

# Dredge Technology Innovation

USACE Dredging Operations  
Environmental Research (DOER)

*Facilitated by*

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*Panelists*

Ancil Taylor, Consultant

Dylan Davis, USACE HQ/SAD

Don Hayes, PhD, PE, The Dredging Professor

Dave Johanson, Great Lakes Dredge & Dock Co.

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Photo courtesy of U.S. Army Corps of Engineers



# Panel Objectives

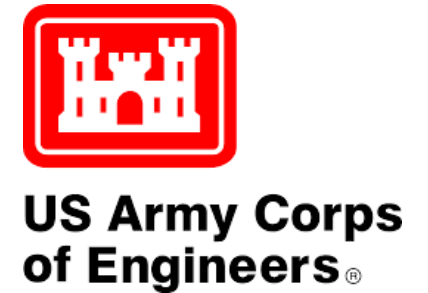
- Review potential areas of dredging innovation in the United States
  - Dredge technology
  - Operations
  - Automation
- Gather input from stakeholders on key areas for USACE and ERDC research



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

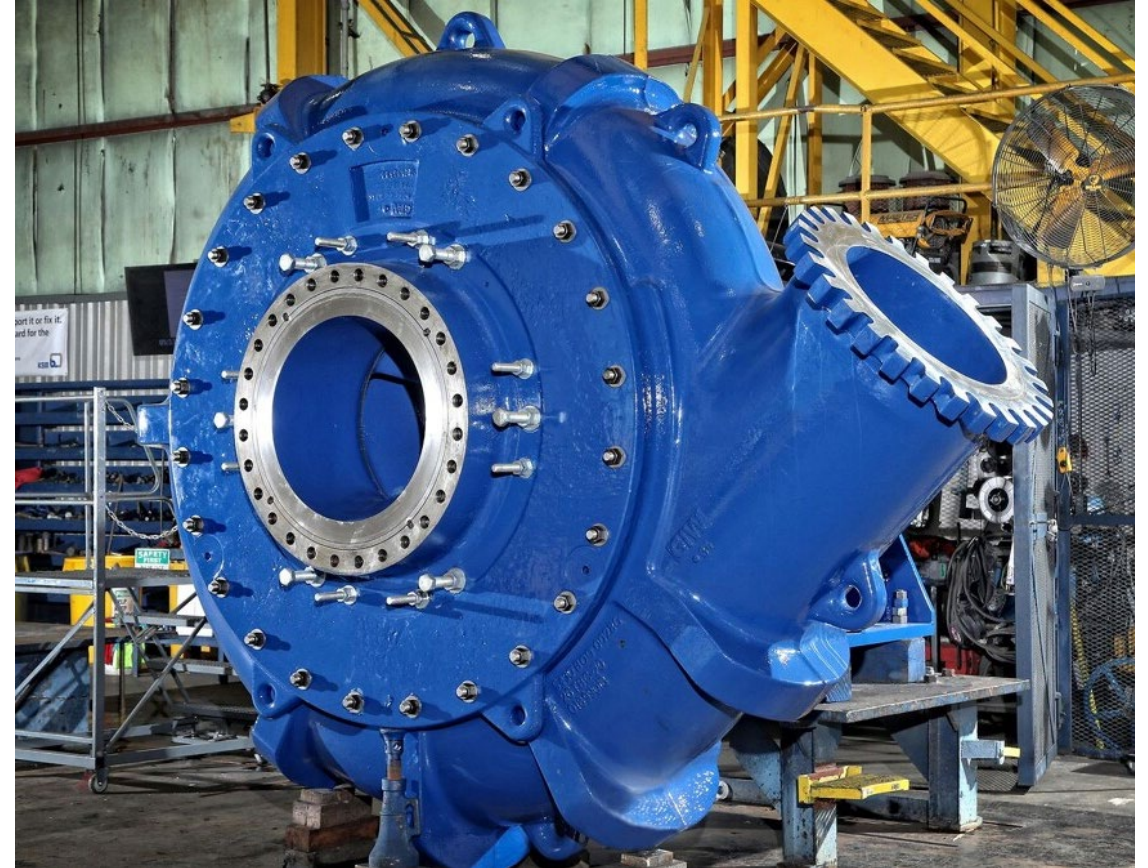


Photo courtesy of KSB/GIW

## 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
  - Evaluate a method of providing feedback from DQM back to dredgers, without violating proprietary concerns?
- 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

Flow Control and Remote Booster(s)

