2018
- 2019
- 2020
- 2021
- 2022
- 2023-2027
- 2028-2032
- 2033-2037
- 2038-2042
- 2043-2047
- 2048-2050

Waste from:

- All Sites
- Ames Laboratory
- Argonne National Laboratory
- Bettis Atomic Power Laboratory
- Brookhaven National Laboratory
- Energy Technology Engineering Center
- Fermi National Accelerator Lab
- Hanford Site – RL
- Hanford Site – RP

- Idaho National Laboratory
- Kansas City Plant
- Knolls Atomic Power Laboratory – Kesselring
- Knolls Atomic Power Laboratory – Schenectady
- Lawrence Berkeley National Lab
- Lawrence Livermore National Lab
- Los Alamos National Laboratory
- Naval Reactor Facility
- Nevada Test Site
- NG Newport News
- Norfolk Naval Shipyard
- Nuclear Fuel Services, Inc.
- Oak Ridge Reservation
- Pacific Northwest National Laboratory
- Paducah Gaseous Diffusion Plant
- Pantex Plant
- Pearl Harbor Naval Shipyard
- Portsmouth Gaseous Diffusion Plant
- Portsmouth Naval Shipyard
- Princeton Plasma Physics Laboratory
- Puget Sound Naval Shipyard
- Sandia National Laboratories – NM
- Savannah River Site
- Separations Process Research Unit
- Stanford Linear Accelerator Center
- Thomas Jefferson National Accelerator Facility
- Waste Isolation Pilot Plant
- West Valley Demonstration Project

Waste to:

- All Facilities
- 200 Area Burial Ground (HANF)
- 746-U Landfill (Paducah)
- Area 5 LLW Disposal Unit (NTS)
- Area 5 MLLW Disposal Cell (NTS)
- Clean Harbors
- Commercial TBD
- E-Area Disposal (SRS)
- EMWMF Disposal Cell (ORR)
- Energy Solutions-Clive (formerly Envirocare)
- Energy Solutions-TN (formerly GTS Duratek)
- ERDF (HANF)
- Impact Services - TN
- INL CERCLA Cell (INL)
- Integrated Disposal Facility (HANF)
- New RH LLW Vaults (INL)
- Omega Waste Logistics
- OSWDF (Portsmouth)
- Paducah CERCLA
- Perma-Fix Gainesville
- Perma-Fix-Diversified Scientific Services, Inc.
- Perma-Fix-Northwest (formerly PEcoS)
- Perma-Fix-Materials & Energy Corp
- Remote Waste Disposition Project (INL)
- River Metals
- RMW Trenches (MLLW/LLW) (HANF)
- RMW Trenches/IDF (HANF)
- RWMC (LLW disposal) (INL)
- Siemens
- Smokey Mountain Solutions
- Studsvik/RACE, LLC
- TA 54/Area G (LLW disposal) (LANL)
- To Be Determined
- Waste Control Specialists

A project milestone (2017-P3-M1.3) to improve the security protocols for the WIMS application with the deployment of a secure socket layer (SSL) was due for completion by August 31, 2018. FIU completed this effort well ahead of schedule, in January 2018, to make the WIMS application and its communication with the users more secure. SSL is a standard security technology for

establishing an encrypted link between a server and a client, such as a website and a browser, and allows information to be transmitted securely. This enhancement is seamless to the users of WIMS, with the previous domain *http* becoming *https*.

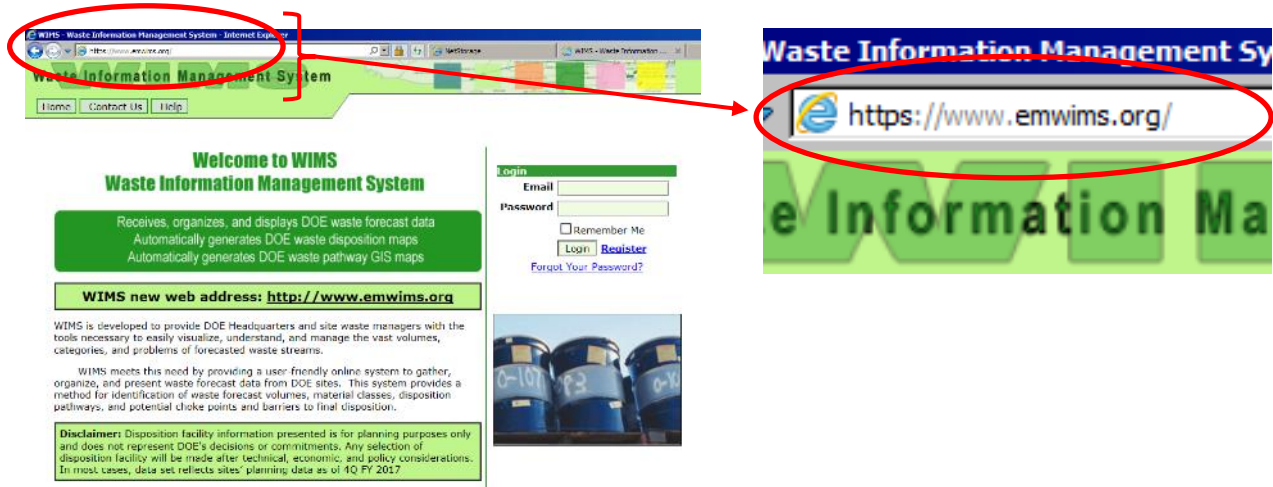


Figure 5. WIMS application with verified secure connection after deployment of SSL.

Waste Management Conference

FIU also participated in relevant meetings and conferences in support of this project. FIU presented a poster on WIMS at the Waste Management Symposia 2018 (WM18) in Phoenix, AZ. The poster was well received and several of the conference attendees expressed appreciation for the availability of the system. Some of the feedback was from existing users of WIMS while others, from the international community, found it very interesting and expressed desire for a similar system to help them with their waste forecasting. The poster was presented by two of the original architects/developers of WIMS: Dr. Himanshu Upadhyay and Walter Quintero.

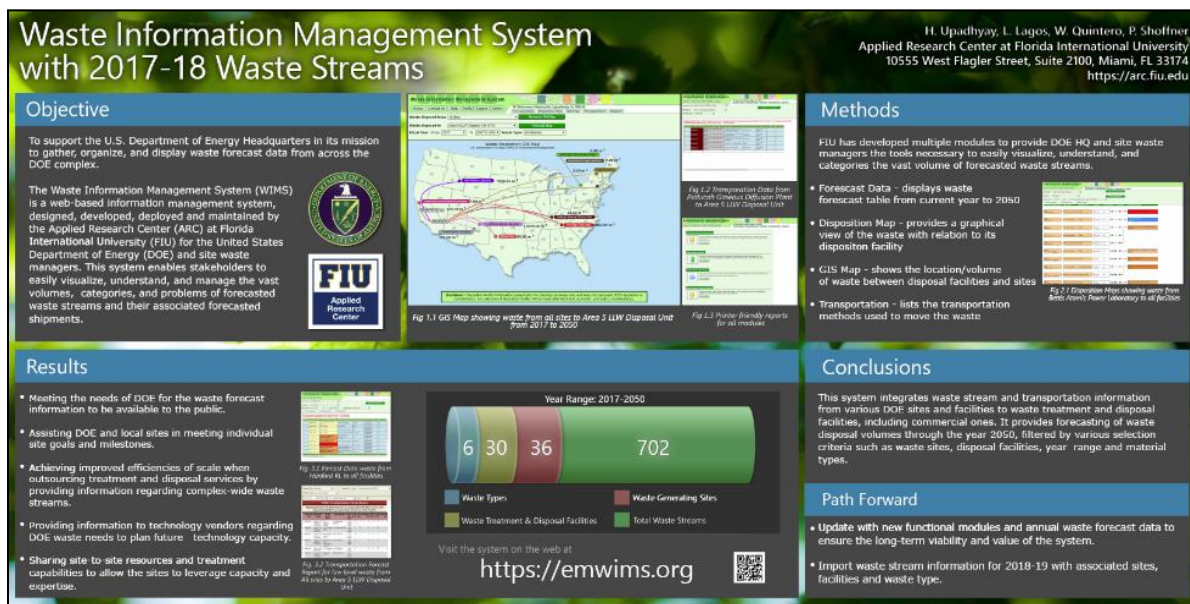


Figure 6. WIMS with 2017-2018 Waste Streams presented at WM18.

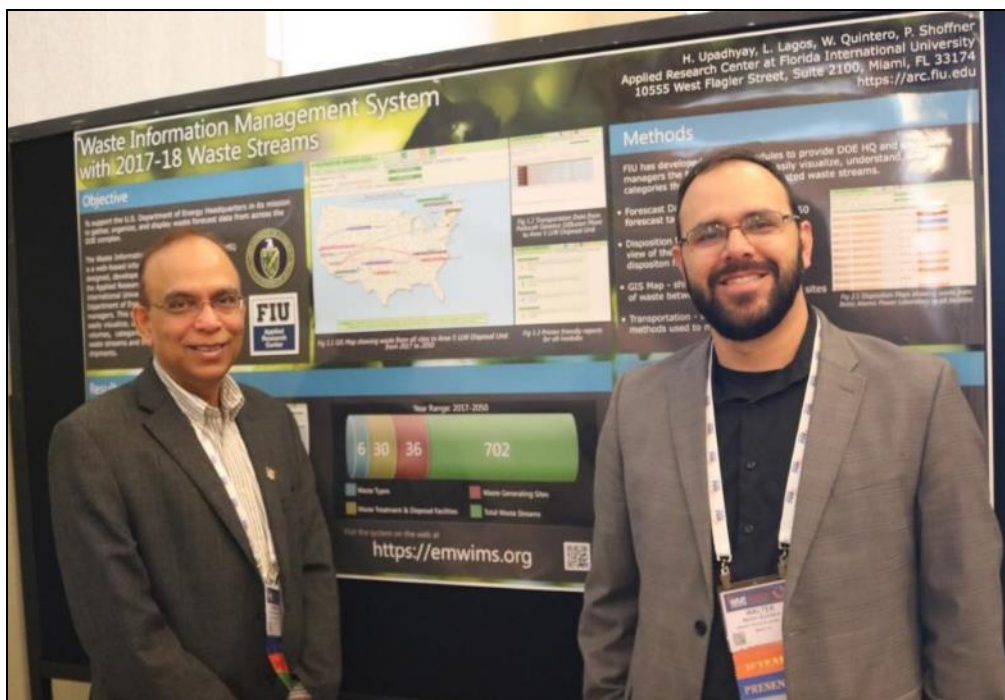


Figure 7. Dr. Himanshu Upadhyay and Walter Quintero presenting WIMS poster at WM18.

TASK 1: CONCLUSIONS

WIMS continues to successfully accomplish the goals and objectives set forth by DOE. WIMS has replaced the historic process of each DOE site gathering, organizing, and reporting their waste forecast information utilizing different database and display technologies. In addition, WIMS meets DOE’s objective to have the complex-wide waste forecast information available to all stakeholders and the public in one easy-to-navigate system. The data includes low-level and mixed low-level radioactive waste forecast data supplied by all DOE programs in addition transportation information.

TASK 1: REFERENCES

Office of Environmental Management (DOE-EM), <http://www.em.doe.gov>, U.S. Department of Energy.

Waste Information Management System (WIMS), <http://www.emwims.org>, Applied Research Center, Florida International University.

Upadhyay, H., W. Quintero, P. Shoffner, L. Lagos, *Waste Information Management System with 2017-18 Waste Streams*, Waste Management 2018 Conference, Phoenix, AZ, March 2018.

TASK 2.

D&D SUPPORT FOR DOE EM FOR TECHNOLOGY INNOVATION, DEVELOPMENT, EVALUATION AND DEPLOYMENT

TASK 2: EXECUTIVE SUMMARY

This task provides direct support to DOE EM for D&D technology innovation, development, evaluation and deployment. Major accomplishments during FIU Performance Year 8 included:

- Provided direct support to SRS 235-F PuFF Risk Reduction Program and SRNL for deployment of an intumescent fixative technology in the radioactive environments of process cell #7 and the entry hood.
- Provided test and evaluation support that resulted in two commercial-off-the-shelf (COTS) technologies being added to the SRS 235-F Risk Reduction Tooling List. These technologies included the Defelsko Positector 6000 dry film gauge and the GRACO TrueCoat Pro II paint sprayer.
- Participated in the development and formal approval of ASTM International's E3191-18, Standard Specification for Permanent Foaming Fixatives Used to Mitigate Spread of Radioactive Contamination.
- Received award from ASTM International E10 Committee on Nuclear Technologies and Applications for leading the E10.03 Subcommittee in developing and promulgating two (2) new international standards.
- Awarded a "Superior Rating" at Waste Management Symposia 2018 for a manuscript and presentation entitled, *International Standards Development and Its Role in Transitioning D&D Technologies to Deployment*.

TASK 2: INTRODUCTION

FIU directly supports DOE-EM's Office of Infrastructure and D&D as well as affiliated DOE sites, national laboratories, and institutions contributing to the development of innovation in D&D. This task also collaborates with DOE-EM's international partnerships and agreements, when appropriate, by providing D&D expertise, knowledge and support. The technical approach for this task is to identify, test and evaluate commercial-off-the-shelf technologies, methodologies, and approaches to support the D&D of facilities across the globe. In this report, FIU presents the accomplishments achieved during FIU Performance Year 8 in support of technology innovation, development, evaluation and deployment.

TASK 2: EXPERIMENTAL

For FIU Performance Year 8, FIU expanded its research in technology test and evaluation in the following key areas: 1) Assist/support SRNL in addressing high priority fire resiliency, protection and safety requirements in support of the SRS 235-F risk reduction project and across the DOE EM complex by conducting fire testing on intumescent coatings and foams; 2) Identify broader

applications for intumescent technologies to mitigate the impacts of fire contingency scenarios across the DOE complex; 3) Execute a phased approach for the standards development, testing, evaluation, and deployment of D&D technologies; 4) Support for an onsite demonstration at SRS of the intumescent coating; and 5) Collaborate with ASTM to continue development of standards and testing protocols in support of D&D technologies. FIU further supported the EM D&D program by participating in D&D workshops, conferences, and serving as subject matter experts.

TASK 2: RESULTS AND DISCUSSION

Support to SRNL and SRS 235-F for Onsite Demonstration

FIU coordinated with SRNL and SRS 235-F to support a test and evaluation of a down-selected intumescent coating as a fire resistant fixative. The objective of this subtask was to select and validate operational performance of fire resilient fixative coating material(s) for residual surface contamination after gross decontamination is completed in a hot, radioactive environment. The operational deployment and hot test and evaluation was a result of the previous test and evaluation of commercial-off-the-shelf (COTS) intumescent technologies by FIU and SRNL, with a particular emphasis on their application as incombustible / fire resistant fixatives.

Based on a request made by DOE EM during the November project coordination teleconference, FIU, in collaboration with SRNL, completed development of a fact sheet/flyer on the research performed to date on intumescent coatings and the planned onsite demonstration at SRS. This document was submitted to DOE on December 13, 2017. In addition, this collaborative research effort between FIU and SRNL was highlighted as part of a SRNS video on the 235-F Risk Reduction Project (<https://srns-corpcomm.sharefile.com/d-scb6e0a1c14c4f258>).



