# Dredging Monitoring Systems for marine excavators:

## Existing technology and future developments

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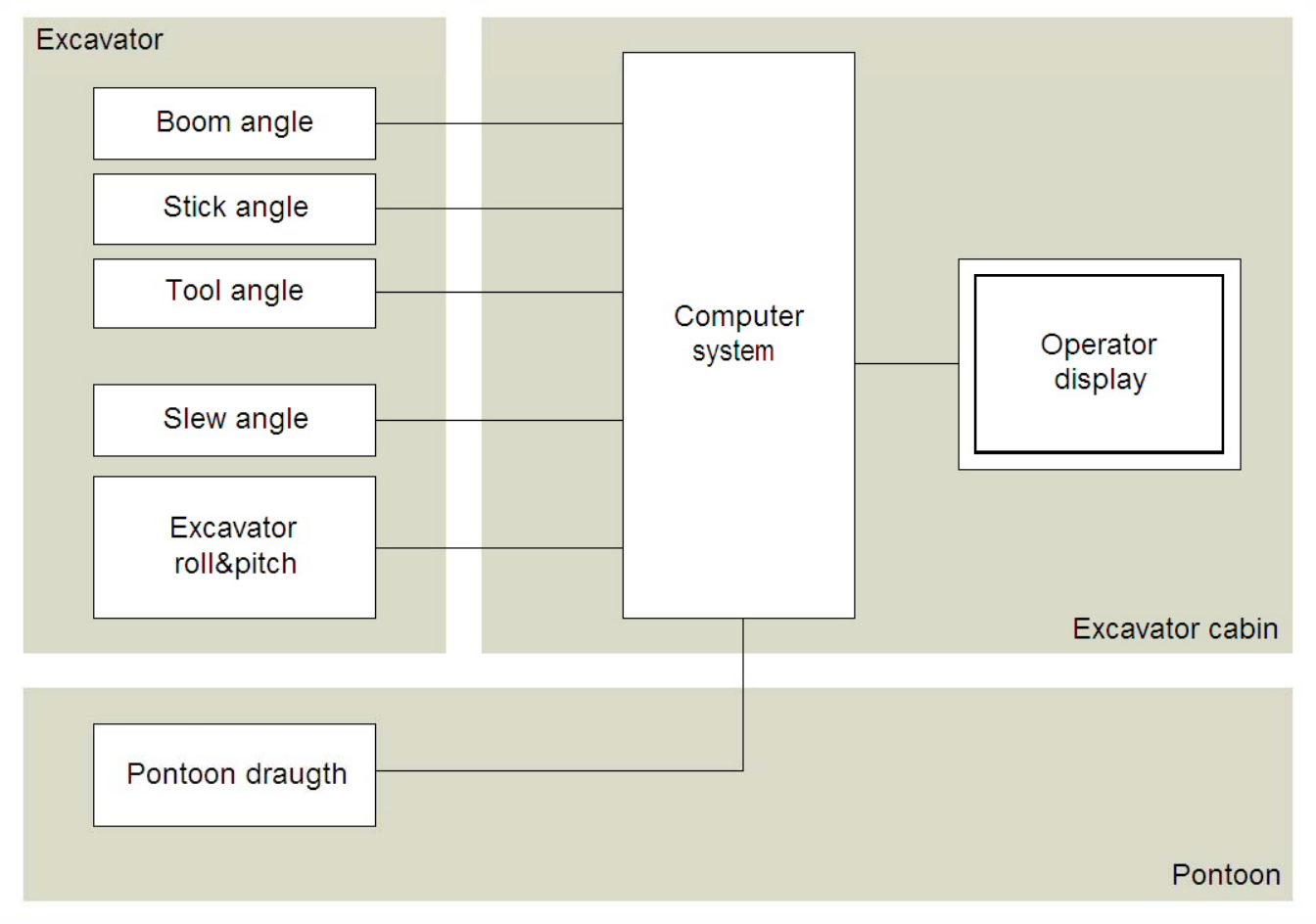
# Introduction