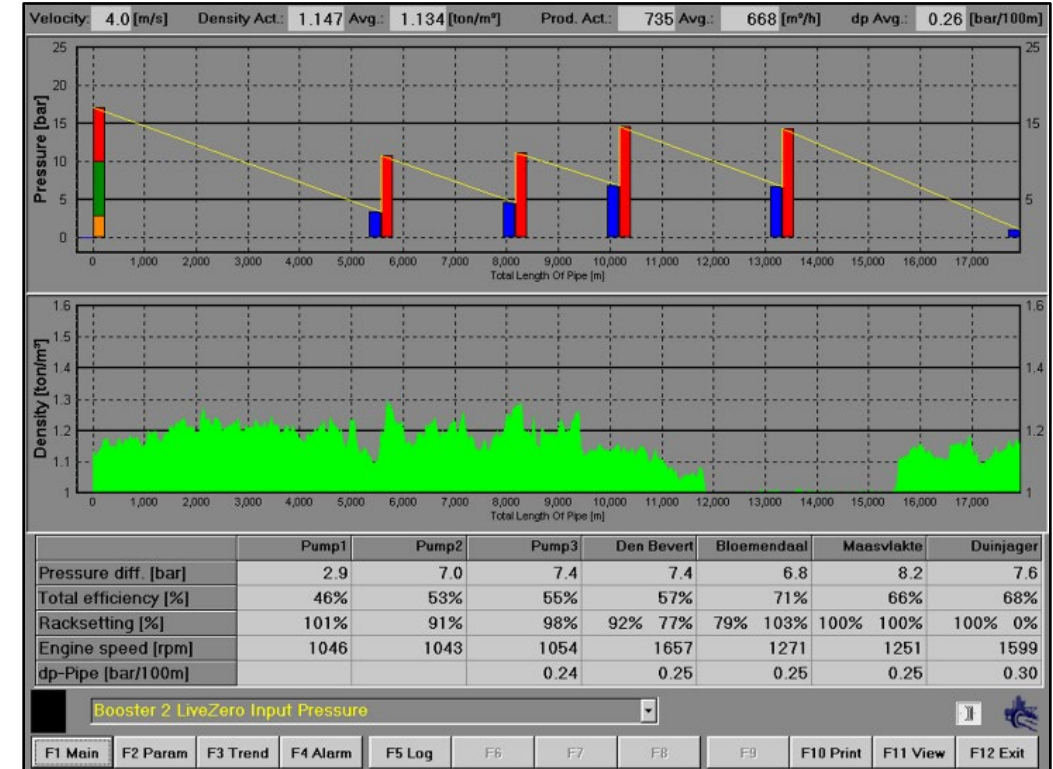


Photo courtesy of Ancil Taylor

# Mechanical Dredges



Photo courtesy of Great Lakes Dredge & Dock Company



# Technology Advances: Bucket Designs

- “Sealed” 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