Figure 8. Freeze frame from the 235-F Risk Reduction Project video by SRNS

Prior to the deployment of the intumescent coating at SRS 235-F, FIU conducted a set of tests specifically designed to address questions outlined by SRS 235-F and SRNL personnel on the

application process for intumescent coatings. The following initial results were forwarded to the SRNL stakeholders:

- The coating thickness technology being used by FIU (Defelsko Positector 6000 dry film gauge) was tested and found incapable of taking a measurement from the backside of the substrate (i.e., through the metal). The manufacturer of the gauge was contacted for further information and they confirmed that this gauge is not capable of obtaining a coating thickness from the back side of the metal substrate nor do they have any gauges with this capability.
- The sprayer was tested at an increased standoff distance to determine if it was still capable of adequately coating the target surface. FIU conducted this test from outside the hot cell test bed, using the gloveports, to spray the back wall directly opposite (approximately 29”). The sprayer performed well and was able to cover an area of 18” x 21” to the requisite 1/8” thickness. However, using the sprayer with a full quart of product with the arms fully extended was physically demanding and would quickly result in worker fatigue. An alternative would be to investigate the use of commercially available nozzle extensions for the sprayer.



Figure 9. Testing sprayer at increased standoff distance.

- FIU tested the sprayer’s ability to maintain effectiveness if it was not cleaned/flushed with water between applications. A full quart of IC was applied through the sprayer, the quart container was removed, and ambient air was flushed through the sprayer/nozzle. The sprayer was then left in the hot cell testbed for 48 hours under conditions that ranged from 72°F-85°F with humidity reaching 85%. The sprayer was then used to apply another quart of IC and appeared to perform well with no degradation in functionality noted. After again flushing the sprayer/nozzle with ambient air, the sprayer was left in the hot cell for another 72 hours. The overall functionality of the sprayer was seriously degraded at this point and a third application of IC was not possible.
- The sprayer was further tested to determine if incidental or continuous spraying would cause damage to the glovebox gloves. No damage, penetration/puncturing, or degradation to the glove was noted from being sprayed at a point blank range for ten seconds as well as a more sustained spray for 30 seconds using water (low viscosity) or IC (higher viscosity).



Figure 10. Testing impact of direct spraying on glovebox gloves: glove (left), sprayer setting (middle), and leak testing (right).

- FIU conducted a series of tests to confirm the initial calculations for coating thickness/coverage per number of applications using the sprayer. A 38" x 38" square area was successfully coated to the requisite 1/8" thickness with 2 applications, using approximately 2 quarts of IC, with a curing time of 48 hours between applications. The first application was applied to the surface until 1/8" thickness of IC was confirmed with a wet thickness gauge and allowed to cure for 48 hours. Upon measuring with the dry thickness gauge after curing, the readings have been generally consistent with a reduction of around 50% thickness during curing after the first application. The second coating was then applied, measured with the wet gauge, allowed to cure for another 48 hours, and then measured with the dry thickness gauge. In all 6 applications to date this approach has resulted in achieving the 1/8" thickness or greater after fully curing under high heat, high humidity environmental conditions.



Figure 11. Confirmation testing of coating thickness with multiple applications of IC.

FIU completed a review and provided concurrence with the SRNL/SRS test plan titled, “Incombustible Fixative and ACE 2.0 Test Plan: Radiological Hot Field Test of Intumescent Coatings and Electrostatic Precipitators,” dated March 16, 2018.

The SRNL and FIU team discussed possible solutions for the potential of worker fatigue when applying the product with a hand-held sprayer at arm’s length, including possibly using a platform that could be introduced into the hot cell through the entry port and used to support the sprayer as the worker applied the coating. The team also engaged the manufacturer of the dry film thickness gauge used during cold testing at FIU to verify that a custom 6-foot cable could be provided once it was determined that the standard 3-foot cord would not be sufficient for deployment at SRS. A

PosiTector 6000 FNTS probe, including the plastic connector, 6 foot cable and FNTS probe, was procured by FIU. Upon receipt of the gauge, FIU conducted an inventory and function check of the custom made DeFelsko Positector dry film gauge with 6' cord and probe, including a comparison of several measurements between the new probe and the old one. The measurements from the new probe were consistent with the old one.

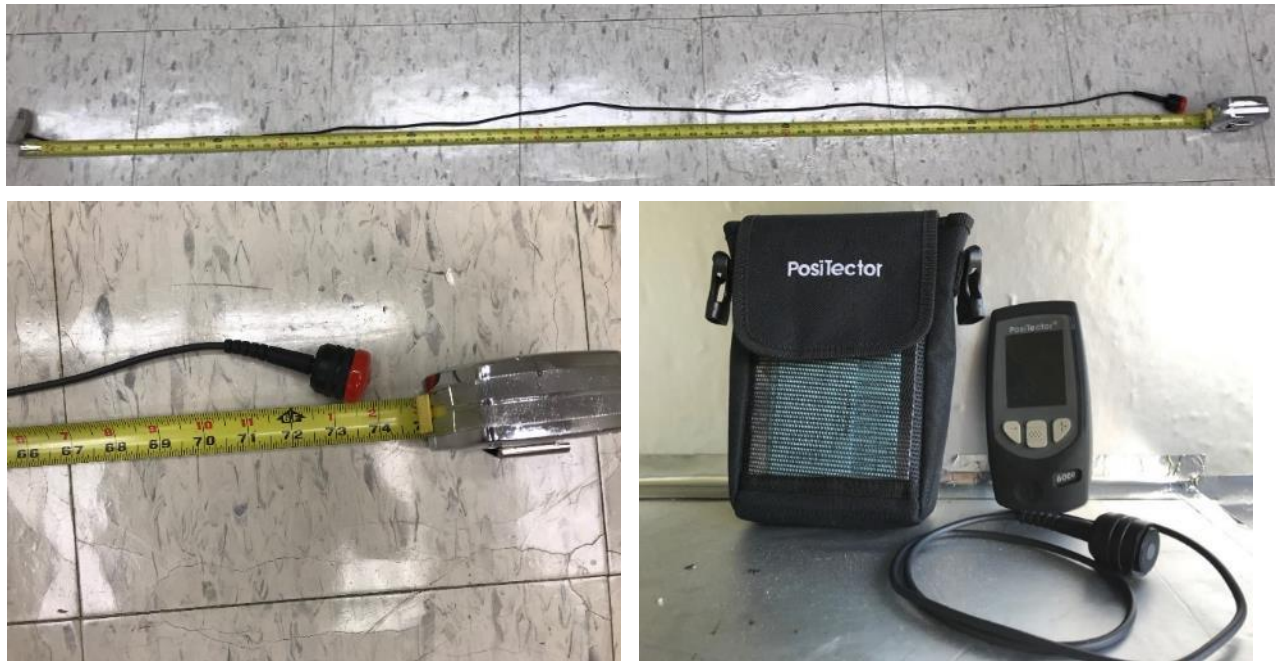


Figure 12. DeFelsko Positector dry film gauge with 6' cord.

FIU provided technical support during the cold demo at the SRS Hot Cell Mockup facility in Aiken, SC, on June 4-6, 2018. This effort was designated an essential precursor to orienting safety and fire personnel, workers, operators, and program managers associated with SRS 235-F Risk Reduction Project, to the intumescent fixative technology. FIU also had the opportunity to tour the 235-F PuFF Facility and view hot cell #7 and the entry hood.



Figure 13. Cold demo at the SRS Hot Cell Mockup Facility.



Figure 14. Connor Nicholson (SRNL) with DOE Fellow Tristan Simoes-Ponce and ARC researcher Joe Sinicrope during SRS tour.

A site tour of SRNL on July 17-19 for FIU staff and summer interns included a cold (non-radioactive) demonstration of the intumescent coating technology. DOE Fellows Joshua Nunez and Tristan Simoes-Ponce assisted with the intumescent coating technology research and pre-testing at FIU, which will be deployed during a hot (radioactive) demonstration at the SRS 235-F PuFF facility. Witnessing the results of their research being applied in a real world environment was a rewarding experience and highlighted the operational difficulties of deploying environmental technologies in the field.



Figure 15. Touring the SRS 235-F Plutonium Fuel Form (PuFF) Facility Operator Station Base.



Figure 16. IC application demonstration at the SRS 235-F Process Cell Mock-up & Training Facility.



Figure 17. DOE Fellows Tristan Simoes-Ponce and Joshua Nunez briefing on the fixative and intumescent coating research.

FIU researchers traveled to SRS from September 9 to September 14 to support the onsite application of the intumescent fixative technology into process cell #7 and the entry hood to the SRS 235-F PUFF Facility. Additionally, FIU completed preparation of two control coupons by coating the 12” by 12” 304 stainless steel in the same intumescent fixative. These control coupons will assist FIU and SRNL in differentiating the impact of Pu-238 irradiation to the intumescent fixative technology applied at SRS 235-F. One control coupon will be stored in FIU’s indoor laboratory in non-radioactive, ideal conditions (~72 degrees F and 30% humidity), and the second will be exposed to the high Miami temperatures and humidity in FIU’s hot cell testbed. The thickness of the intumescent fixative technology will be measured on each coupon at designated points on a monthly basis, corresponding with each time the SRS personnel take a similar measurement in the SRS 235-F PUFF Facility entry hood.



Figure 18. Operational deployment and hot demonstration of intumescent fixative technology within the SRS 235-F Risk Reduction Project.

Uniform Testing Protocols and Performance Metrics for D&D

The development of uniformly accepted testing protocols and performance metrics is an essential component for testing and evaluating D&D technologies. The development of international standards improve safety and mitigate risk by providing a basis for testing and evaluating a technology's ability to meet designated performance criteria before being introduced. They also provide empirical data that could be used to address other DOE EM initiatives such as updating DOE handbooks, capturing and archiving lessons learned / best practices in a systematic manner, etc.

FIU continued to work with the ASTM International E10.03 Subcommittee on Radiological Protection for Decontamination and Decommissioning of Nuclear Facilities and Components to move forward with creating consensus based standards for D&D technologies, and currently has a Research Scientist serving as the Subcommittee Chairman to lead the effort.

FIU participated in the bi-annual ASTM International E10.03 Subcommittee meeting on January 21-23, 2018, in New Orleans, LA. The focus of this meeting was on initiating the development of a new standard practice for *Preparation of Fixed Radiological/Surrogate Contamination on Porous Test Coupon Surfaces for Evaluation of Decontamination Techniques*. This practice is relatively standard across the D&D community and has been adopted by several agencies (DHS,

EPA, etc.) as an acceptable practice. It has been well researched and contains a good body of empirical data supporting the methods.

At the meeting event, ASTM International leadership recognized the E10.03 Subcommittee for the successful development and publication of two new standard specifications on fixative technologies. Mr. Joseph Sinicrope accepted the Award of Recognition on behalf of the subcommittee.



Figure 19. Edward Walker (ASTM E10 Chairman, Nuclear Technology and Applications) presenting an award of recognition to Joseph Sinicrope (FIU Applied Research Center), January 2018.

FIU developed a news release for the DOE EM Newsletter on the results from the January ASTM E10.03 Subcommittee meeting and forwarded to DOE EM HQ officials on February 5. This news release was also posted to the FIU ARC and KM-IT websites as well as included in an electronic newsletter from KM-IT to all of the registered users of that system.

An online collaboration area for relevant stakeholders was created on the ASTM International E10.03 website to facilitate efforts on the draft standard practice. A formal work number for this initiative was assigned by ASTM International and all comments received from the ASTM internal subcommittee working group were integrated into the draft.

FIU attended and chaired the ASTM International E10.03 Subcommittee meeting on June 24-28, 2018. During this meeting the subcommittee completed the draft standard mentioned above as well developed an initial draft for a fourth standard titled, *Standard Specification for Permanent Foaming Fixatives Used to Mitigate Spread of Radioactive Contamination*. The intent of the latter standard is to continue employing best practices developed during the technology development effort for the intumescent fixative research, specifically setting the conditions for a smooth transition of the technology into the operational environment by also focusing on other critical enablers.

During July, the two draft standards were approved for an E10.03 subcommittee vote and were unanimously approved during the ballot (18-01) which closed on August 17, 2018. The standard specification for permanent foaming fixatives outlines the performance requirements for this new

technology and, like the two standards developed last year, provides an industry benchmark by which to measure. The second standard builds on the strippable coating standard promulgated last year and outlines a uniform testing practice for the industry to pursue when evaluating the decontamination factor of a decon gel. During the subcommittee balloting, a few editorial/administrative comments were received which were adjudicated and integrated before submitting the draft standards to the full E10 Committee in early September.

Fire Testing of Radiological Shielding Foams

The SRS 235-F facility has a current high priority need in the area of enhancing fire resiliency in facilities by deploying improved fire resistant fixatives in support of D&D activities. The objective of this subtask was to research, test, and validate the operational performance of D&D products designed to fix residual contamination with a special focus on maximizing the fire resiliency of these technologies. Specifically, FIU utilized the testing protocols developed in support of the adaptation of intumescent coatings as incombustible fixatives task and conducted fire testing on SRNL's innovative radiological shielding foams.

FIU completed the development of the supporting test plan for this activity and disseminated the plan to SRNL and DOE research collaborators for review and input prior to finalization. FIU initially received a set of samples from SRNL to support the testing under this subtask to determine the impact of thermal stressors, specifically a direct flame and incremental temperature increases over specified time periods to determine mass loss. The samples included six commercially available foam materials: two (2) non-fire rated, two (2) fire-rated, and two (2) intumescent products.

The testing began with a direct flame testing protocol, using the IEC 60695 Flammability Standard (Vertical and Horizontal Method) as well as a 30-minute exposure to direct flame test. Though not specifically designed for this material or the operational requirements associated with its employment, it was determined that this standard may serve as a "near fit" standard. To compliment the IEC Flammability standard, FIU also developed a 30-minute exposure to direct flame test that is more closely aligned with safety and fire basis requirements of the site.

The tests completed on the commercially available foam material samples included:

- Direct flame testing protocol
 - IEC 60695 Flammability Standard (vertical and horizontal method)
 - 30-minute exposure to direct flame
- Mass loss series testing - incrementally increasing temperatures between 200-800 degrees in a muffle furnace



Figure 20. Initial testing of selected foam products: direct flame (left) and muffle furnace (right).

FIU received a second set of the six commercially available foam samples from SRNL (2 non-fire rated, 2 fire-rated, and 2 intumescent products). Direct flame testing to failure of one sample of each of the six products from this second set was performed, along with repeating the previous testing on each product. The repeated test results were generally consistent with the previous series of tests

The non-fire rated and fire-rated foams all performed poorly in the direct flame and mass loss testing. All of the non-intumescent foam samples failed to withstand even 15 minutes of exposure to the direct flame and FIU recommended that these be removed from the list of products under consideration on the basis of fire resistance

The intumescent foam samples far exceeded the others in terms of fire resilience. One product in particular emerged as a clear front runner in terms of fire resistance with minimal overall impact during the mass loss testing. During direct flame testing, zero flame or smoke propagation was noted and the significant thermal insulation capabilities were demonstrated, with temperatures above 1400°F on the exposed end but never above 84° F on the back end over the 2-hour period. This material exhibited only marginal degradation after 2 full hours of direct flame exposure. There was no registered loss in diameter thickness and only 4 mm of shrinkage in length. When dissected, the structural integrity of the foam inside was solid and relatively intact.

The second intumescent foam also performed well, with no flame or smoke propagation and significant thermal insulation. The far end of the sample never exceeded 96° F over the 2-hour direct flame period. While the structural integrity of the non-damaged portion of the material was good, there was a significant loss in terms of length, diameter, and mass.

Based on FIU's understanding of the operational requirements associated with the employment of these materials, both of the intumescent foams can be considered to have passed the 2-hour direct flame requirement. In fact, these samples could likely have sustained further exposure to the direct flame.



Figure 21. Experimental setup for direct flame testing.

