# DOER **Operations Technologies Focus Area** NNOVATION NNOVATION

**Timothy Welp** 

# Operations Technologies (OT) Focus Area

### **Objective:**

To provide the dredging community of practice with technological solutions to successfully make changes to address both today's and tomorrow's challenges.



### OT Approach To Meeting Objective



- Identify innovative, or develop where necessary, operations technologies,
- Test these new technologies in locations and situations suitable to evaluate performance in terms of defined metrics,
- Facilitate implementation of well-performing technologies into the dredging community of practice.

# **OT Structure**

- Diffusion of Innovative Technologies (DoIT) Work Unit
- Dredging Technologies and Operations (DTOS) Work Unit



# Diffusion of Innovative Technologies (DoIT) Work Unit



- Identifies mature innovative operations technologies that exhibit potential.
- Objectively demonstrates/evaluates these technologies.
- Conducts diffusion activities to foster the successful implementation (adoption) of these technologies.

### Dredging Technologies and Operations (DTOS) Work Unit

Where mature technologies are not available, or are not in a form suitable to meet specific USACE dredging operations needs, DTOS conducts research and develops new, or modifies existing technologies, for USACE use.

### Diesel Fuel Additive/Alternatives Performance Investigations

- Problem/Purpose
  - Rising dredging costs a function of rising diesel fuel costs.
  - Fuel additives and alternatives available but not objectively tested by USACE.
- Solution/Approach
  - Evaluate additives and/or fuel alternatives performance and use on USACE diesel plants.
  - Optimize USACE fuel management practices.



- Products
  - Diesel fuel additive performance test results report
  - Draft USACE Fuel Management Practices Report





**Coriolis meter** 



De-aeration equipment



#### SOUTHERN RESEARCH

#### Legendary Discoveries. Leading Innovation.





### Sediment Treatment Processes Demonstrations

#### Problem/Purpose

- Limited institutional treatment background
  - Impediment to technical evaluation of proposals
  - Inappropriate & ineffective performance specifications
  - Higher risk = higher cost (what you don't know CAN hurt you...)



#### • Solution/Approach

- Obtain operational information on the SAJ Miami River Dredging project and support/document the SPL Sediment Treatment and Remediation (STAR) Project.
- Transfer "lessons learned" to the Corps community

- Products
  - DOER Technical Note Miami River Project – Modular Separation and Dewatering Plant and LA STAR Project



### Miami River Project











### Draghead Modifications and Bed Leveler Studies for TES Protection

#### Problem/Purpose

- Draghead and bed leveler improvement recommendations are outlined in several Regional Biological Opinions.
- USACE has not addressed any further evaluations of dredging equipment for TES protection since the original inception of the turtle deflector in 1994.

### Solution/Approach

 To conduct engineering and biological evaluations with innovative dredging technologies for increased TES protection while minimizing impacts on dredge production rates.





#### Products

- Report on Model Bed Leveler Study
- Contract Specs of "Modified Bed Leveler" equipment





### High Resolution Fluid Mud/Residuals Survey System

#### Problem/Purpose

- Sounding pole, lead line, and acoustic echo sounding will generally not correlate with one another, or give consistent readings from one time to the next when the same type of instrument is used in fluid mud.
- This measurement ambiguity has hindered Corps management of fluid mud projects

### Solution/Approach

 Improve USACE capability to more accurately characterize fluid mud and dredging residuals with increased resolution density probe that doesn't require calibration.



• Products

- TN: World-wide Fluid mud Surveying Systems and Nautical Depth Definitions
- White Paper discussing engineering feasibility of Corps implementation of a nautical depth policy.
- High-resolution prototype probe and testing report.



### **Overdepth Dredging Tools**

#### Problem/Purpose

 The EPA has raised concerns related to the dredging of material from outside authorized channel dimensions.

### Solution/Approach

- Provide quantitative understanding of overdepth dredging.
- Provide operations managers with tools to monitor overdepth dredging.



- Products
  - Statistical analyses of different dredge type excavation/overdepth accuracies.
  - Hypack overdredge statistics module
  - Peer-reviewed journal manuscript