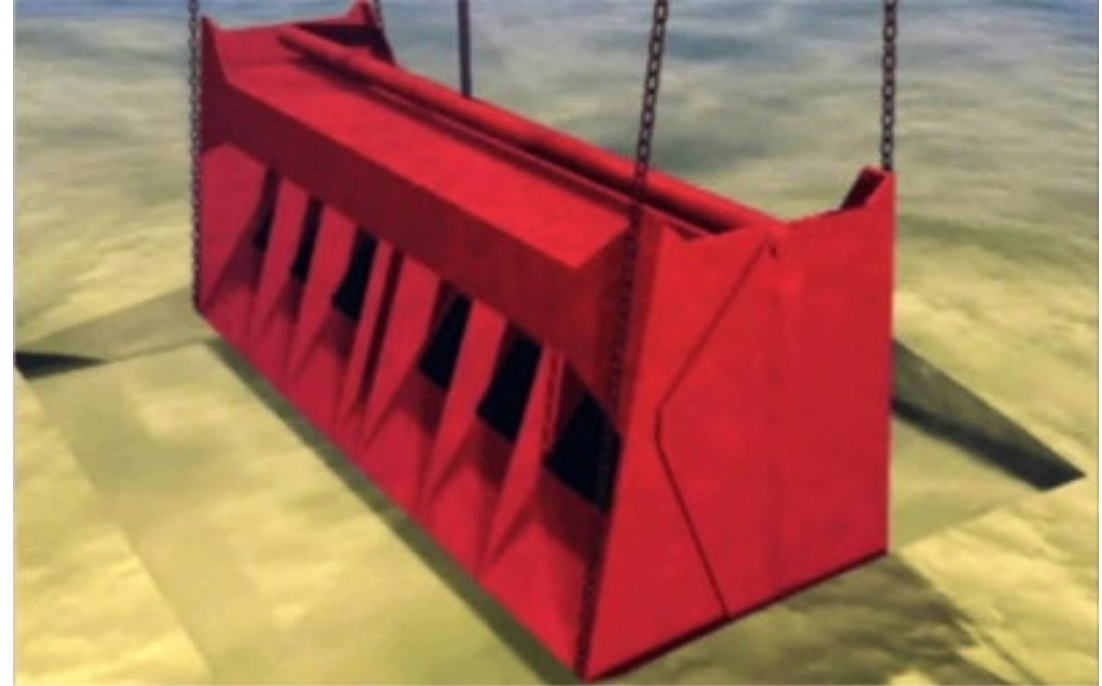


Photo courtesy of Cable-Arm

# 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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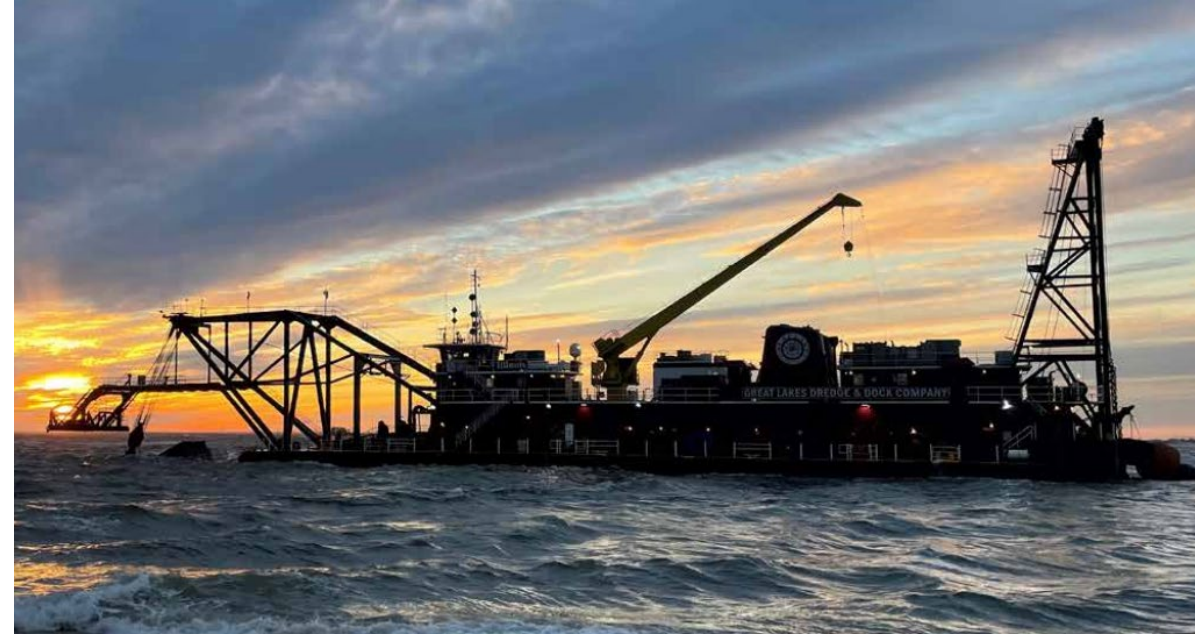