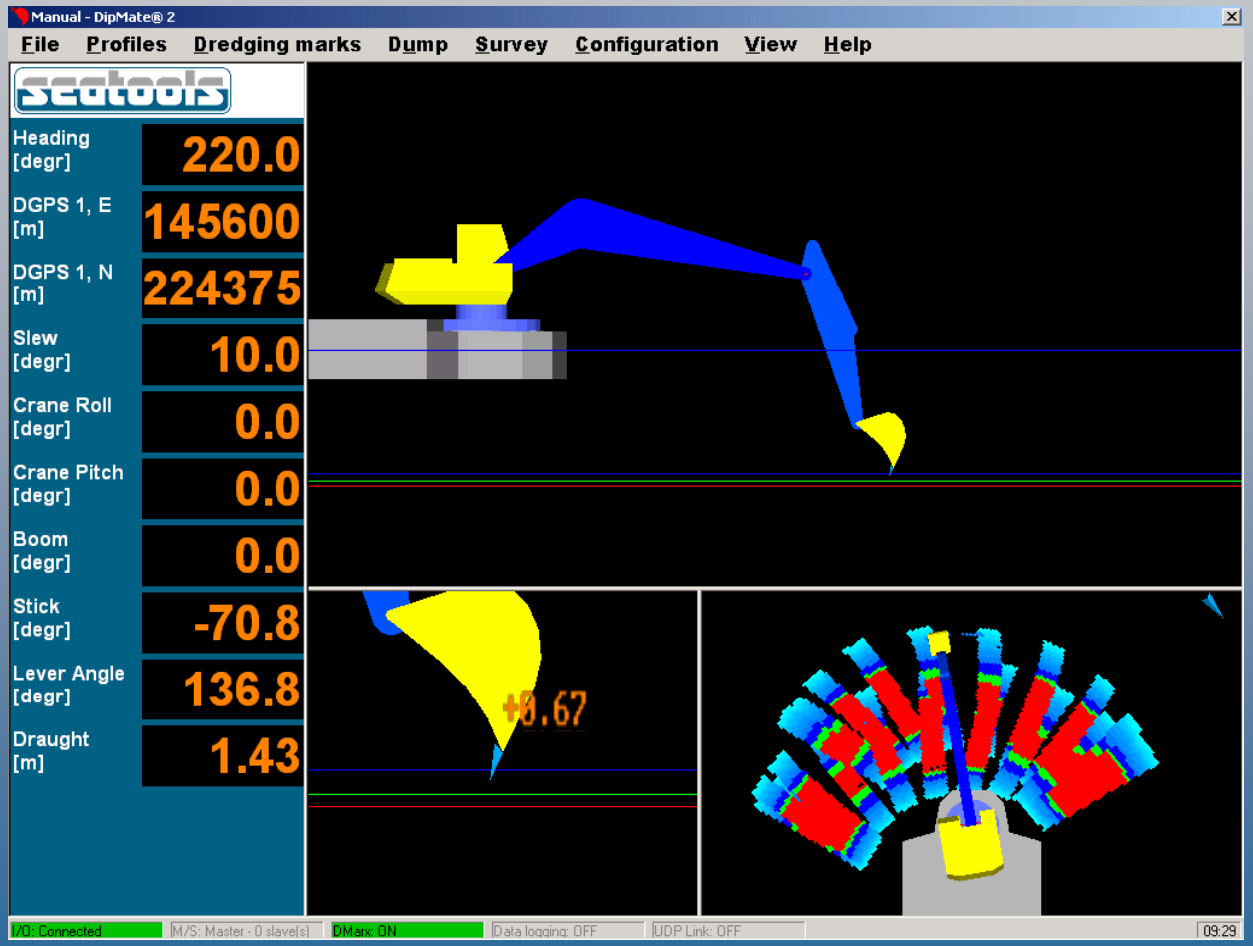
## What is a Dredging Monitoring System?

- An electronic system that does the registration and visualisation of the dredging process in real-time.
- The visualisation is showing the dredger and its surroundings:
  - the required design bottom profile
  - the realized bottom profile from the registration.

