

Dredge Technology Innovation

USACE Dredging Operations
Environmental Research (DOER)

Facilitated by
Ram Mohan, PhD, PE, F.ASCE

Panelists
Ancil Taylor, Consultant
(former Callan Marine; Bean Dredging; Boskalis)

Dylan Davis, USACE HQ/SAD

Don Hayes, PhD, PE, The Dredging Professor

Dave Johanson, PE, Great Lakes Dredge & Dock

WEDA Eastern Chapter Meeting
Jacksonville, Florida
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Photo courtesy of U.S. Army Corps of Engineers

Panel Objectives

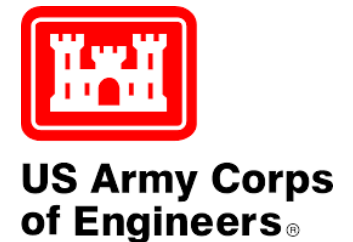
- Review potential areas of dredging innovation in the United States
 - Dredge technology
 - Operations
 - Automation
- Gather input from stakeholders on key areas for USACE and ERDC research



Photo courtesy of U.S. Army Corps of Engineers

Panelists

- Ancil Taylor
 - Consultant | Former Dredger
- Dylan Davis
 - Government | USACE SAD/HQ
- Don Hayes
 - Consultant | Former ERDC/Professor
- Dave Johanson
 - Dredging Contractor | Executive



Panel Focus

- Review the opportunity and need for dredging innovation in the United States for the major types of dredges:
 - Hopper dredges
 - Cutterhead dredges
 - Mechanical dredges
- Additional focus on how to advance BU using improved technologies

KSB MDX-850



Photo courtesy of KSB/GIW

Panel Focus (Cont.)

- Encourage broader use of effective technology across all major U.S. dredging companies
- Explore cost-effective technological innovations and encourage ways to improve their operating cost efficiency

IMS 1008 Booster Pump



Photo courtesy of IMS Dredge

Panel Focus (Cont.)

- Explore how U.S. agencies responsible for procuring dredging services can encourage dredge technology innovation in the industry
- Focus on innovative technology that is proven, technically implementable, and easily understood, maintained, and operated by the dredge crew



Photo courtesy of Eddy Pump

Cutterhead Dredges



Photo courtesy of Dredge Supply Company

Technology Advances: Instrumentation/Automation

- Measurement of flow/velocity
 - Magnetic or Doppler flow meters
- Slurry density measurements
 - Nuclear and non-nuclear devices
- Improved production monitoring
 - Provide feedback from DQM back to dredgers?
- Spud carriages
 - Dual carriages or titling designs

Magnetic Flowmeter



Photo courtesy of Ancil Taylor

Technology Advances: Instrumentation (Cont.)

- Gas ejection at the first dredge pump
 - Move gas extraction point to the eye of the impeller?
- Flow control
 - Improved technology to optimize choice of velocity setpoints
- Full swing control
 - Auto slope dredging and auto cutter depth/elevation
- Jet production drive systems
- High-pressure water jet
- Internal cutterhead trash screening