Photo courtesy of Great Lakes Dredge & Dock



# 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?

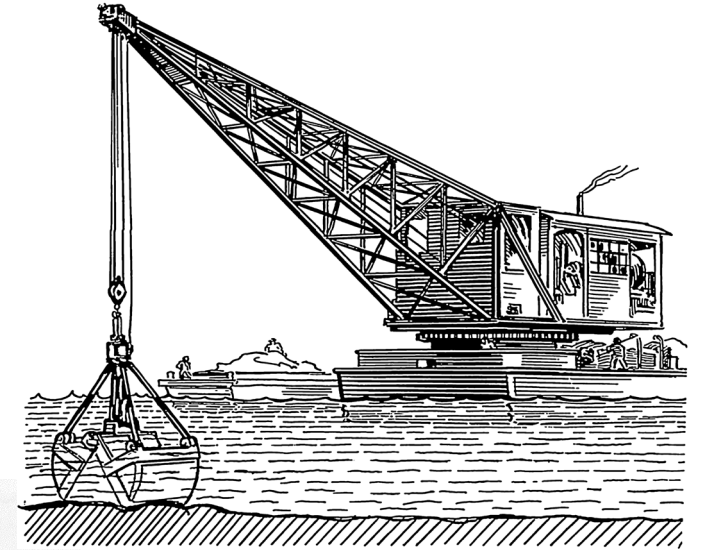


Photo courtesy of Eddy Pump Corporation

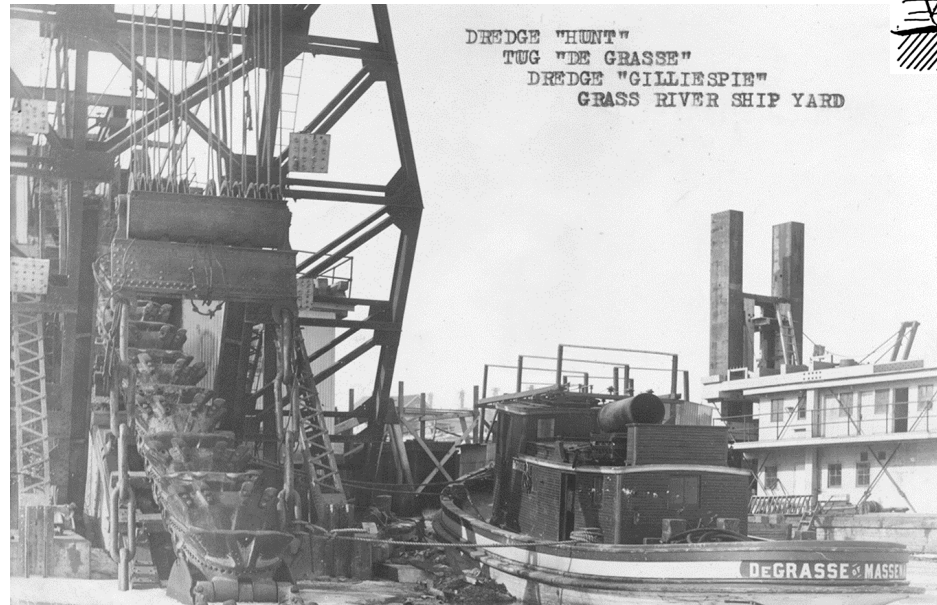


# Question No. 3

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



Photos courtesy of Wikipedia



Photos courtesy of Andrew Timmis (JF Brennan Company)