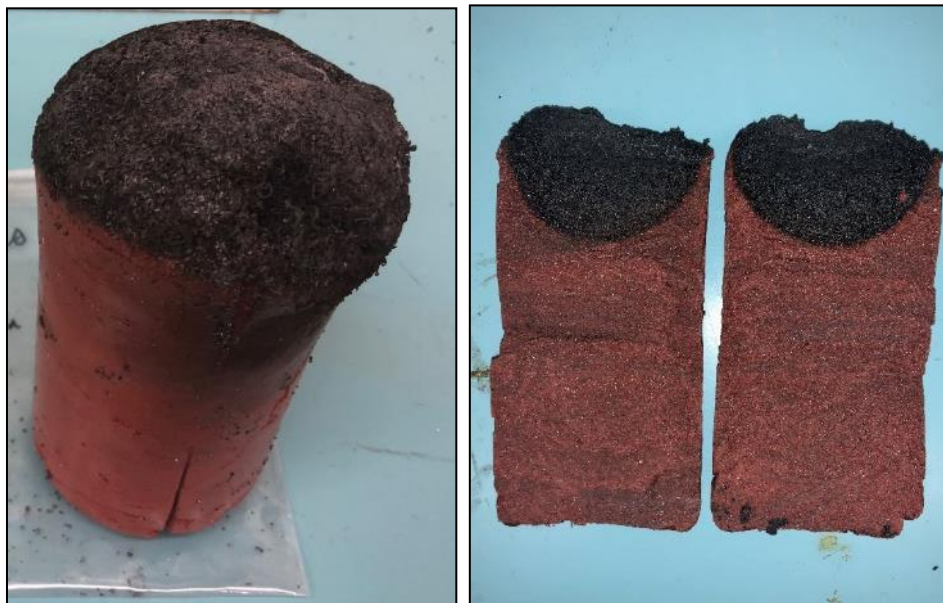


Figure 22. Intumescent foam after direct flame testing (left) and once dissected (right).

A summary of the test results is provided below.

- **Intumescent Foams**

- Best in class among products tested
- Met fire safety requirements
- Maintained structural integrity
- Excellent thermal insulation
- No flame or smoke propagation



Figure 23. Intumescent foam testing.

- **Fire Rated Foams and Non-Fire Rated Foams**
 - Failed to meet fire safety requirements
 - Loss of structural integrity
 - Poor thermal insulation
 - Flame and smoke propagation

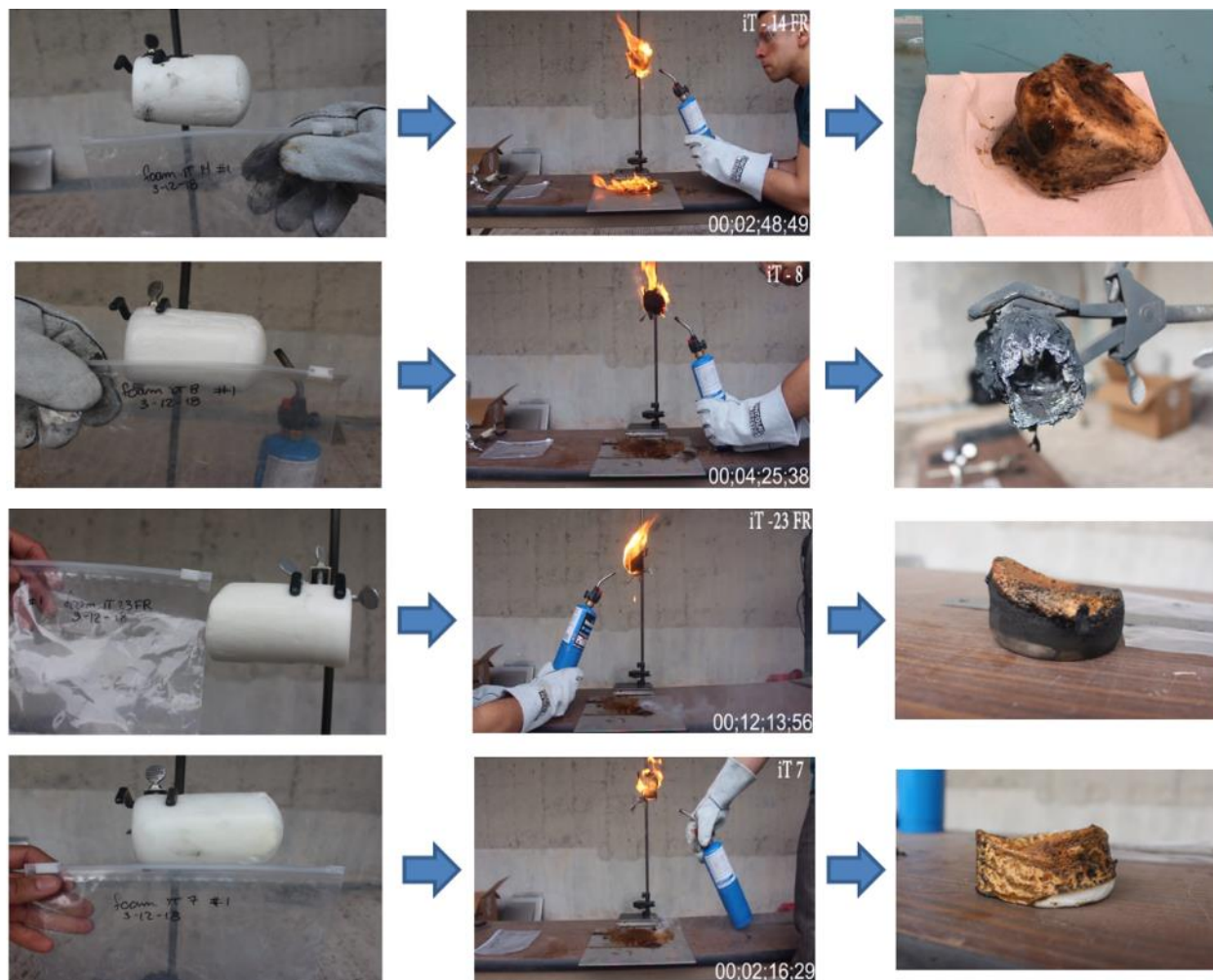


Figure 24. Testing of non-fire rated (top two) and fire rated (bottom two) foams.

Application of Intumescent Coatings to other DOE EM Problem Sets

The test and evaluation of commercial-off-the-shelf (COTS) intumescent technologies by FIU and SRNL, with a particular emphasis on their application as incombustible / fire resistant fixatives, has resulted in an operational deployment and hot demonstration of a designated intumescent coating in support of risk reduction activities at the SRS 235-F PuFF Facility. This successful effort highlighted the technology’s potential to satisfy certain D&D mission sets, and prompted DOE EM to request FIU ARC to explore other innovative applications across the complex.

Intumescent coatings have the potential for much broader applications in mitigating the impacts of contingency scenarios outlined in Basis for Interim Operations documents at other DOE sites (e.g., WIPP, Hanford, Oak Ridge, Idaho, Portsmouth, etc.). Consequently, the objective of this subtask was to identify specific applications of intumescent coating technology to satisfy other problem sets and challenge areas related to fire/extreme heat conditions.

In assessing potential uses of intumescent technologies to address operational and safety basis requirements, FIU researched various Basis for Interim Operation (BIO) documents across the DOE EM facilities. Contingency scenarios and potential hazardous events, with a specific focus on risks associated with fire, were the focus of the BIO document research. Discussions with site

and national laboratory personnel via a variety of forums confirmed that there is significant interest in the technology’s promise to not only serve as an incombustible fixative, but to also address other high priority safety concerns and mitigate exposure of personnel to residual radioactive contamination during fire events. Though the majority of sites have highlighted fire contingencies as very real threats, FIU summarized three specific examples: 1) Waste Isolation Pilot Plant (WIPP); 2) Hanford Site; and 3) Los Alamos National Laboratory (LANL).

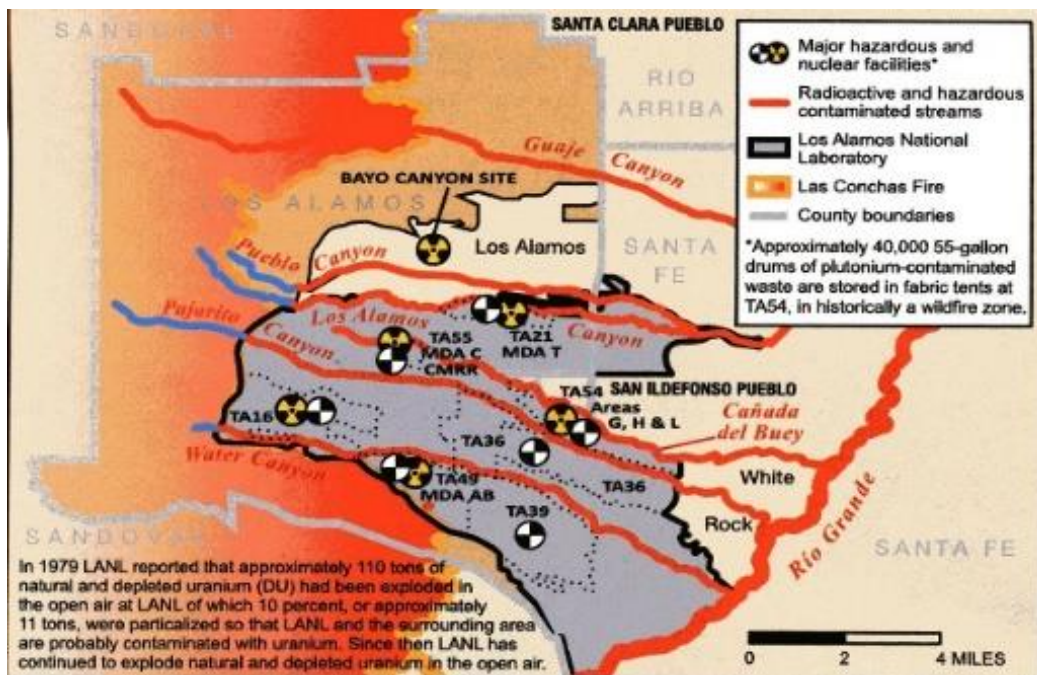


Figure 25. Map of LANL displaying the Las Conchas fire and hazards.

FIU completed the report deliverable for this task and submitted it to DOE on July 25, 2018. The intent of this effort was to: 1) Reinforce the successes FIU/SRNL has had with adopting intumescent coatings as fire resistant fixatives in support of risk reduction activities at SRS PuFF; 2) Provide examples of other fire contingencies outlined in BIOs across the complex where intumescent technologies could be useful in mitigating risks associated with fire; and perhaps the most important from an institutional impact perspective, and 3) Highlight the requirement to address institutional barriers in order to facilitate adoption and operational deployment of intumescent and other technologies.

Presentations, Meetings and Conferences

FIU also participated in relevant meetings and conferences in support of this task. FIU participated in two meetings for the ASTM International's E10 Committee on Nuclear Technologies and Applications, working with the ASTM International E10.03 Subcommittee on Radiological Protection for Decontamination and Decommissioning for Nuclear Facilities and Components to develop uniformly accepted testing protocols and performance metrics for testing and evaluating D&D technologies. These meetings were held on January 21-23, 2018, in New Orleans, LA. and on June 24-28, 2018 in San Diego, CA.

FIU completed the development of and gave a presentation titled “International Standards Development and Its Role in Transitioning D&D Technologies to Operational Deployment” at WM18 during the Decontamination & Decommissioning program topic on March 22, 2018. Related collaborative research was presented by Aaron Washington (SRNL) at the same conference, titled “Environmental and Radiological Readiness of Fixatives, Foams, and Intumescent Coatings for D&D Applications.”

In addition, two DOE Fellows prepared and presented posters related to this research task at the student poster session during Waste Management 2018. “Potential Applications of Intumescent Coating Technologies to Address Safety Basis Requirements” was presented by DOE Fellow Tristan Simoes-Ponce and Conceptual Design for Remote Measurement of Coating Thickness in Hot Cells was presented by DOE Fellow Anibal Morales.



Figure 26. Joe Sinicrope presenting at WM18.

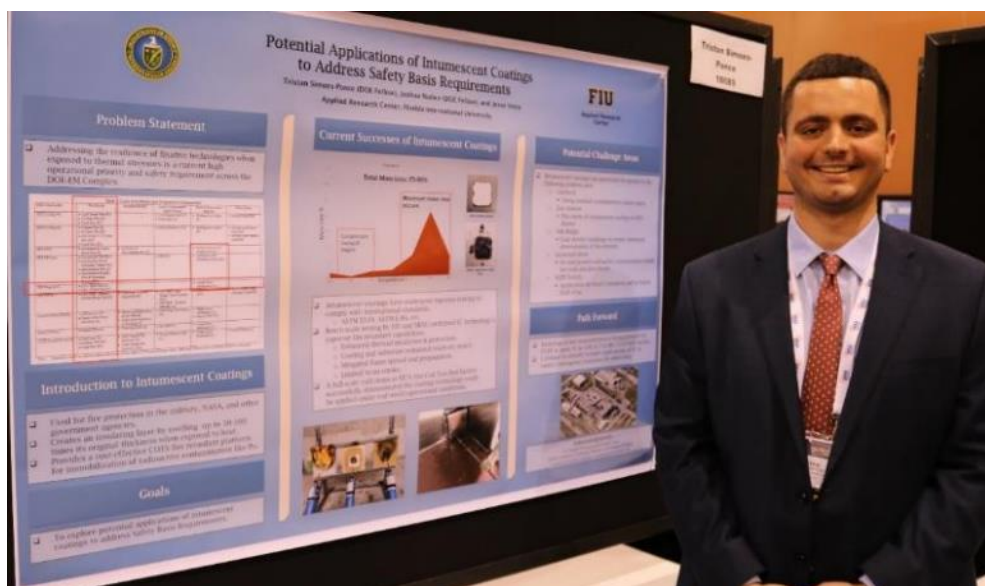


Figure 27. DOE Fellow Tristan Simoes-Ponce presenting his research poster at WM18: Potential Applications of Intumescent Coating Technologies to Address Safety Basis Requirements.

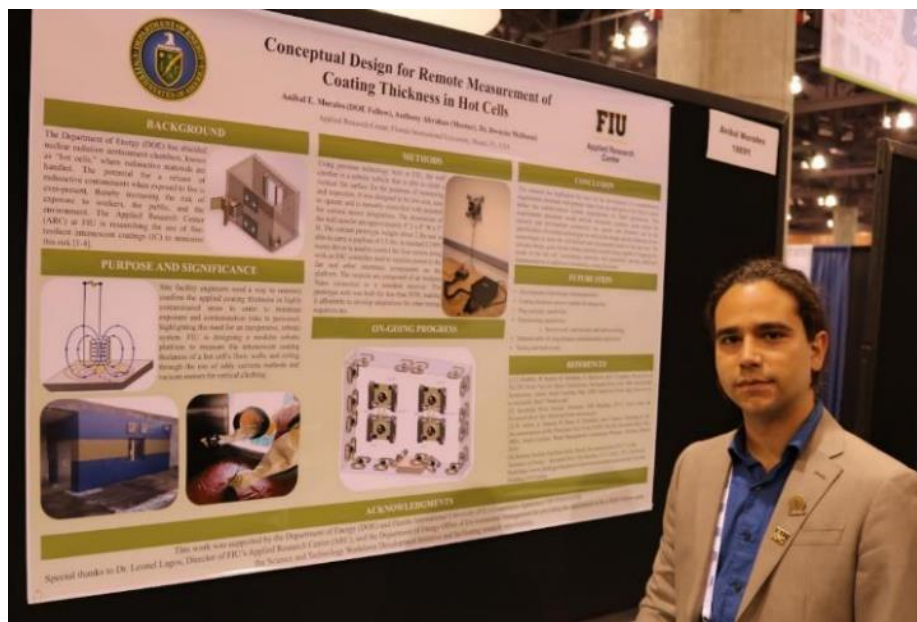


Figure 28. DOE Fellow Anibal Morales presenting his research poster at WM18: Conceptual Design for Remote Measurement of Coating Thickness in Hot Cells.