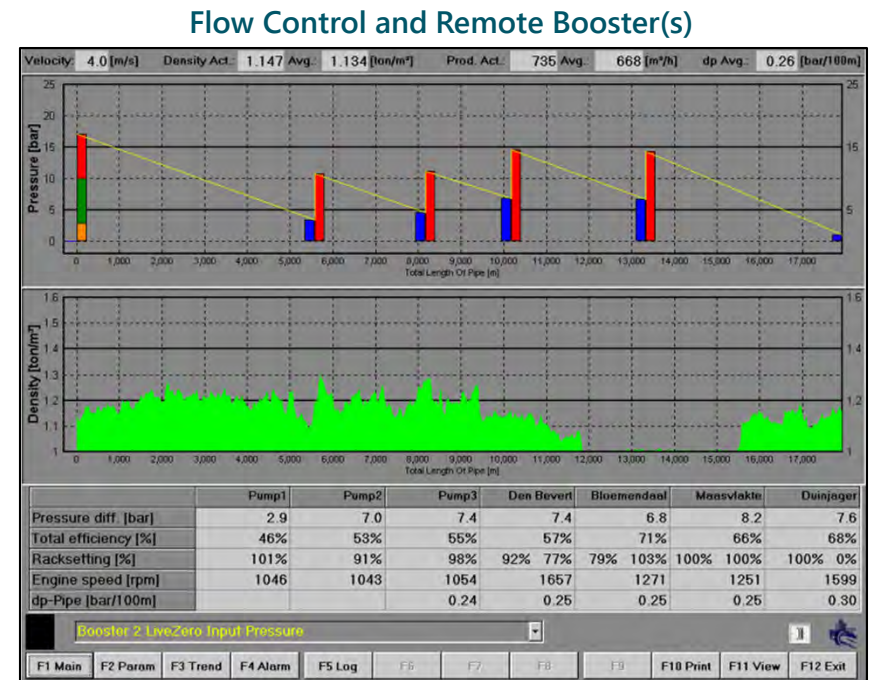


Photo courtesy of Ancil Taylor

Mechanical Dredges



Photo courtesy of Great Lakes Dredge & Dock Company

Technology Advances: Bucket Designs

- “Watertight” buckets
- Level-cut buckets
 - e.g., Cable-Arm
- Articulating buckets
- GPS monitoring and calibration
- Automated swing control
- Scows electronic monitoring integrated into dredging sequence/logic

Cable-Arm Bucket



Photo courtesy of Cable-Arm

Hopper Dredges



Photo courtesy of Manson Construction

Technology Advances: Optimizing Production

- Optimizing production
 - Trailing speed, sailing speed, turning time, loading time, hopper capacity
- Improved drag arms
 - Dredge pumps on drag arms
 - Active (automated) drag heads
- DQM monitoring of cycle times/production
- Automatic light mixture overboard (ALMO)
- Hopper deep loader
- Silt tanks
- Environmental controls
 - Deterring biologic intake



Photo courtesy of Cashman Dredging

Reminder: Panel Objectives

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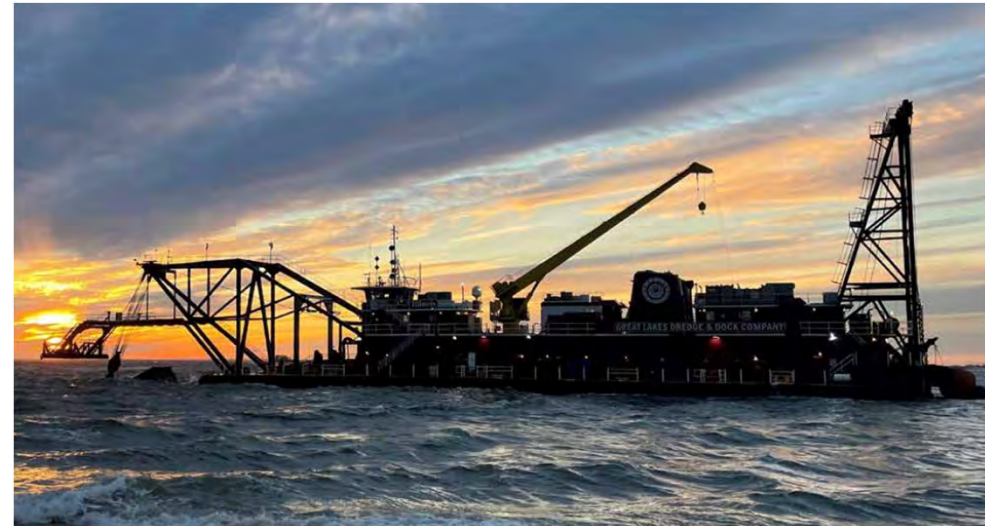


Photo courtesy of Great Lakes Dredge & Dock

Question No. 1

- How can dredge automation further improve performance and production? Will dredge automation help improve dredge performance and production?
 - What's next in dredge automation?