# System layout



# Operator view (typical)

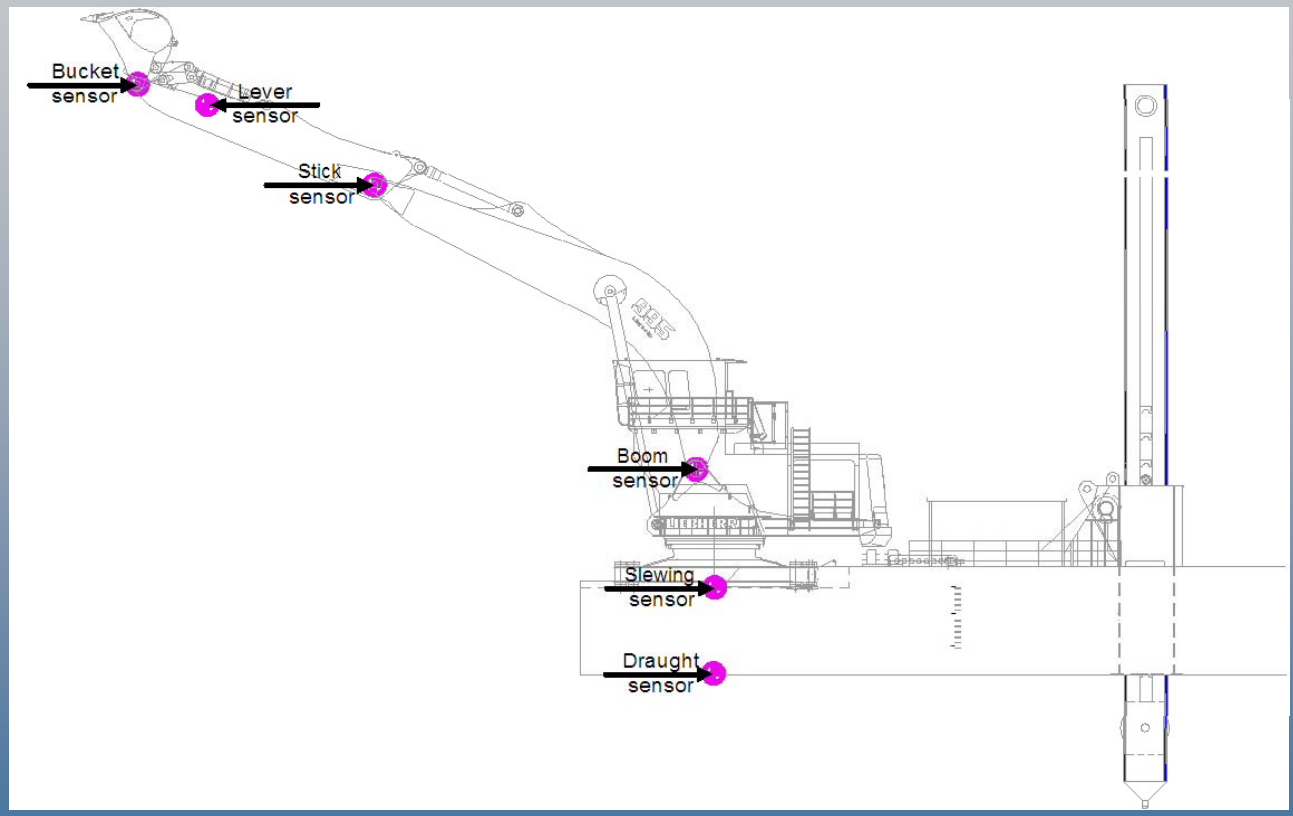


# System function

The system needs to calculate and visualize the position of the dredge tool using:

- sensors on the joints of the different excavator parts measuring the angles between these components.
- the dimensions of the parts (boom length, stick length etc.)

# System inputs – sensors




Sensors needed for the calculation of the dredge tool position

# System inputs – sensors (1)

- Bucket joint (or lever) rotation sensor
  - Measures the angle (direct/indirect) between the bucket and the stick. In essence, the sensor is a potentiometer.

# System inputs – sensors (2)

- Stick joint rotation sensor
  - Measures the angle between the stick and boom.