## Question No. 4

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

KSB MDX-850

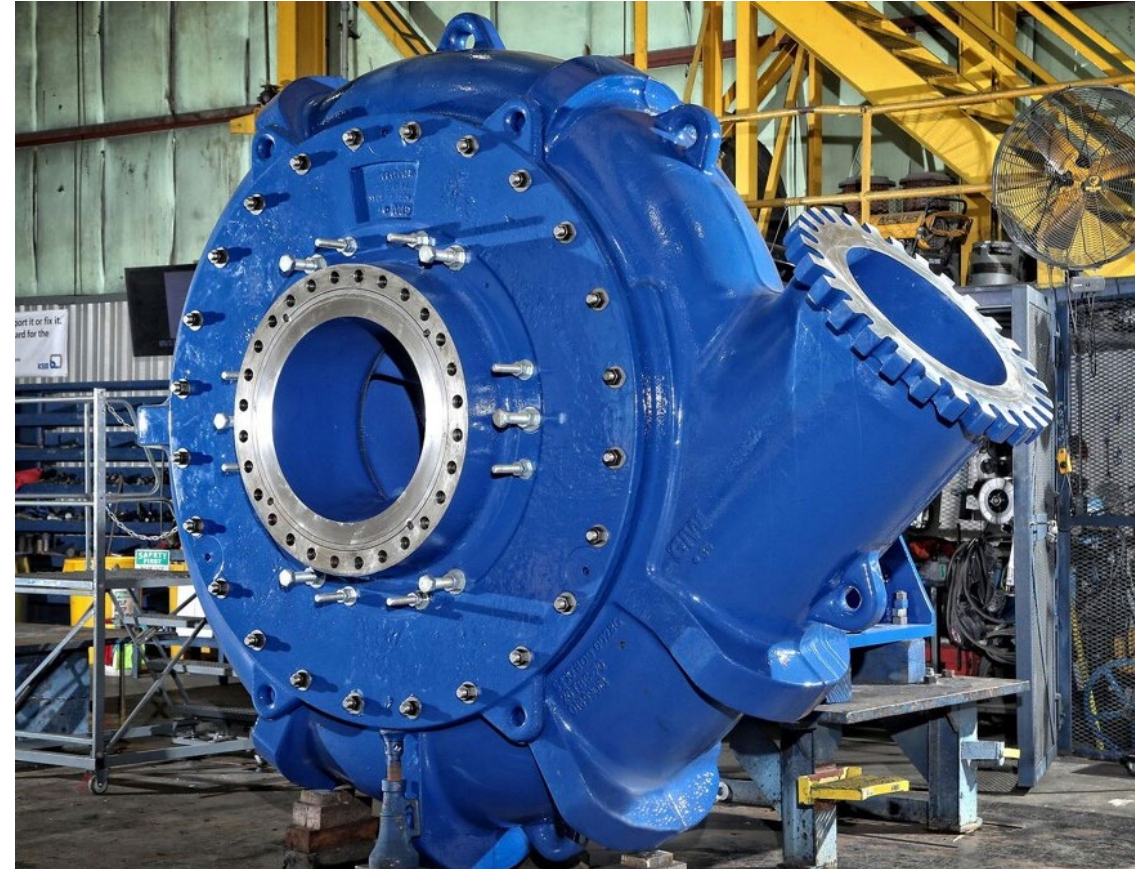


Photo courtesy of KSB/GIW



# 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?

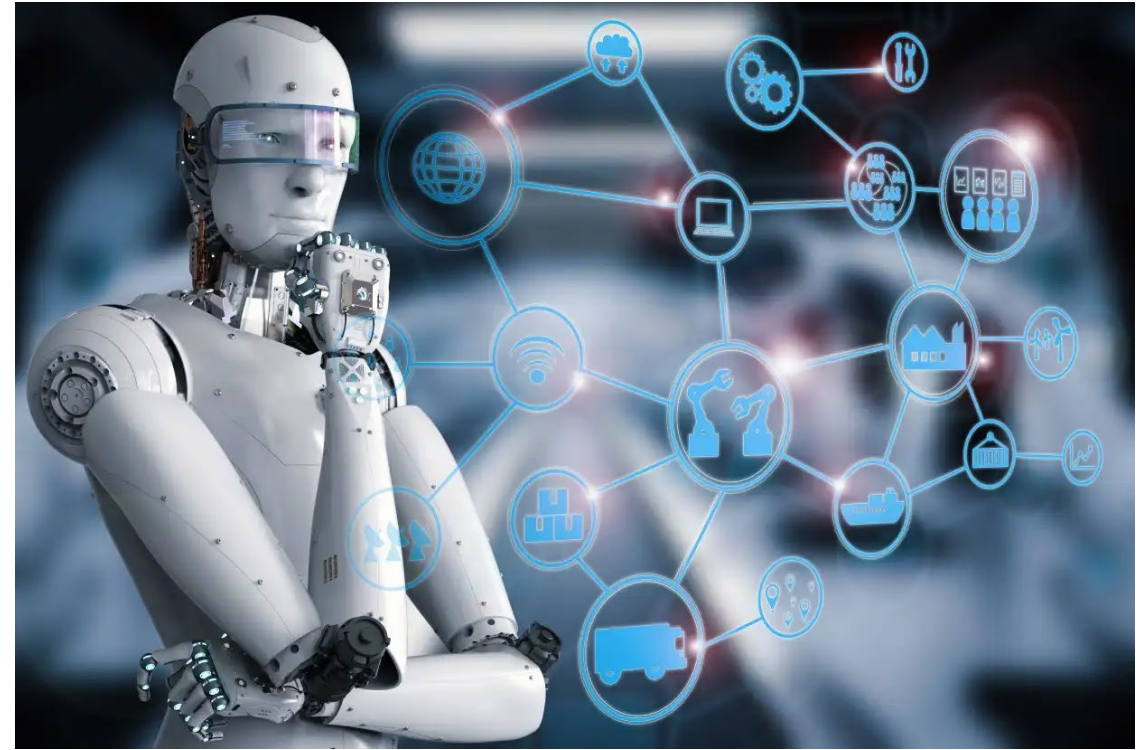
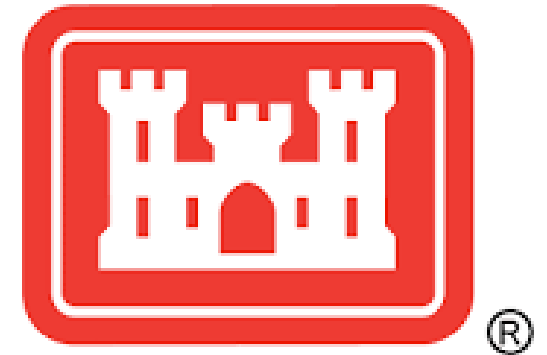


Photo courtesy of THINKSTOCK



# 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?





# Thank You!

## Questions?

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Photo courtesy of US Fish and Wildlife Service