Photo courtesy of U.S. Army Corps of Engineers

Question No. 2

- Do we need new/improved dredge equipment/technology?
 - If so, how specifically?
 - What are the “low-hanging” fruits?

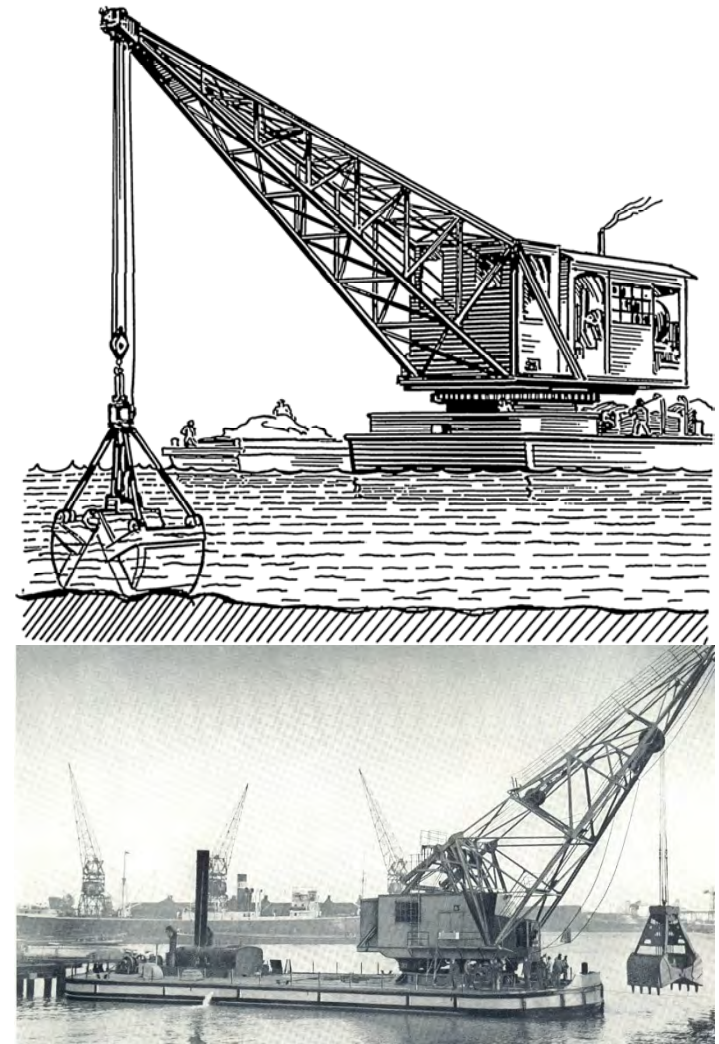
Cable Deployed Barge Unloader



Photo courtesy of Eddy Pump Corporation

Question No. 3

- What are the top two items to innovate to improve dredge production for:
 - Cutterhead dredges?
 - Mechanical dredges?
 - Hopper dredges?



Question No. 4

- Are there innovations needed for dredge pumps and boosters to make them more efficient?
 - If so, how specifically?

KSB MDX-850



Photo courtesy of KSB/GIW

Question No. 5

- What innovations do we need on the placement side of the equation to promote more efficient BU?
 - Uniform placement?
 - Pumping distances?
 - Spray technology?
 - Other?

Seal Beach Thin Layer Placement



Photo courtesy of US Fish and Wildlife Service

Question No. 6

- Is there a role for AI in dredging?
 - Pros and cons?



Photo courtesy of THINKSTOCK

Question No. 7

- What are the unmet R&D needs related to dredge technology innovation?
 - How can we create “idea-incubators” to foster dredge innovation?
 - How to fund such projects?
 - Concept of “seed” money
 - Licensing aspects?





Photo courtesy of US Fish and Wildlife Service

Thank You!

Questions?
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