# System inputs – sensors (3)

- Boom joint rotation sensor
  - Measures the angle between the boom and excavator base.

# System inputs – sensors (4)

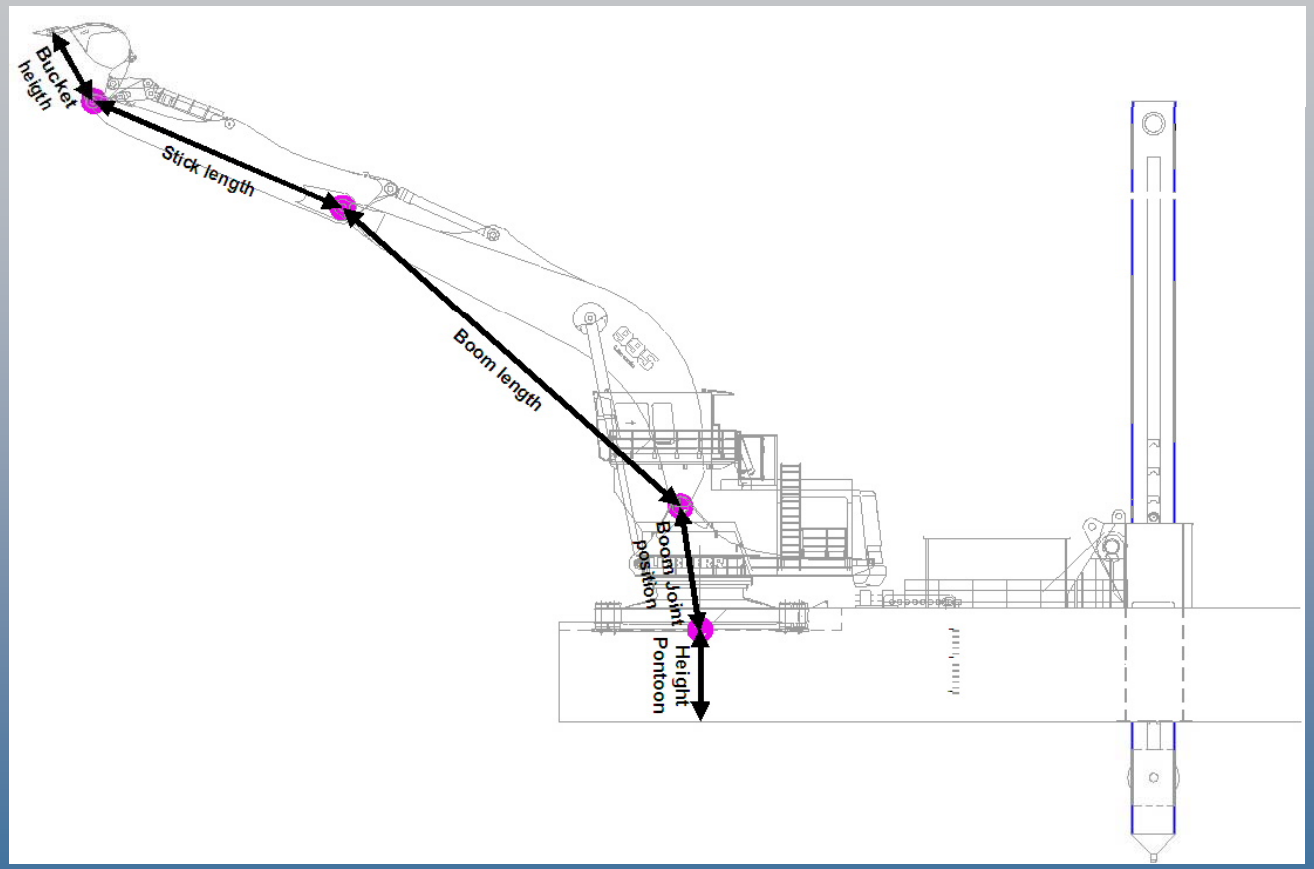
- Excavator slewing angle
  - Measures the rotation angle between excavator and pontoon.

# System inputs – sensors (6)

- Pontoon draught sensor
  - Measures the depth (pressure) at the bottom of the pontoon.