In addition, FIU completed the development of and gave a presentation for the EPRI Decommissioning Workshop held June 18-19, 2018, in Savannah, GA, titled, “Addressing D&D Technology Implementation Challenges via International Standards Development.” This presentation included a description of a process to overcome implementation challenges with an end-to-end technology development approach.

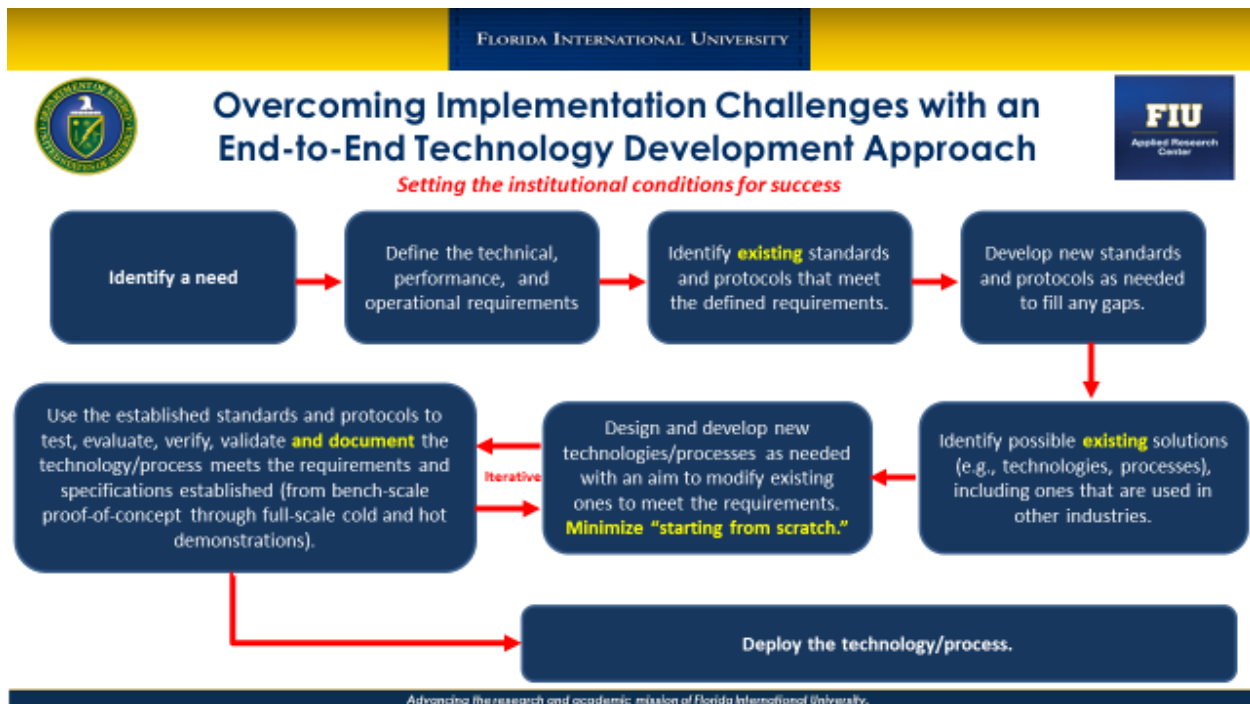


Figure 29. Slide from EPRI presentation on standards development for D&D.

Finally, FIU also completed the development of and gave a presentation for the EPRI Decommissioning Workshop titled. *Intumescent Coatings for D&D Applications – from Bench-Scale to Radiological Hot Field Testing*.

TASK 2: CONCLUSIONS

Planning for the D&D of facilities across the DOE complex is a tremendous undertaking, especially considering that a significant number of the facilities contain hazards to human health and the environment: seriously deteriorated structural integrity, very high dose rates, high levels of fixed and removable contamination on/in facility surfaces and equipment, and chemically hazardous materials. Providing support for technology innovation, development, evaluation, and deployment is critical to the safe and efficient completion of facility D&D. In addition, the development of uniformly accepted testing protocols and performance metrics is an essential component for testing and evaluating D&D technologies.

TASK 2: REFERENCES

- Florida International University, *Enhancing Operational Performance of Fixatives and Coatings for D&D Activities: Baseline and Proof of Concept*, Test Plan, June 2015.
- Florida International University, *Incombustible Fixatives – Adapting Intumescent Coatings as Fire Retardant Fixatives to Support D&D Activities*, Technical Progress Report, June 2016.
- Florida International University, *Adapting Intumescent Coating as Fire Resilient Fixatives ISO SRS 235-F D&D Activities – Phase II: Construction of SRS 235-F Hot Cell Test Bed and Application Demonstration*, Test Plan, January 2017.
- Florida International University, *Incombustible Fixatives – Adapting Intumescent Coatings as Fire Retardant Fixatives to Support D&D Activities*, Technical Report, October 2017.
- Florida International University, *Testing and Evaluation Radiological Shielding Foams Resistance to Thermal Stressors*, Test Plan, January 2018.
- Florida International University, *Potential Applications of Intumescent Coatings to Address Safety Basis Requirements*, Technical Report, July 2018.
- Nicholson, J., A. Washington, M. Serrato, P. Shoffner, L. Lagos, J. Sinicrope. *Environmental and Radiological Response of Fixatives and Intumescent Coatings for D&D Applications*, Waste Management Symposia, Phoenix, AZ, March 5-9, 2017.
- Savannah River National Laboratory, *Radiological Hot Field Test of Intumescent Coatings and Electrostatic Precipitators*, Incombustible Fixative and ACE 2.0 Test Plan, SRNL-TR-2018-00074, July 2018.
- Sinicrope, J., P. Shoffner, E. Walker, L. Lagos. *The Expanding Nuclear Niche: Meeting the Growing Need for Standardized Testing and Performance Metrics for the Deactivation and Decommissioning of Nuclear Facilities*. ASTM International Standardization News, March 2016.
- Sinicrope, J., P. Shoffner, J. Nicholson, R. Demmer, L. Lagos. *International Standards Development and Its Role in Transitioning D&D Technologies to Deployment*, Waste Management Symposia, Phoenix, AZ, March 18-22, 2018.

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- Sinicrope, J., P. Shoffner, L. Lagos. *Intumescent Coatings for D&D Applications – from Bench-Scale to Radiological Hot Field Testing*, EPRI Decommissioning Workshop, June 18-19, 2018.
- Washington, A., J. Nicholson, B. Peters, J. Sinicrope, P. Shoffner, L. Lagos, M. Serrato. *Environmental and Radiological Readiness of Fixatives, Foams, and Intumescent Coatings for D&D Applications*, Waste Management Symposia, Phoenix, AZ, March 18-22, 2018.

TASK 3.

D&D KNOWLEDGE MANAGEMENT INFORMATION TOOL

TASK 3: EXECUTIVE SUMMARY

FIU has developed a D&D Knowledge Management Information Tool (D&D KM-IT) to maintain and preserve the D&D knowledge base and to provide a focused web-based tool to assist the DOE D&D community in identifying potential solutions to their problem areas by using the vast resources and knowledge-base tools available through the web. During FIU Performance Year 7, FIU performed several subtasks, including community outreach and training, application development, system/database/network administration, and data mining.

TASK 3: INTRODUCTION

Planning for the D&D of facilities across the DOE complex is a tremendous undertaking. Capturing the knowledge, experience, and lessons learned from historic D&D activities at DOE sites is imperative to the successful and safe management of future D&D projects. The D&D Knowledge Management Information Tool is a central initiative to accomplish these goals.

The D&D KM-IT is a web-based system developed to maintain and preserve the D&D knowledge base. The system was developed by FIU-ARC with the support of the D&D community, including DOE EM, the former ALARA centers at Hanford and Savannah River, and the DOE's Energy Facility Contractors Group (EFCOG). The D&D KM-IT is a D&D community driven system tailored to serve the technical issues faced by the D&D workforce across the DOE Complex. D&D KM-IT can be securely accessed from web address <https://www.dndkm.org>, as well as via mobile devices at <https://m.dndkm.org>.

TASK 3: EXPERIMENTAL

The D&D KM-IT is a web-based knowledge management information tool custom built for the D&D user community by FIU. The objective of the D&D KM-IT is to provide a focused web-based tool to assist the DOE D&D community in identifying potential solutions to their problem areas by using the vast resources and knowledge-based tools available through the web. One such knowledge-based tool includes solutions provided by subject matter specialists who respond to specific questions. The D&D KM-IT archives, in a retrievable module within the system, information collected from the subject matter specialists, thereby building a knowledge repository for future reference. The primary subtasks for FIU Performance Year 7 included community outreach and training, application development, system/database/network administration, and data mining.

TASK 3: RESULTS AND DISCUSSION

Outreach and Training

Significant effort was made towards community outreach in support of the D&D KM-IT system during FIU Performance Year 8. FIU participated in meetings and conferences, hosted conference exhibitor booths, and disseminated newsletters on D&D KM-IT to registered users, subject matter specialists, and conference attendees. Outreach and training is a critical element towards the long-term sustainability of knowledge and essential for the long-term strategic vision of D&D KM-IT:

it will continue to grow and mature into a self-sustaining system through the active participation of the D&D community it was designed to serve.

Conferences and Workshops

FIU participated in relevant meetings and conferences in support of this project, including the EPRI International Low-Level Waste Conference, June 18-19, 2018, in Savannah, GA and the Waste Management Symposium, March 18-22, 2018, in Phoenix, AZ.

FIU prepared and presented a professional paper titled, “KM-IT Mobile Platform for D&D,” during the Waste Management 2018 (WM18) conference in Phoenix, AZ with a poster detailing the KM-IT mobile platform that featured the multi-platform mobile development on Android, iOS and Windows. The poster presented the challenges, methods, solutions and results from the mobile development. The poster was presented by Dr. Himanshu Upadhyay and Walter Quintero, the key developers of the KM-IT system and mobile application.

At this same conference, a poster titled, “Robotics Technologies on KM-IT Platform” was presented by DOE Fellow Ryan Cruz during the student poster session.

KM-IT Mobile Platform for D&D
 Developed by: FIU Applied Research Center
 In Collaboration with: [Logos of partner organizations]
 Powered by the Global D&D Community

Objective
 Knowledge management deals with the processes and practices used within the operation to identify, collect, distribute and share experiences. Deactivation and Decommissioning (D&D) work within the Department of Energy, Office of Environmental Management (DOE-EM) complex is a high priority area. The Applied Research Center at Florida International University, working in collaboration with DOE-EM has developed a web-based Deactivation and Decommissioning Knowledge Management Information Tool (D&D KM-IT) to preserve the knowledge that the community has gathered through experiences on various projects.

Methodology - Modular Design
 Remote Information Access - Native mobile app provides online and offline information while working primarily on the site.
 Remote Data Collection and Synchronization - Allows to collect data remotely and synchronize with central database.
 Easy of Maintenance - Cross-Platform development for Android, iOS and Windows operating systems using single code base.
 Access to Native Mobile Device Features - Ability to Capture videos, photos, NFC, GPS, etc. using mobile device hardware.
 Native User Interface - Users prefer an app with a native design. Xamarin Studio (C#) provides code sharing across multiple mobile operating systems such as Android, iOS & Windows Phone while simplifying the product development lifecycle.
 Shared App Logic - Apart from a native user interface, the need of sharing the app code to reduce mobile software makes Xamarin the multi-use cross-platform mobile development tool.
 API Integration - Xamarin allows developers to combine the same APIs and UI controls that are used for developing Android, iOS and Mac applications in their respective platform-specific programming languages.
 Rapid Mobile App Development (RMAD) - RMAD is one of the major benefits of Xamarin. The reason why industry businesses prefer cross-platform development over native development is to accelerate their development processes of an affordable cost.

Results
 The D&D Fixative module can assist in the selection of fixtures, site-specific catalogs, and decontamination jobs for application during D&D activities. The module includes a comprehensive database of commercially available fixtures and other contamination control products and is capable of filtering and sorting the available products according to the criteria entered by the user.
Features: Keyword Search, Multi-level Criteria Search, Fixative Details, Fixative Data, Vendor Data.
Current Platforms: Android, Apple.

D&D KM-IT Focus Areas
Dismantlement: Solutions that address the challenges and problems to dismantle and reduce contaminated facilities' process equipment, support equipment, and ventilation ducts.
Characterization: Solutions that address the challenges and problems to assist in the accurate location, identification and/or quantification of radiological contamination of DOE facilities.
Decontamination: Solutions that address the need to improve the decontamination of DOE facilities including process equipment and ductwork.
Robotics: DOE EM provided a database of 471 robotic technologies, originally developed by NuRex Engineering and Cogentus Consulting, for integration into the KM-IT platform.
Worker Safety: Solutions that address the need to improve the protection of the health and safety of workers in contaminated DOE facilities.

REST Service Fixative Architecture Diagram
 The diagram shows the interaction between the mobile app and the REST service architecture, including components like the API Gateway, Service Registry, and Data Store.

Conclusions & Future Work
 The increase of mobile usage worldwide is demanding that legacy and current platform update the technologies to provide a better usage experience for growing community of mobile users.
 Native mobile apps provide the ability to collect data offline that can be synchronized later to a central database.
 Complete D&D KM-IT Fixative Native app for iOS and Windows mobile devices.
 Deploying a native mobile application such as this Fixative app, provides a path for future application development to support the D&D community with specific task in the effort of nuclear decontamination and remediation.

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 Applied Research Center, Florida International University
 10555 West Flagler Street, Suite 2100, Miami, FL 33174

Visual Studio, Xamarin, REST, JSON, iOS, Android, Windows Phone, dndkm.org

Figure 30. KM-IT poster titled "KM-IT Mobile Platform for D&D" presented at WM18.

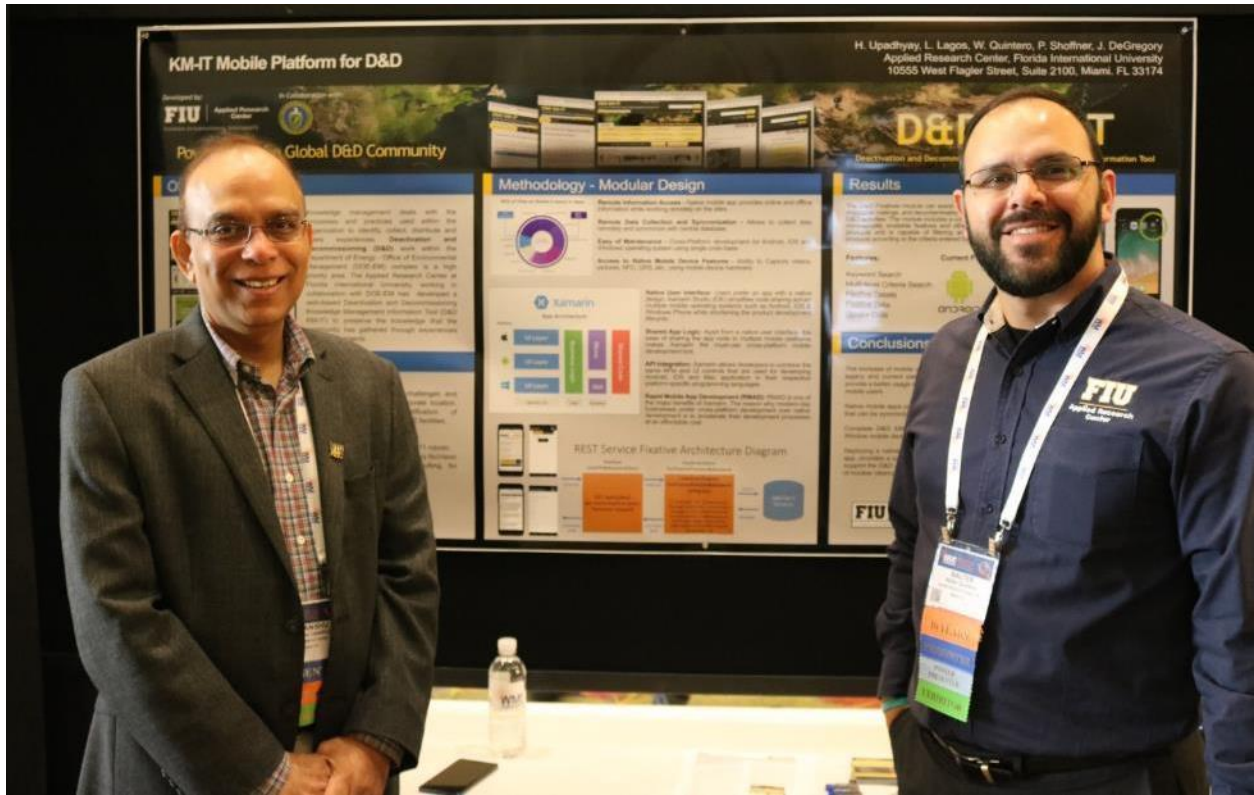


Figure 31. Dr. Himanshu Upadhyay and Walter Quintero presenting the KM-IT poster at WM18.