### Hypack Dredge Statistics (Prototype I)

File <u>Edit</u> Before Dredge Survey (	C:\HYPACK 2009\Projects\R			
Before Dredge Survey (	C:\HYPACK 2009\Projects\R			
	C:\HYPACK 2009\Projects\RaysProject\Sort\ERDC Bennett:			Number of Samples
After Dredge Survey			1.0 nnett	
Area Limits C	C: \HYPACK 2009\Projects\R	aysProject\4+00 - 32+00	2.0 0 C 2.5	1 Sigma: 1.45
Channel Design Depth 6	6 Start Li	ne	-	
Overdepth Offset 1	1 End Lin	e		Mean (Before): 3.6
Material	Before	Dredge Date 03/23/200	09	
Dredge Type	Honner 👻 After D	redge Data 03/23/200		
	Before	After	Run 5.0	
Average Depth	3.58	7.45	6.0	
Standard Deviation	1.45	0.65	6.5	
epths Above Required Gra	ade 90.8%	1.7%	7.0	
Depths in Paid Overdepth	9.2%	18.2%		Mean (After): 7.5 Median Depth of Nonpay (After): 7.5
Pepths Beneath Paid Overd	depth 0.0%	80.1%		1 Simon 0.95
Median Depth of Nonpay	n/a	7.50	8.0	i signa. 0.05
rear peptro nonpay	iija	7.00	8.5	2 Sigma: 1.30

### SI Potential for Payment Purposes

#### Problem/Purpose

 Bin measure data currently obtained for payment or QA calculations is manually collected.

### • Products

- White Paper SI Hopper
   Measure Potential as a
   Contract Payment Basis
- Solution/Approach
  - Improve the USACE procedures and data accuracies for dredging contract QA and, if feasible, payments through use of SI data.
- Evaluation of historical SI data for potential payment report

Ullage Sensor Evaluation Onboard GLDD Hopper Dredge *Terrapin* 



### **CE-Dredge**

- Problem/Purpose
  - Dredging information and data are stored in multiple databases, servers, and desktops in multiple formats.
  - Information is difficult to access, visualize, and analyze in a timely manner.
  - Access to regional & national information is very limited.
  - Redundant data entry for multiple uses
- Solution/Approach
  - Provide a single, integrated, webbased system for the management, archival, access, and visualization of regional and national dredging related data and information.
  - Standardize formats, tools, methods, and procedures.
  - Improve forecasting budgets, schedules, and future volumes, capacities, and needs for dredging and disposal facilities.

- Products
  - Design Documentation, Phase I
  - CE-Dredge Application Launch
     Pad
  - Dredging History Database
     Application Phase I: Summary
     Reports, Online Mapping, Disposal
     Area Management, Sediment
     Sampling
  - Survey management tools, Phase I
  - Link to DIS, SI databases
  - Website, manual Phase I



### Pipeline Dredge Selection and Dredge Material Placement Screening Tool

#### Problem/Purpose

 Evaluation of different placement sites and optimization of hydraulic pipeline dredge size and necessity of booster pumps requires labour intensive tedious calculations.



### Solution/Approach

- Develop pipeline analytical program
- Rules-based scheduling application
- Graphical user interface

#### • Products

- Desktop software (beta version) analyzing pipeline dredge projects
- Accompanying draft user's manual

### **DoIT Website**



#### Diffusion of Innovative Technologies (DoIT)

U.S. Army Corps of Engineers | Engineer Research and Development Center | Warning

<u>DoIt Home</u>

 <u>DoIT</u> <u>Innovation</u> <u>Submission Form</u>

DoIT Information

What is DoIT?
How does DoIT

Operate?

What is IAP?
Criteria



#### What is the Diffusion of Innovative Technologies (DoIT) Work Unit?

Historically, there has been no programmatic or systematic approach to demonstrating, evaluating, and communicating information on new (innovative) dredging technologies in the U.S. Army Corps of Engineers (USACE) dredging program. The <u>Diffusion</u> of Innovative Technologies (DoIT) work unit of the <u>Dredging</u> <u>Operations and Environmental Research (DOER)</u> program identifies mature innovative technologies that exhibit potential to improve the USACE capacity to achieve its **navigation dredging mission**, objectively demonstrates/evaluates these technologies, and conducts diffusion activies to foster their use by the dredging community. Candidate technologies can consiste of either an object, practice, or idea (e.g. new types of dredging equipment, construction methods / techniques, software, surveying methods, tools, and contracting methods).

#### How Does DoIT Operate?

#### Innovation Identification:

There are several ways the DoIT work unit identifies innovation technologies; active and passive.

DoIT active steps for identifying innovative technologies include:

- Making contact with industry by holding "topic specific" as well as general forums for groups that have innovative dredging technologies.
- Contacting other agencies (government and non-governmental) that have similar needs and, therefore, possibly similar innovative ideas that are being practiced by them or that have been submitted to them.
- 3. Conduting periodic literature reviews (at least two times per year) for

#### http://el.erdc.usace.army.mil/dots/doer/DoIT/doit.html

# YOUR INPUT

- What needs do you see in these areas?
  - Identifying, demonstrating, and evaluating innovative technologies
  - Tools to address dredging operations needs