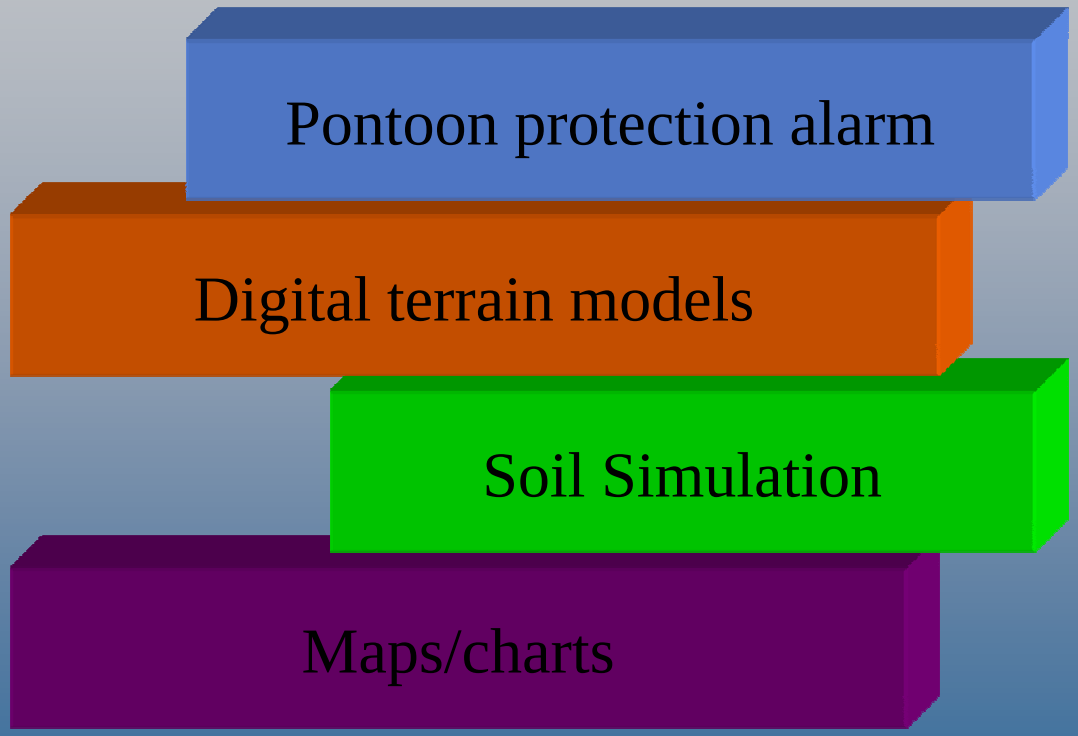
- Tidal receiver
  - Tide information is used in calculating the correct height between the waterline and the design profile.

# System input - dimensions



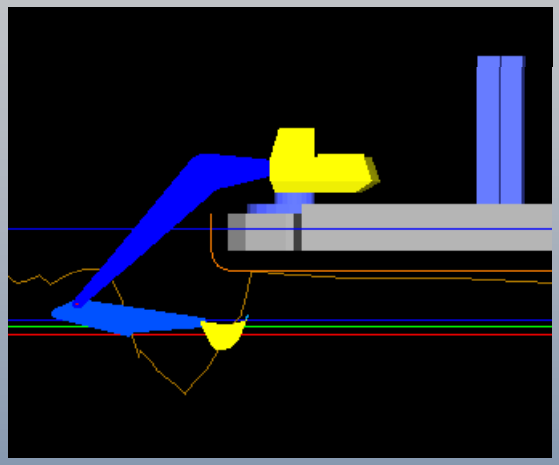

Dimensions needed for the calculation of the dredge tool position

# Software options (1)

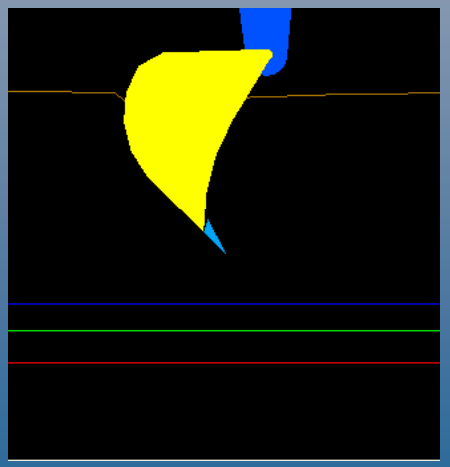


# Software options (1)

- Pontoon protection alarm
  - Prevention against damaging the pontoon with the bucket by alarming any dangerous situation.