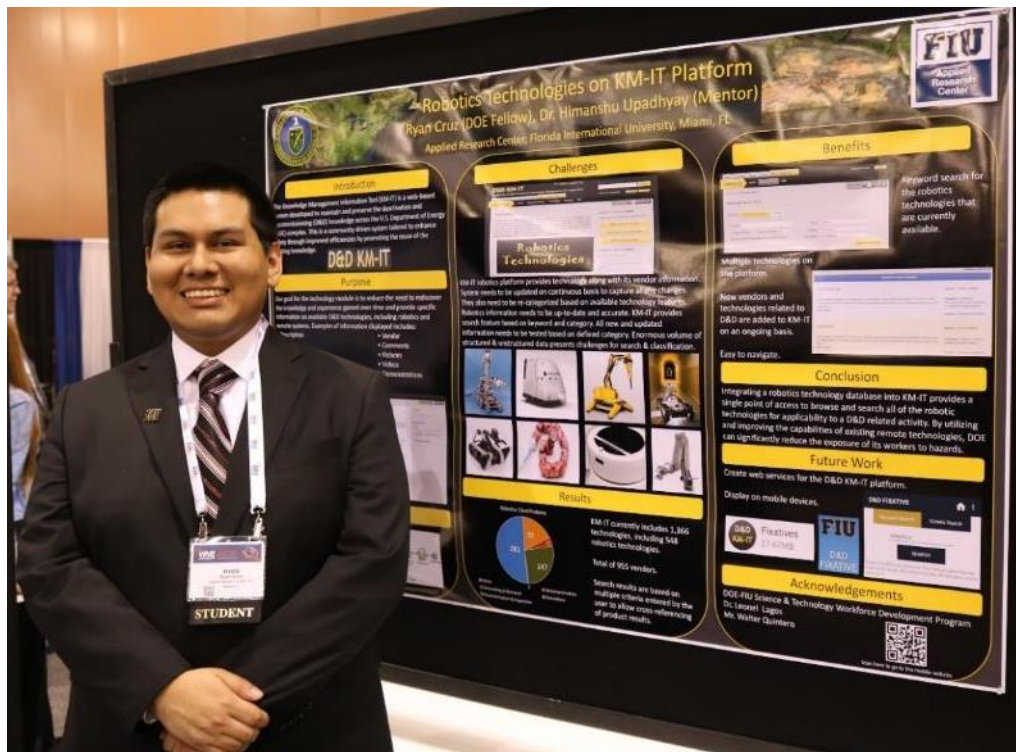


Figure 32. DOE Fellow Ryan Cruz presenting his research poster at WM18: Robotics Technologies on KM-IT Platform.

KM-IT was also showcased at WM18 at the FIU booth in the conference exhibition hall. FIU staff used the opportunity to demonstrate the system to conference attendees. The DOE Fellows assisted with manning the booth and had the opportunity to interact with the conference participants.



Figure 33. Dr. Leonel Lagos, FIU staff and DOE Fellows with Andrew Szilagyi (DOE EM-4.11) and Mark Gilbertson (DOE EM 4) at the FIU exhibitor booth at WM18.

Website Analytics

FIU reviewed the KM-IT website analytics during the performance year using information from Google Analytic and Google Web Master tools, which provide information and multiple graphics that tracks and reports website traffic in order to assess and improve the effectiveness of the website.

A brief summary of the D&D KM-IT web analytics that compares the fourth quarter of 2017 (Oct-Dec 2017) the previous (third) quarter (July-Sept 2017) was prepared. The KM-IT website concluded the 2017 year with an over-performing fourth quarter. Typically, there is a drop during the final quarter of the calendar year and it is usually the lowest performing period. However, the fourth quarter of 2017 outperformed the third quarter. All of the major metrics were up during this period. The metrics with double digit improvements over the previous quarter include the number of page views with an increase of 17.77% followed by average session duration and pages viewed per session with increases of 20% and 15.28%, respectively. There was a total of 2,415 users who visited the website during this period which generated 5,992 page views. The number of sessions and users also posted increases of 3.07% and 2.16%, respectively.

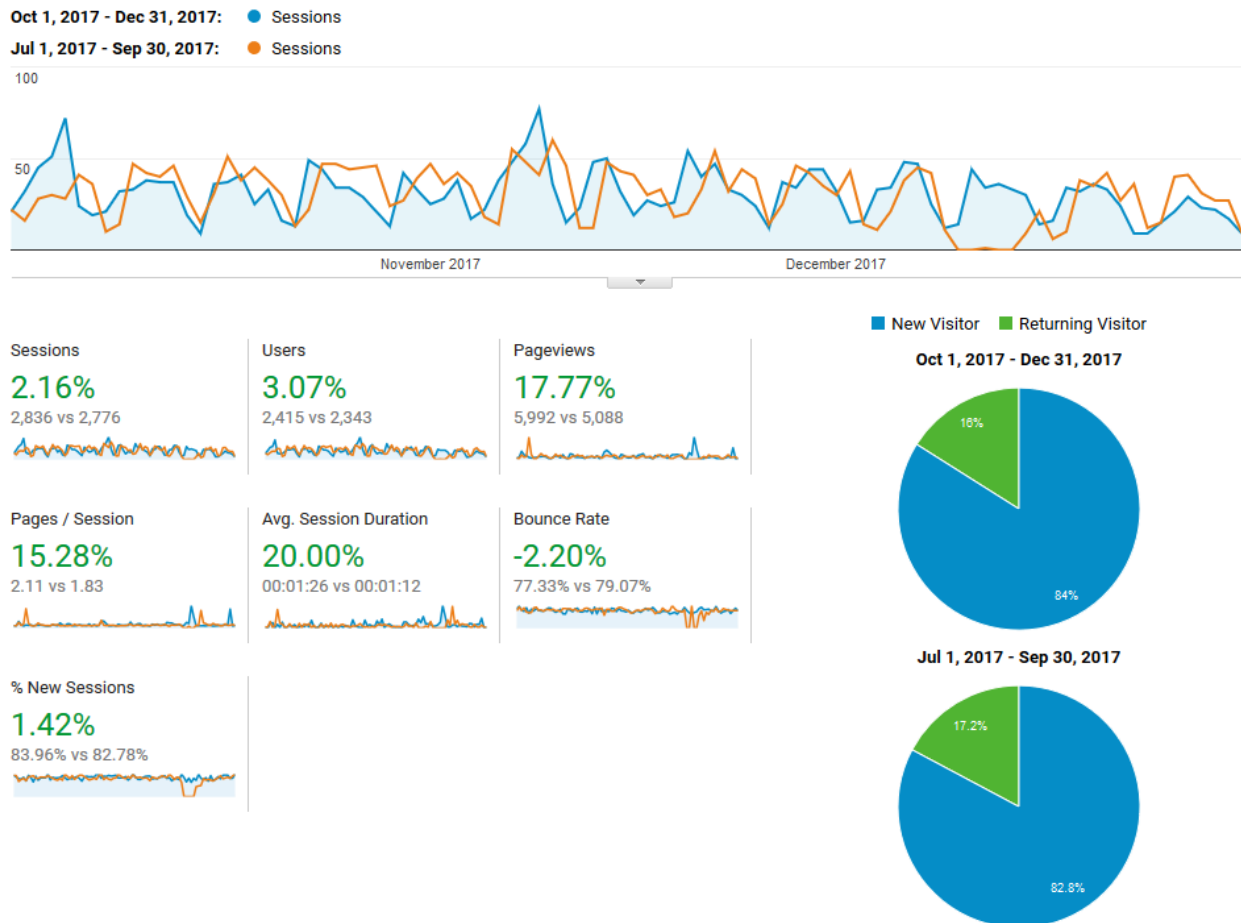


Figure 34. KM-IT analytics summary (July-Sept 2017 vs. Oct-Dec 2017).

This summary was obtained using Google Analytics (GA) data and does not include direct pageviews to the many PDF documents store on the website. The data shown on the above figure is from (GA) only, where the current period is represented by the blue line and the previous period is represented by the orange line.

Another summary of the web analytics for KM-IT was prepared to capture the traffic activity on the system during the first quarter of 2018 (Jan-Mar 2018) and compared to the fourth quarter of 2017 (Oct-Dec 2017). The KM-IT analytics started 2018 by performing even better than the fourth quarter of 2017. All of the major metrics were up during this period. The metrics with double digit improvements over the previous quarter included the number of sessions with an increase of 10.58% and pageviews with a large increase of 44.63%, as well as pages per session and average session duration with increases of 30.79% and 26.73%, respectively. There were a total of 2,617 users who visited the website during this period which generated a total of 8,666 pageviews. The number of users and new users also posted increases of 8.36% and 8.74%, respectively.

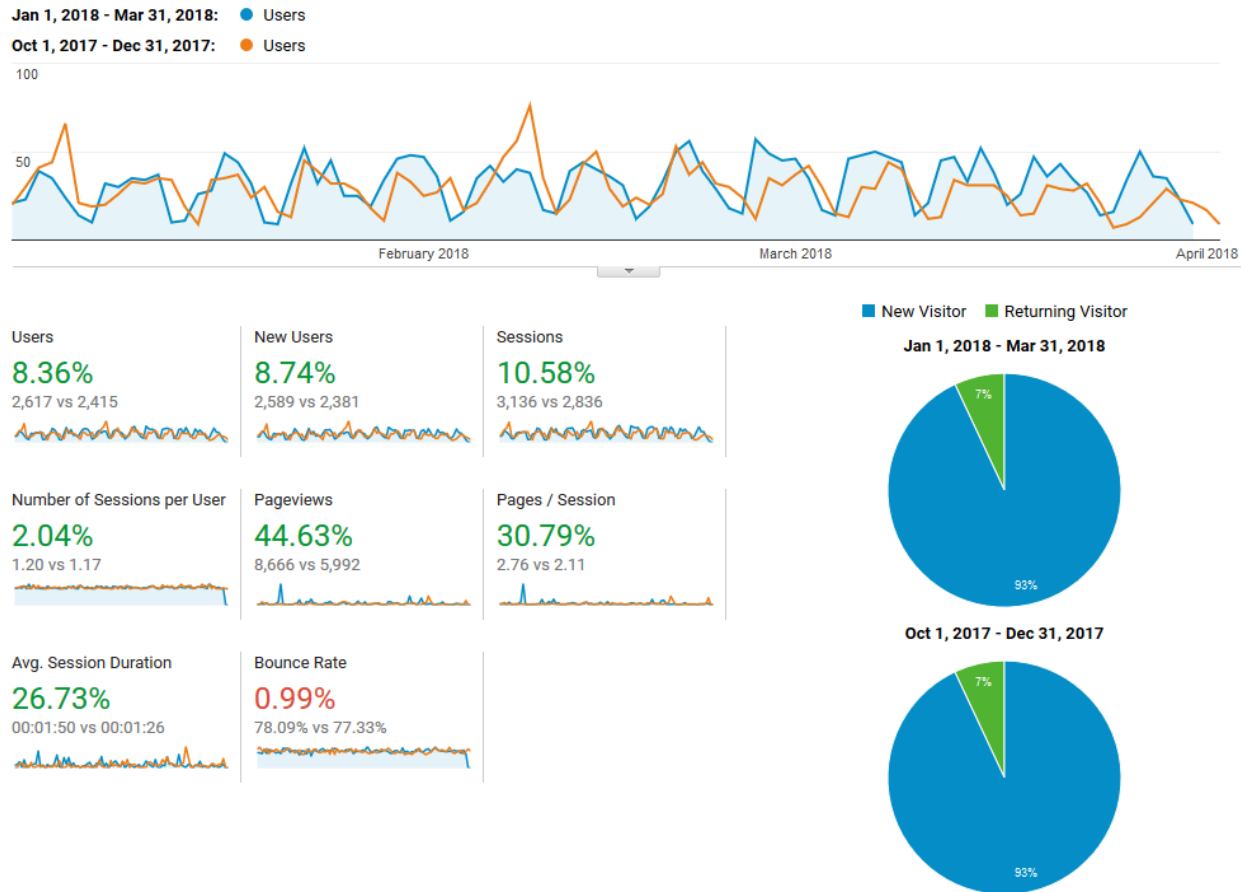


Figure 35. D&D KM-IT analytics summary (Oct-Dec 2017 vs Jan-Mar 2018).

Newsletters

Also as part of the outreach effort, FIU created targeted newsletters to send electronically to D&D KM-IT registered users, subject matter specialists, and Waste Management Conference attendees. These newsletters informed the recipients of current and newly added features of D&D KM-IT and provided quick links to the system website so that they could immediately try out the enhancements. Newsletters are a digital medium of communication and are a great outreach technique to bring waves of traffic to the website. By using the registered users as recipients, KM-IT can keep the users up to date on new features and content.

FIU developed and sent out newsletters to the registered users of the D&D KM-IT system on the following topics:

- D&D Technology Development, Test and Evaluation: Standards and Testing Protocols
- FIU Students Deploy Stream Monitoring Stations at SRS
- D&D KM-IT Fixative Android Mobile App
- Announcement of the FIU-ARC booth at Waste Management Symposia 2018 (WM18)

D&D KM-IT

Knowledge Management Information Tool

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D&D Technology Development, Test and Evaluation Activities : Standards and Testing Protocols



Building on the initial success from the recent publication of two new international standard specifications for fixatives in July 2017, DOE EM and ASTM International's E10.03 Subcommittee have embarked on an aggressive strategy to address shortfalls in uniform testing protocols specifically designed to provide a set of accepted tools to evaluate and compare the operational performance of fixative technologies under a variety of safety basis scenarios. As highlighted by Mr. Andrew Szilagy, Director for DOE EM's Office of Infrastructure and D&D, "There is general acceptance by the community on the utility of fixatives to immobilize residual contamination and mitigate risk during D&D activities, but a more formal process needs to be available for site personnel and regulators to

Edward Walker (ASTM E10 Chairman, Nuclear Technology and Applications) presenting an award of recognition to Joseph Sinicrope (FIU Applied Research Center), January 2018.

Figure 36. KM-IT Newsletter.

Application Development

During FIU Performance Year 8, FIU added features to the D&D KM-IT application and maintained the system for the D&D community. Major accomplishments for the performance year include 1) completing development of a robotics technology and vendor modules; 2) completing the development of a pilot native mobile application using the D&D fixatives module for Android, iOS, and Windows platforms; and 3) integrating social media buttons into KM-IT.

Robotics Vendor and Technology Modules

As part of the FIU performance year 8 scope detailed in the Project Technical Plan, FIU completed development of a robotics technology module (milestone 2017-P3-M3.5) and a robotics vendor module (milestone 2017-P3-M3.6). These milestones leverage the existing KM-IT infrastructure to develop a pilot platform on a selected area of interest (robotics). The robotics modules were developed based on the current KM-IT infrastructure for D&D and support similar features.