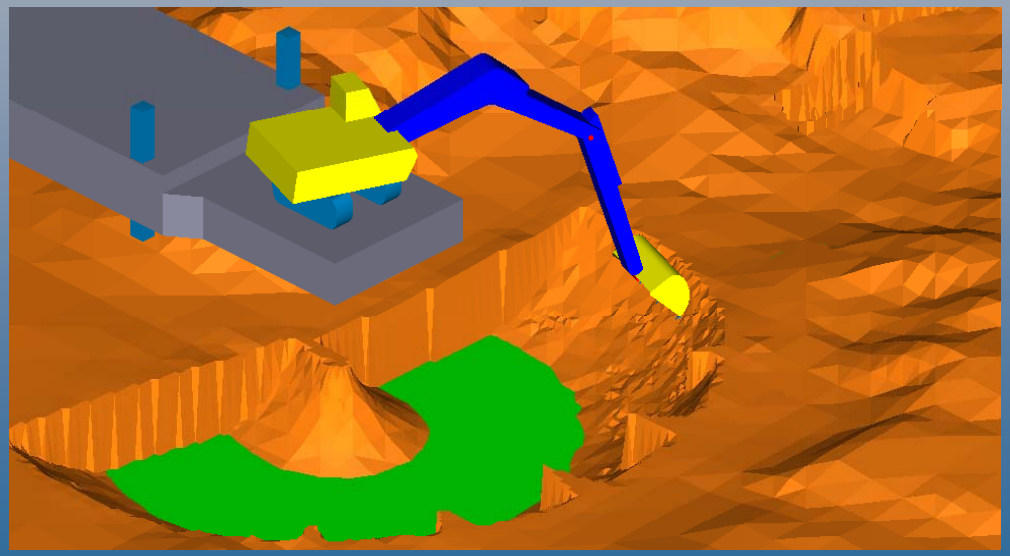


- Digital terrain models
  - Using survey data, show the current seabed line and the design profile together in one picture.



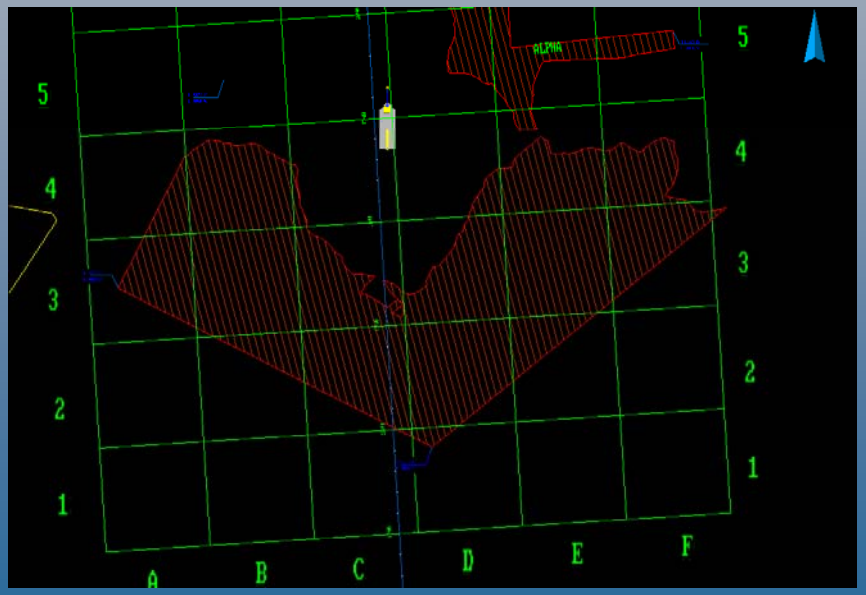
# Software options (2)