FIU worked on these two modules in parallel as their functionality are dependent on one another. FIU started by extending the current framework of the existing D&D KM-IT to support the new modules. The framework is the foundation of the application and includes critical functions and features like user membership and login. FIU also completed the design and presentation layout of the modules for the web interface. In addition, FIU completed the development on the backend of the application, focusing on the database to support the modules. These activities include table design and store procedure optimization. Screenshots of the robotics technology and vendor modules are provided below.


Robotics KM-IT

Knowledge Management Information Tool

Welcome Guest

[Login](#)

Home [About](#) [Contact](#) [Register](#) [Login](#)



Robotic Technologies

Robotics Vendors

Hotline

Lessons Learned

Picture Video Library

Specialist Directory


Best Practices

Document Library

Web Crawler

Training





Collaboration Tools



The technology module provides comprehensive information on D&D related technologies, including associated technology demonstrations and commercial vendors.

It also includes technology descriptions, benefits, limitations, and associated links and documents. The objective of this feature is to create, maintain and enhance the technology information repository for D&D applications, including characterization, decontamination, dismantlement, and worker health and safety.

Featured Robotics Technologies

Industry News


- Waste Management Showcases Robots That Could Support EM's Cleanup
- DOE Fellows from FIU Deploy Remote Monitoring Stations in Tims Branch, Savannah River Site for Environmental Data Collection
- Department of Energy (DOE) Office of Environmental Management (EM) and the American Society for Testing and Materials (ASTM) International Build on Successful Initiative to Develop Standard Specifications for Fixative Technologies in support of D&D
- Department of Energy Announces \$35 Million for Emerging Research Projects to Address Manufacturing Challenges


[More News](#)

Robotics Technologies

- Robotics Technologies
- Dyneema Long Sleeve Crew Neck
- Porter-Cable Circular Saw with Vacuum System
- ADAMANT Twin Blade Cutter Circular Saw
- Technology Search

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Figure 37. Robotics module homepage on KM-IT.

The screenshot displays the Robotics KM-IT Knowledge Management Information Tool interface. At the top, the site title "Robotics KM-IT" is shown in yellow and white, with the subtitle "Knowledge Management Information Tool" below it. A navigation menu includes "Home", "About", "Contact", "Modules", "Register", and "Login". A "Welcome Guest" message and a "Login" button are in the top right corner. Below the navigation is a banner image of a robot with the text "Powered by the D&D Community". A secondary navigation bar contains "Vendor Module", "Technology", "Search", "Advanced Search", and "Help". The main content area is titled "Technology > Advanced Search" and features a gear icon and the heading "Technology Advance Search". A search instruction reads "Search through deactivation & decommissioning related technologies." The search form includes a "Search by:" section with radio buttons for "Technology Category" (selected) and "Vendor". It has a "Keyword" input field, a "Group" dropdown menu set to "Robotics", a "Results Per Page:" dropdown set to "20", a "Category" dropdown set to "All Category", and a "Subcategory" dropdown set to "All Subcategory". There is a "Demonstrated" checkbox and a link to "Basic Search". An "Advanced Search" button is at the bottom right of the form. The footer contains a green banner with text about the Applied Research Center at Florida International University, the FIU logo, and the Applied Research Center logo. Copyright information for 2011-2018 is also present.

Figure 38. Robotics technology module advanced search.

The screenshot displays the Robotics KM-IT Knowledge Management Information Tool interface. At the top, it says 'Welcome Guest' with a 'Login' button. A navigation menu includes 'Home', 'About', 'Contact', 'Modules', 'Register', and 'Login'. Below this is a banner image of a robotic tank cleaning device with the text 'Powered by the D&D Community'. A search bar area contains buttons for 'Vendor Module', 'Technology', 'Search', 'Advanced Search', and 'Help'. The current page is titled 'Technology > Advanced Search'. A search filter section allows users to search by 'Technology Category' (selected) or 'Vendor'. It includes fields for 'Keyword', 'Group' (set to 'Robotics'), 'Results Per Page' (set to 20), 'Category' (set to 'Decontamination'), and 'Subcategory' (set to 'All Subcategory'). There is a 'Demonstrated' checkbox and a link to 'Basic Search'. An 'Advanced Search' button is also present. Below the search filters, a green box indicates '4 Records found'. The results are listed under 'Advance Search Results' and include four entries: 'Extended Reach Sluicer', 'Manway Cannon', 'Robotic Tank Cannon', and 'Sluicer Tank Cannon'. Each entry provides a brief description, a 'Read More' link, and source information: 'Source : Vendor Website', 'Category : Robotics > Decontamination > Other', and 'Vendor : AGI Engineering'. The footer contains a green bar with text about the Applied Research Center at Florida International University (ARC-FIU), the FIU logo, and a copyright notice for the Robotics Knowledge Management Information Tool.


Figure 39. Example of technology search results.

Welcome Guest [Login](#)

Robotics KM-IT

Knowledge Management Information Tool

Home
About
Contact
Modules
Register
Login



Powered by the D&D Community


Vendor Module
Technology
Search
Advanced Search
Help

Technology Factsheet

710 Kobra

Category: Robotics > Other > Wheeled/Tracked System
Reference # : Model No :

The Endeavor Robotics 710 Kobra is designed to provide unmatched strength, power, and payload support in an easy to operate robot package. The 710 Kobra has a lift capacity of 330 lb (150 kg) and integrates numerous payloads to expand your operational area.



Endeavor Robotics® Kobra™


Benefits

- Can reach as high as 11 ft (3.5 m)
- Easily climbs stairs, fits through doorways or down aisle ways
- Deploys from the back of a small 4x4 vehicle
- Able to reach speeds of 8 mph (12.9 km/h) while carrying 150 lb (68 kg) payloads
- Maintains mobility on rough terrain in all weather conditions

Limitations

Comments

Pictures


710 Kobra

Videos

Vendor


- [Endeavor Robotics](#)

Documents

- Title: Endeavor Robotics 710 Kobra Spec Sheet.pdf (Posted: 03/31/2017)
Description: 710 Kobra Spec Sheet

Demonstrations

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Figure 40. Example robotic technology detail page.

Welcome Guest
[Login](#)

Robotics KM-IT

Knowledge Management Information Tool

Home About Contact Modules Register Login



Powered by the D&D Community

Vendor Module
Vendors
Search
Help

Vendors

A listing of D&D vendors with contact information.

The vendor module provides a directory of commercial D&D vendors. Vendor management captures all the vendor related information, including vendor name, address, phone, fax, email, website and areas of expertise. Vendor information will be monitored and maintained by FIU.

The user may search for vendors using a basic text string search. The basic search allows the user to input a simple word or phrase (e.g., full or partial vendor name or area of expertise) to return the applicable vendors.

Disclaimer

The information provided in the vendor module is a sampling of the commercial vendors who provide D&D related technologies, supplies, and services, and, thus, is not intended to be a comprehensive directory of all D&D vendors in the marketplace. Vendors included in the vendor module may offer additional products and services and users are encouraged to contact the vendor directly for more information.

In addition, the data provided is for informational purposes only and does not constitute an endorsement of any particular product, service, or vendor by FIU or the United States government (see full disclaimer here).

[See Full Disclaimer](#)



Search Vendors

Start searching our vendor directory

[Start Your Search Now](#)

[View All Vendors](#)

Popular Vendors

Special Technologies Laboratory
AIL Systems Inc
AECOM
Alaron Nuclear Services
HTFx, Inc.

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Figure 41. Landing page for robotics vendor module on KM-IT.

Robotics KM-IT
Knowledge Management Information Tool

Welcome Guest
Login

Home About Contact Modules Register Login

Powered by the D&D Community

Vendor Module Vendors Search Help

Vendors > Search

Search Vendors

Search through deactivation & decommissioning related vendors.

Search by: Search by Keyword Search by Category


Search Keyword:

Search Vendor Show all Vendors

Disclaimer

The information provided in the vendor module is a sampling of the commercial vendors who provide D&D related technologies, supplies, and services, and, thus, is not intended to be a comprehensive directory of all D&D vendors in the marketplace. Vendors included in the vendor module may offer additional products and services and users are encouraged to contact the vendor directly for more information. In addition, the data provided is for informational purposes only and does not constitute an endorsement of any particular product, service, or vendor by FIU or the United States government (see full disclaimer here).
[See Full Disclaimer](#)

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Figure 42. Vendor search feature for robotics module on KM-IT.

The screenshot displays the Robotics KM-IT Knowledge Management Information Tool interface. At the top, there is a navigation menu with links for Home, About, Contact, Modules, Register, and Login. A banner image shows a close-up of a robotic arm with the text "Powered by the D&D Community". Below the banner is a "Vendor Module" section with buttons for "Vendors", "Search", and "Help". A search bar contains the text "Vendors> Search".

The main content area is titled "Search Vendors" and includes a sub-header: "Search through deactivation & decommissioning related vendors." Below this is a search form with the following elements:

- Search by: Search by Keyword (selected) and Search by Category
- Search Keyword:
- Buttons: Search Vendor and Show all Vendors

The search results list four vendors, each with a "Vendor Technologies" and "View Details" button:

- S&ME Inc**
Address: 3201 Spring Forest Road, Raleigh, North Carolina 27616 United States
Phone: 919-872-2660 Toll Free: 800-849-2517 Fax: 919-790-8909
Email: NA
Website: www.smeinc.com
Area of Expertise: Regulations - other, Other
- 2K Manufacturing LTD**
Address: Preservation House, Airport Way, Luton, Not Available(UK) LU2 9LF United Kingdom
Phone: +44-0-1582 437 170 Toll Free: Fax: +44-0-1582 411 669
Email: info@ecosheet.com
Website: www.ecosheet.com
Area of Expertise: Other
- 3D Robotics Inc.**
Address: 1608 4th Street, Suite 410, Berkeley, California 94710 United States
Phone: 858-225-1414 Toll Free: Fax: N/A
Email: N/A
Website: 3drobotics.com
Area of Expertise: Robotics & Remote Technology
- 3DX-RAY Ltd**
Address: 16 & 18 Hayhill Industrial Estate, Sibley Road, Barnow-Upon-Soar, Loughborough, Leicestershire LE12 8LD United Kingdom
Phone: 44 (0) 1509 817400 Toll Free: Fax: 44 (0) 1509 817401
Email: info@3dx-ray.com
Website: www.3dx-ray.com
Area of Expertise:


Figure 43. Example vendor search results for robotics module on KM-IT.

Welcome Guest [Login](#)

Robotics KM-IT

Knowledge Management Information Tool

Home
About
Contact
Modules
Register
Login



Powered by the D&D Community

Vendor Module
Vendors
Search
Help

[Vendors > View Vendor Details](#)

Advanced Inspection Technologies Inc

Address:
 2020 W. Eau Gallie Blvd. Suite 101
 Melbourne, Florida 32935 United States

Phone: 321-610-8977 **Toll Free:** **Fax:** 321-574-3814

Email: support@aitproducts.com

Website: aitproducts.com

Description:
 Advanced Inspection Technologies (AIT) Inc. is a supplier of remote visual inspection equipment to industrial customers. Products include video borescopes, pipe inspection cameras, and fiberscopes. AIT also rents video borescopes and pipe cameras for a variety of inspections. The products help customers to quickly and efficiently conduct visual inspections of the most remote reaches of their plant and equipment.

Area of expertise:
 Robotics & Remote Technology, Other

Additional Expertise:
 Remote visual inspection.

Comments:

View Related Technologies

Is This Listing Yours?


If you need to update this listing or find errors please contact us so that we may update it.


Contact Us

Popular Vendors

Special Technologies Laboratory
AIL Systems Inc
AECOM
Alaron Nuclear Services
HTFx, Inc.

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Figure 44. Example robotic vendor detail page for robotics module on KM-IT.

The screenshot displays the Robotics KM-IT Knowledge Management Information Tool interface. At the top, there is a navigation menu with links for Home, About, Contact, Modules, Register, and Login. A search bar is present with buttons for Technology, Search, Advanced Search, and Help. The main content area shows the results of a search for 'Technology Advance Search', indicating that 5 records were found. The results are organized into sections: Vendor Information, Vendor Technologies, and individual technology entries. The first entry is for 'Advanced Inspection Technologies Inc', providing contact information and a brief description of their services. The subsequent entries are 'Duo Pipe Camera', 'Portable Industrial Rover', 'PTZx Inspection Camera System', 'RX 130 Industrial Crawler', and 'RX 400 Pipe Crawler', each with a detailed description of the technology and its capabilities.

Robotics KM-IT
Knowledge Management Information Tool

Welcome Guest
Login

Home About Contact Modules Register Login

Powered by the D&D Community

Vendor Module Technology Search **Advanced Search** Help

Technology > Advanced Search

Technology Advance Search

Search through deactivation & decommissioning related technologies.

5 Records found

Vendor Information

Advanced Inspection Technologies Inc
Address : 2020 W. Eau Gallie Blvd. , Melbourne , Florida , United States 32935
Phone : 321-610-8977 Phone 800 : Fax : 321-574-3814
Email : support@aitproducts.com Web Site : http://aitproducts.com
Comments :
Advanced Inspection Technologies (AIT) Inc. is a supplier of remote visual inspection equipment to industrial customers. Products include video borescopes, pipe inspection cameras, and fiberscopes. AIT also rents video borescopes and pipe cameras for a variety of inspections. The products help customers to quickly and efficiently conduct visual inspections of the most remote reaches of their plant and equipment.
View Details

Vendor Technologies

Duo Pipe Camera
This technology is a portable pipe camera with two camera systems: one push rod camera for small and one for larger pipe lines. Camera head choices include 13, 18, 25 and 55 mm. Up to 50 m in length.
More Information
Source : Vendor Website
Category : Characterization > Camera & Surveillance > Surveillance Non-Crawler

Portable Industrial Rover
This portable robotic pipe inspection camera can inspect areas 4 in. and larger up to 328 ft. For industrial inspections and includes laser measurement, distance counter, text annotation, pan and tilt
More Information
Source : Vendor Website
Category : Robotics > Characterization and Inspection > Other

PTZx Inspection Camera System
This portable inspection system includes features to inspect tanks, vessels, drums and other large confined spaces and piping. White LED lighting provides over 1000 lumens of light and add-on auxiliary
More Information
Source : Vendor Website
Category : Robotics > Characterization and Inspection > Other

RX 130 Industrial Crawler
The RX130 Crawler is designed to inspect pipeline diameters from 150 mm to 1000 mm (6 in. to 39 in.) Includes 200 m (656 ft.) of cable. Includes laser measurement, distance counter, text annotation; s
More Information
Source : Vendor Website
Category : Robotics > Characterization and Inspection > Other

RX 400 Pipe Crawler
RX400 Pipe Crawler is designed to inspect pipeline diameters from 400 mm to 2000 mm (16 in. to 79 in.) Includes 300 m (984 ft.) of cable. Includes laser measurement, distance counter, text annotation;
More Information
Source : Vendor Website
Category : Robotics > Characterization and Inspection > Other

Figure 45. Example of robotic technologies from vendor for robotics module on KM-IT.

D&D Fixative Module

FIU completed the development of a pilot native mobile application using the D&D Fixatives Module for the Android, iOS, and Windows platforms. A native application is an app that is developed for use on a specific platform and which is downloaded onto a mobile device in order to be accessed. As such, the native app does not need an internet connection to be used.

Android D&D Fixative App on Google Play

The KM-IT D&D fixative app for Android devices has been approved and published by the Google Play Store. It is now available for download from any Android device with a valid Google account without the use of an .apk file. The direct link to the app download on Google Play is <https://play.google.com/store/apps/details?id=com.dndkm.fixative>. A search for the terms "fixatives" or "d&d km-it" on Google Play will also display the new app in the search results.



Figure 46. D&D fixative android mobile app.

A screenshot of the app on Google Play is provided below. From here, the users can download and install the app as well as read a description of the app, see screenshots and view other information like the app developer contact information, ratings, audience target, etc.

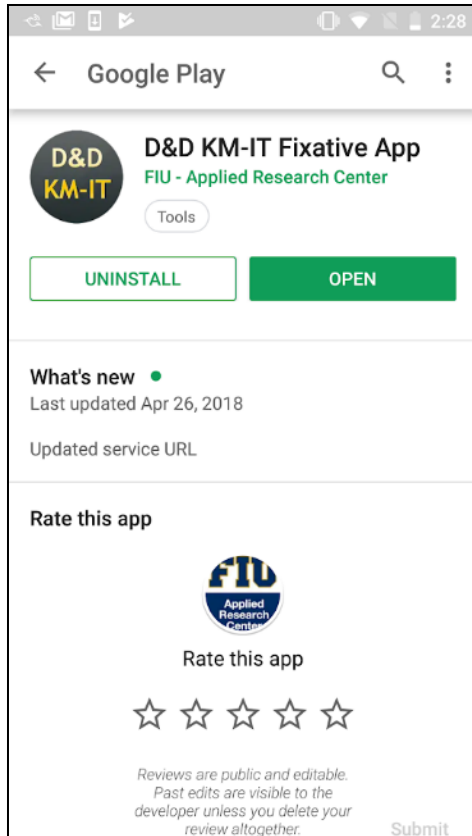


Figure 47. D&D Fixative App on Google Play using an Android mobile device.

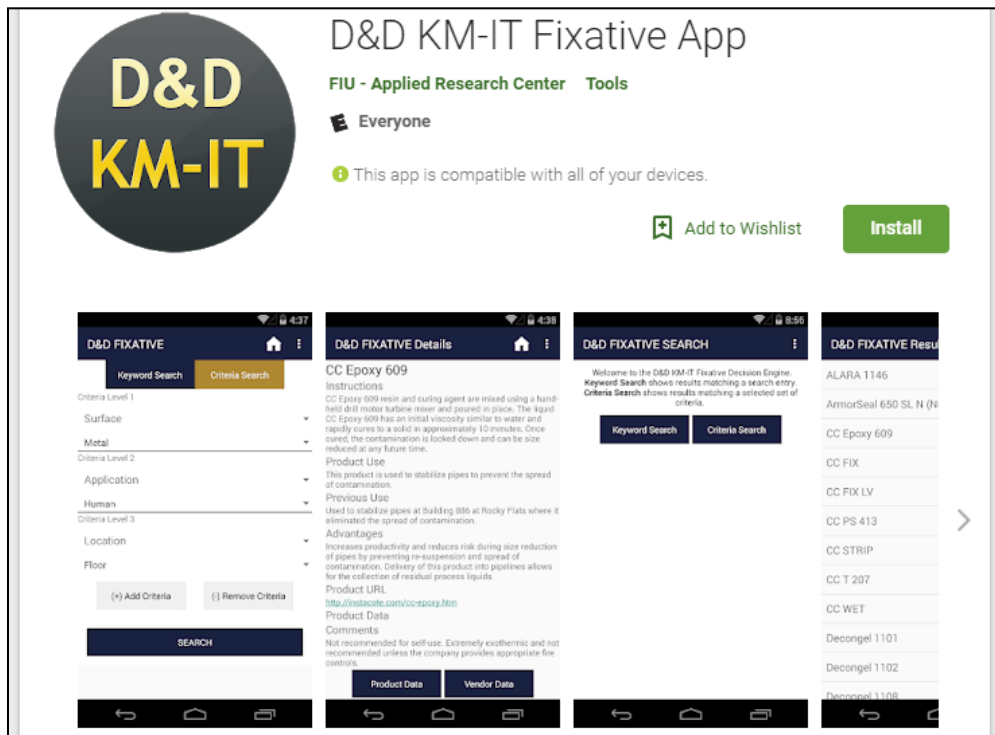


Figure 48. D&D Fixative App on Google Play, view from a desktop computer.

iOS D&D Fixative App


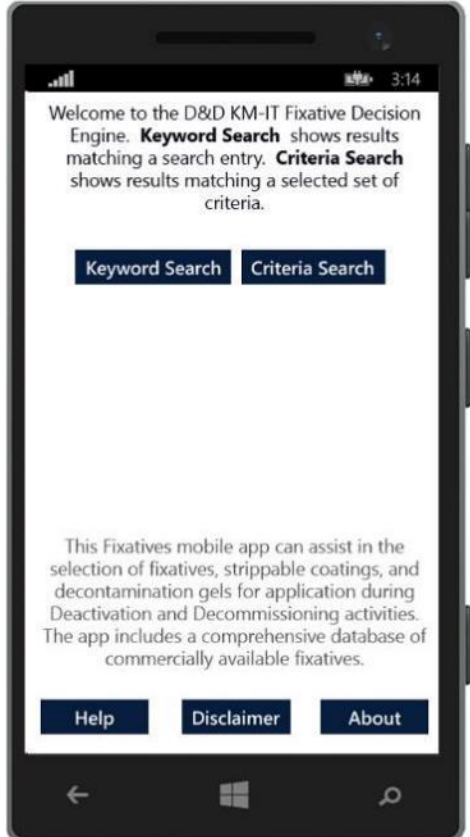
FIU completed the development of a native mobile application for the iOS platform as a pilot based on the KM-IT Fixative Module (milestone 2016-P3-M3.4) in March. In April, FIU focused on meeting all of the requirements for the app to be accepted on the iTunes marketplace, making it available to the public. Apple iTunes has very strict guidelines for uploading an app to their distribution platform. The process includes enrollment in the Apple Developer Program, filling out several forms related to app information and description, app target audience, safety rating, capabilities, devices supported, etc.

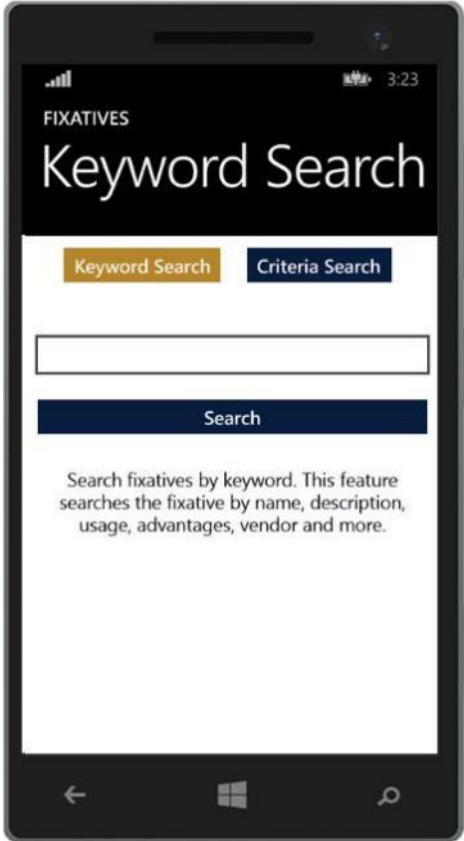
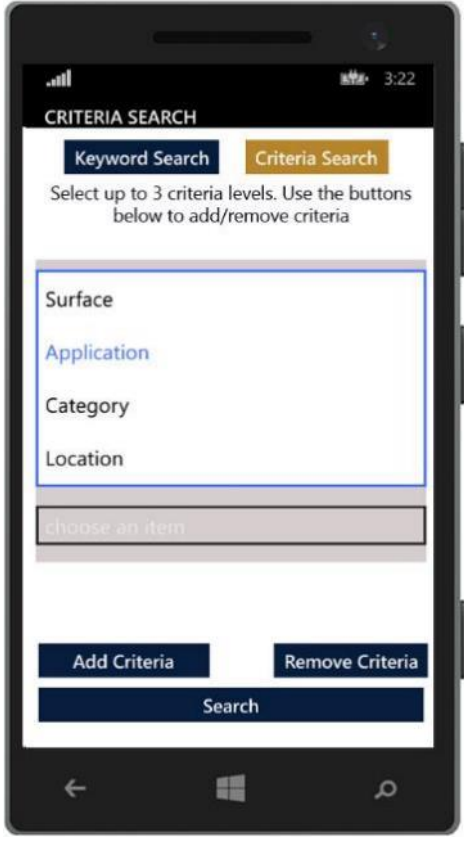


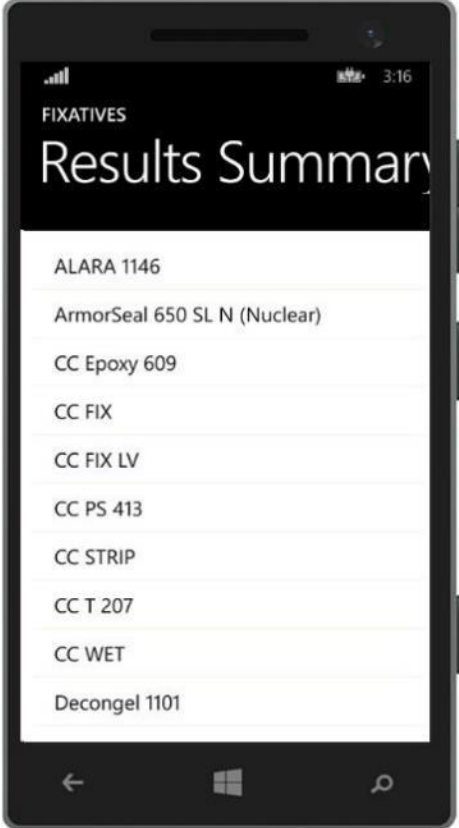
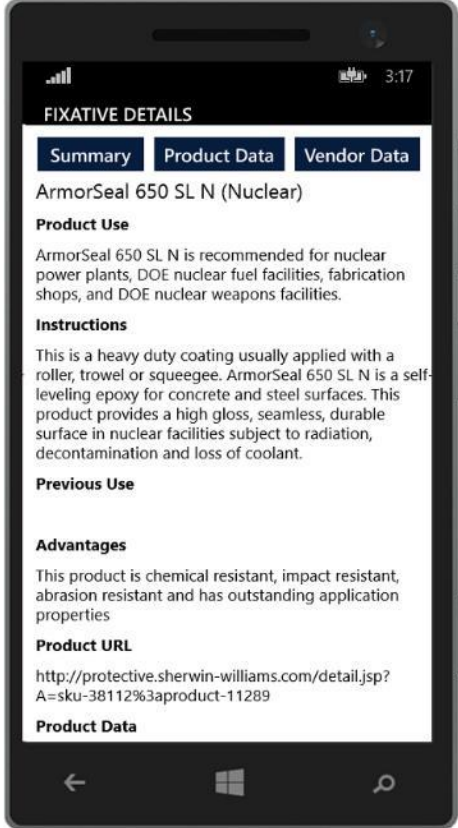
Figure 49. D&D KM-IT Fixative iOS Mobile App.

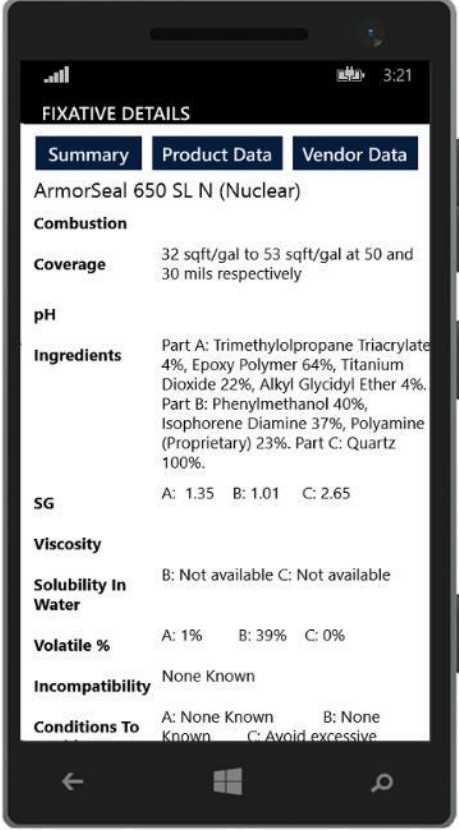

Windows D&D Fixative App

FIU finished the development of the Windows D&D fixative app. Screenshots are included below to show how the Windows app functions. FIU subsequently submitted the Windows mobile app to the Windows marketplace (Windows app distribution platform).

	
<p>Home page of a Windows phone showing D&D KM-IT fixative app icon</p>	<p>D&D fixative Windows app landing page – from here users can use a keyword or criteria search to find a fixative product</p>

	
<ul style="list-style-type: none"> • Keyword search will search for fixative products according to the search word. • If no keyword is entered and the search button is clicked it will return all of the fixative products 	<ul style="list-style-type: none"> • Criteria search allows the user to build a multi-tier criteria search for fixative products by adding criteria and subcriteria. • Each time a new criteria is added, the results will be filtered according to the previous selection, allowing for targeted results • The buttons “Add Criteria” and “Delete Criteria” are used to build the criteria requirements

	
<ul style="list-style-type: none"> • The results summary view displays the search results by fixative product name • Clicking on any of the result names will send the user to the fixative product details 	<ul style="list-style-type: none"> • The details view provides general information for the selected product with further button options to view the product data and vendor data

	
<ul style="list-style-type: none"> • After pressing the product data button, the user is taken to the product data available for the selected fixative product 	<ul style="list-style-type: none"> • After pressing the vendor data button, the user is taken to the vendor description and contact information • The mobile app allows for automatic calling when a phone number is clicked and opens the web browser when an URL is clicked

Web API REST

All of the mobile apps are supported by a Web API REST Service. REST stands for representational state transfer which is a web service popular with mobile apps. REST is an architectural style that specifies constraints, such as the uniform interface, that is applied to a web service. It provides desirable properties, such as performance, scalability, and modifiability. REST relies heavily on JavaScript object notation (JSON), which is a minimal, readable format for structuring data. It is used primarily to transmit data between a server and web application, as an alternative to XML. This service is a critical component because it is used by all the platforms to interact with the data store on the server.

FIU customized the Web API REST Service for optimal performance of the mobile apps. FIU removed all references to Windows Communication Foundation (WCF) from the existing service and created a new solution on a Web API REST Service framework. FIU imported all the functionality and modified the code accordingly to adapt to the new Web API framework. The

Web API REST Framework is lighter and performs better when using it in conjunction with Microsoft Internet Information Services (IIS). In addition, FIU added additional error handling code to maintain optimal performance. Extensive testing of the Web API REST Service was also performed. The testing included:

- Unit testing – FIU tested each of the service methods individually to make sure they respond accordingly. This test were done with third party tools (Postman) and internet browsers (Chrome and Internet Explorer).
- Integration testing – FIU tested the Web API REST service with the Android fixative mobile app by running the app on a mobile device and testing all the functionalities that interact with the service. This test was performed on multiple Android mobile devices targeting the public Web API REST service
- System test – FIU performed multiple testing of the service that could affect the system including IIS. FIU also added exception handling to all of the methods to record any improper behavior.

FIU developed additional security features to protect all of the systems against possible cyber attacks and infections once the mobile applications are made available to the public. Deployment of the fixative mobile server in a demilitarized zone (DMZ) increases the security of the API and the host along with the database used to store the fixative information. A DMZ is a physical subnetwork that contains and exposes the service to an untrusted public network.

The Web API REST Service was subsequently added to IIS as a website. This required additional testing inside the development environment and the DMZ. This adds an additional layer of security to FIU's local area network. Updates to the Web API REST Service also included error handling features to make the service more stable.