- Soil simulation
  - Simulating the dredging process by adapting the digital terrain model (survey data) based on the interaction between the dredge tools and soil



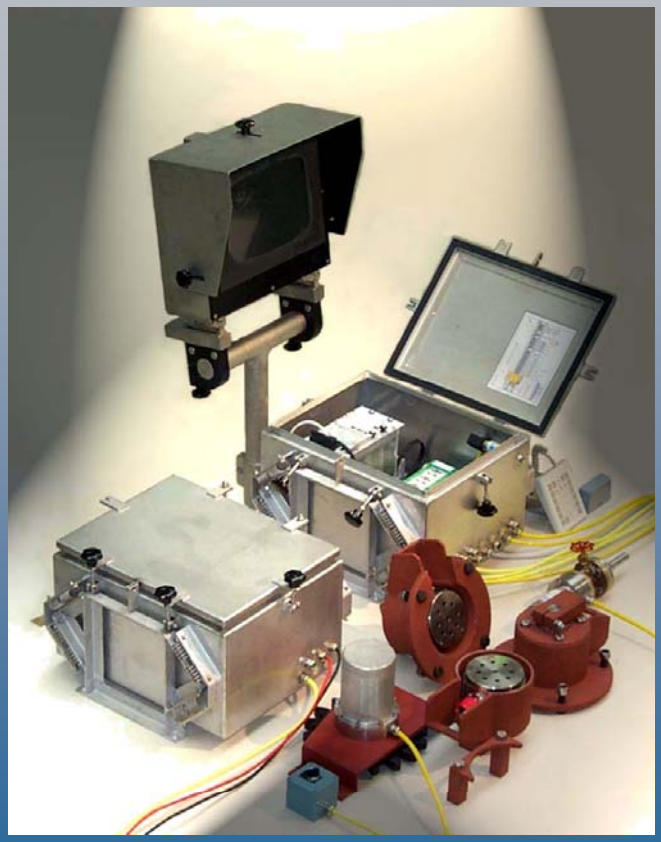
# Software options (3)

- Harbour charts
  - The dredge master can position the dredger precisely to a know spot assisted by the map.
  - Map can include information about sections to be dredged, subsea cables or pipelines.
  - GPS is required



# Practical example of a DMS

- DipMate from Seatools



# Clients using DipMate

ACP - R.M. Christensen

Jan De Nul – Il Principe

Hydro Wacht - Johannes

***20 systems installed worldwide***

Heron - Machiavelli

# Future of DMS

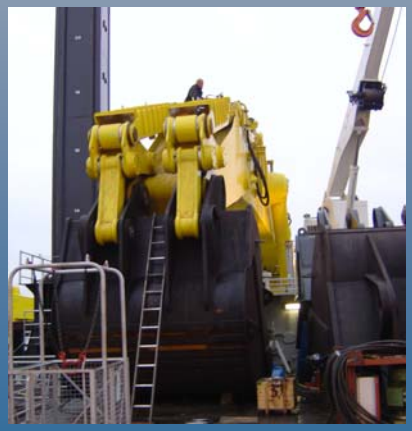
- Monster Machines
  - Currently the biggest backhoe dredges in operation are the “Pinocchio” and the “New York”, both carrying Liebherr P 996 Litronic dredging excavators

# Future of DMS

- Monster Machines – Backacter BA1100

# Future of DMS

- Monster Machines
  - The Backacter BA1100 will be the largest backhoe dredger that has been designed especially for marine dredging purposes.



# Future of DMS

- Real time 3D survey
  - Visualise to the operator the status of the seabed condition while dredging takes place.
- Backhoe Simulator
  - For selection and training of operators.
- Motion Control
  - Optimizing the excavation process by controlling the hydraulics.

# Conclusion

The Dredging Monitoring System helps the operator to excavate more economically.

New technologies incorporated in DMS will improve the productivity of the backhoe dredgers even more.

# Q&A

for more information

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# Thank you for your attention

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