Social Media Integration

FIU has engaged in several discussions with DOE related to social media integration on KM-IT for the purpose of outreach and marketing. Social media has been identified as a platform that should be targeted to increase visibility of KM-IT among the community and other EM related areas. FIU-ARC is approaching this integration using DOE's *social media policy and best practices* as a guideline to provide social integration on KM-IT to allow Like/Share/Pin to Facebook, Twitter, LinkedIn, and Pinterest as well as to utilize YouTube as platform for D&D KM-IT Videos. FIU previously developed a white paper to describe the planned social media integration activities for KM-IT in comparison with the guidelines provided in DOE's *social media policy and best practices*.

FIU completed the implementation of social media buttons on KM-IT and conducted testing on the new feature to optimize it for a better user experience (milestone 2017-P3-M3.2). This effort focused on the three major social media platforms: Facebook, Twitter and LinkedIn. FIU added the capability for visitors to the KM-IT website to share the content of any page to their social media account platform. This will allow more exposure of the KM-IT to the personal and professional contacts of the users sharing the content. The social media buttons have been added across the entire KM-IT website and can be found just below the main module navigation ribbon.

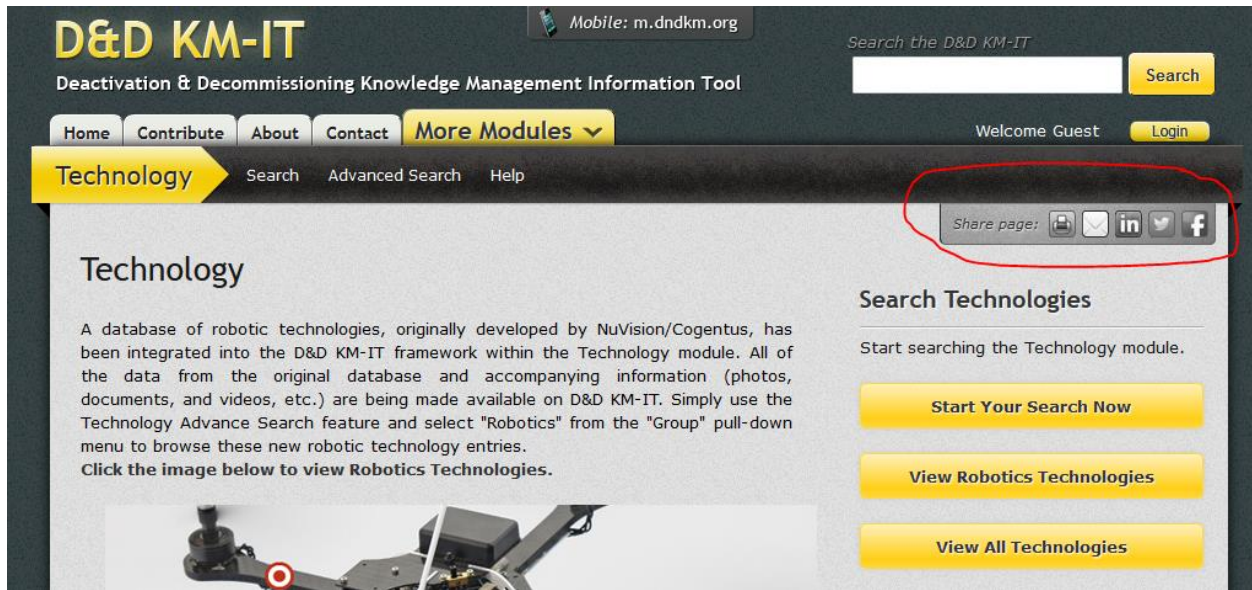


Figure 50. Social media buttons on the KM-IT website.

Each of the buttons performs a different action, including print, share via email, and share with LinkedIn, Twitter or Facebook. After pressing any of the share buttons, a pop-up displays so the user can share the page on their social media site. If the user is already logged in to their social media account, the pop-up will be pre-populated to make the page easier to share. Below are examples of how each of the social media buttons will respond to a click from the Technology module.

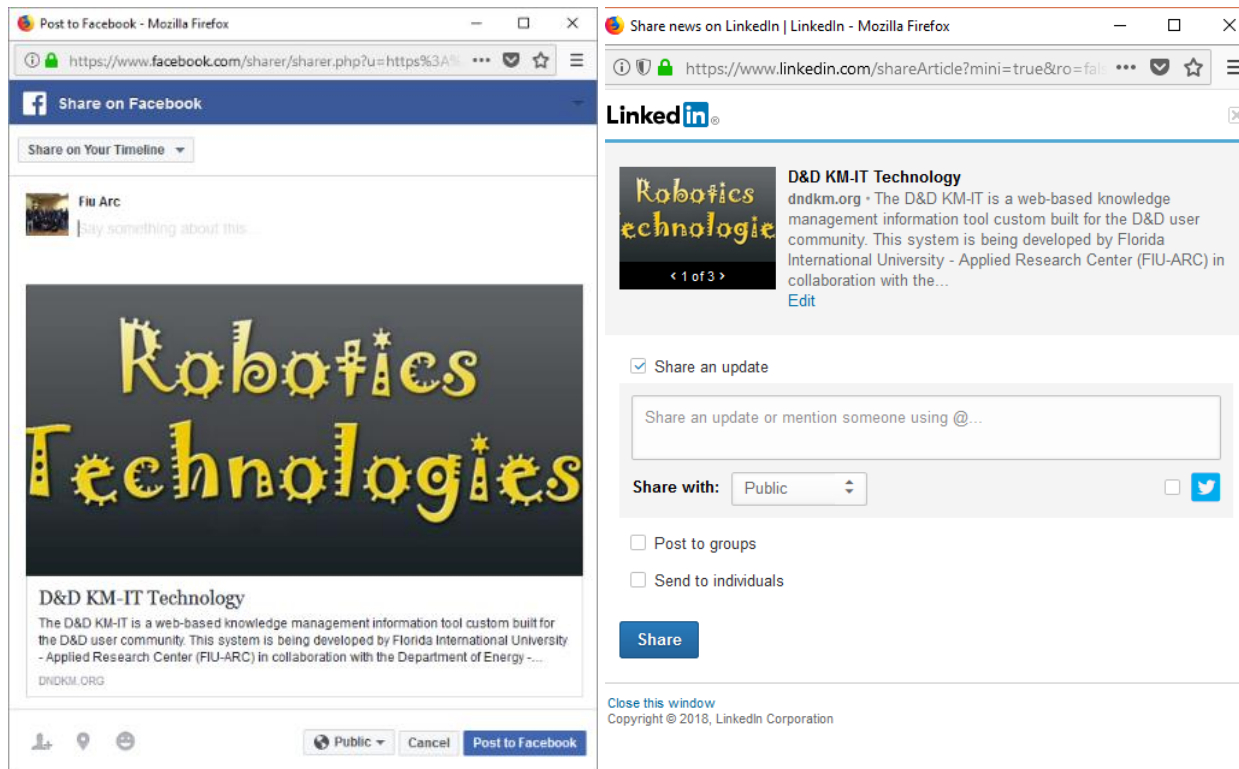


Figure 51. Facebook (left) and LinkedIn (right) popups from social media buttons on the KM-IT website.

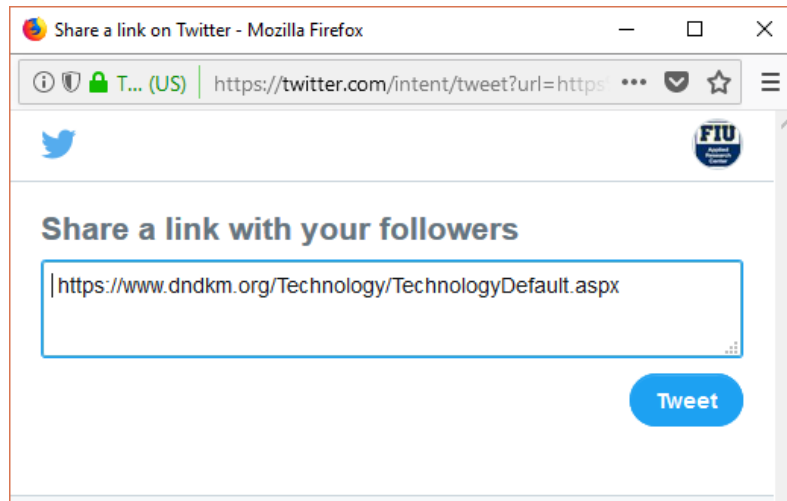


Figure 52. Twitter popup from social media buttons on the KM-IT website.

Administration

System, database, and network administration are ongoing activities that FIU undertakes to maintain servers and applications to ensure a consistent high level of performance. FIU continued these efforts during this reporting period. System administration included the day-to-day maintenance and administration of the KM-IT application, network, and database servers. Major tasks involved load balancing, active directory accounts, security patches, operating system updates, system optimization, server monitoring, and emergency problem resolution. Database administration included database backup, optimization, performance tuning, system security, controlling and monitoring user access to the database, and maintaining the database cluster. Finally, the network administration involved monitoring the network and server traffic, installing and maintaining the network hardware/software, assigning addresses to computers and devices on the network, troubleshooting network activities and performance tuning.

Data Mining

DOE Fellows performed data management activities in order to add current and relevant data to the KM-IT System. Their efforts included identifying and adding additional vendors and technologies from industry journals, conference publications, and news announcements as well as researching additional relevant technologies offered by existing vendors. As of the end of September 2018, the KM-IT system included a total of 962 vendors and 916 technologies. Based on a request from DOE EM, the robotics technology data originating from the original Cogentus database has been removed from KM-IT. All technology information remaining in KM-IT, including robotics, was populated by FIU.

News

FIU explored potential sources of information for D&D related news and is gathering and updating D&D KM-IT with D&D related news around the globe from multiple news sources. The following figure shows a screen shot of the industry news displayed on the homepage of D&D KM-IT.

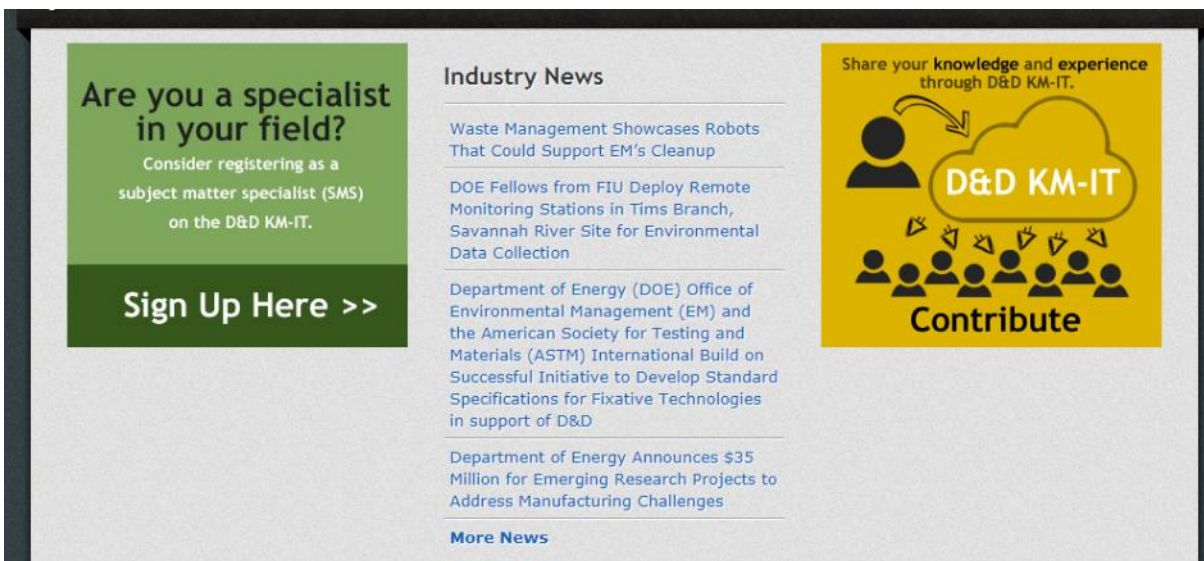


Figure 53. Industry news links displayed on homepage of D&D KM-IT.

TASK 3: CONCLUSIONS

Planning for the D&D of facilities across the DOE complex is a tremendous undertaking, especially considering that a significant number of the facilities contain hazards to human health and the environment: seriously deteriorated structural integrity, very high dose rates, high levels of fixed and removable contamination on/in facility surfaces and equipment, and chemically hazardous materials. Capturing the knowledge, experience, and lessons learned from historic D&D activities at DOE sites is imperative to the successful and safe management of future D&D projects. The Knowledge Management and Information Tool is a central initiative to accomplish these goals.

TASK 3: REFERENCES

D&D Knowledge Management Information Tool (D&D KM-IT), www.dndkm.org, Applied Research Center, Florida International University.

Upadhyay, H., L. Lagos, W. Quintero, P. Shoffner. *KM-IT Mobile Platform for D&D*, Phoenix, AZ, March 18-22, 2018.

OVERALL PROJECT CONCLUSIONS

WIMS continues to successfully accomplish the goals and objectives set forth by DOE for this project. WIMS has replaced the historic process of each DOE site gathering, organizing, and reporting their waste forecast information utilizing different database and display technologies. In addition, WIMS meets DOE's objective to have the complex-wide waste forecast information available to all stakeholders and the public in one easy-to-navigate system. The enhancements to WIMS made over the last year include annual updated data sets.

The D&D support work for this period of performance included:: 1) supported SRNL in addressing high priority fire resiliency, protection and safety requirements in support of the SRS 235-F risk reduction project and across the DOE EM complex by conducting fire testing on intumescent coatings and foams; 2) identified broader applications for intumescent coating technologies to mitigate the impacts of contingency scenarios across the DOE complex; 3) executed a phased approach for the standards development, testing, evaluation, and deployment of D&D technologies; 4) supported an onsite demonstration at SRS of the intumescent coating; and 5) collaborated with ASTM to continue development of standards and testing protocols in support of D&D technologies. FIU further supported the EM D&D program by participating in D&D workshops, conferences, and serving as subject matter experts.

These activities provide DOE with the information necessary to complete D&D safely and effectively for facilities which contain hazards that prevent the use of safe manual techniques; enhance safety while reducing risk to workers, the public, and the environment; reduce the future cost, schedule, and risk for similar work through a thorough understanding of existing technologies and technical approaches from past D&D projects, and provide the tools necessary to successfully complete difficult D&D tasks that can then be applied complex-wide to similar DOE facilities.

Planning for the D&D of facilities across the DOE complex is a tremendous undertaking. Capturing the knowledge, experience, and lessons learned from historic D&D activities at DOE sites is imperative to the successful and safe management of future D&D projects. The DOE D&D support task and the KM-IT are two central initiatives to accomplish these goals and FIU has made significant contributions towards developing these tools. The KM-IT system was developed by FIU in collaboration with DOE, EFCOG, and the former ALARA Center at Hanford and former ISSC at Savannah River. The KM-IT system is ultimately a tool for and by the D&D community. Its success will be dependent on the participation and cooperation of those for whom it was designed.

APPENDIX

The following reports are available at the DOE Research website for the Cooperative Agreement between the U.S. Department of Energy Office of Environmental Management and the Applied Research Center at Florida International University: <http://doeresearch.fiu.edu>

1. Florida International University, *Project Technical Plan*, Project 3: Waste and D&D Engineering and Technology Development, September 2017.
2. Florida International University, *Robotic Technologies for D&D Applications – Conceptual Design for Remote Measurement of Coating Thickness*, Technical Report, December 2017.
3. Florida International University, *Incombustible Fixatives – Adapting Intumescent Coatings as Fire Retardant Fixatives to Support D&D Activities*, Technical Report, October 2017.
4. Florida International University, *Testing and Evaluating Radiological Shielding Foams Resistance to Thermal Stressors*, Test Plan, January 2018.
5. Florida International University, *Potential Application of Intumescent Coatings to Address Safety Basis Requirements*, Technical Report, July 2017.