Working Group PIANC Envicom 13

Best Management Practices Applied to Dredging and Dredged Material Disposal Projects for the Protection of the Environment

Axel Netzband (Chairman of WG 13)
Starting point

• A wide variety of environmental management practices exists with the intention of reducing or eliminating perceived environmental risks.
• Restrictions and constraints may have significant logistical, execution schedule and cost implications.
• Balance the benefits of constructing and maintaining navigation infrastructure in a cost efficient manner and the recognised need to care for the environment.
• Make knowledgeable choices among existing BMPs, and identify promising alternatives to routinely applied practices.
Definition of Management Practice

“A Management Practice is a practice intended to improve the environmental performance of a dredging project, inclusive of excavation, transport, and placement of dredged material.”

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## Description of Management Practices

<table>
<thead>
<tr>
<th>Title</th>
<th>Modify available equipment</th>
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</thead>
<tbody>
<tr>
<td><strong>Apply Green valve or Environmental Valve</strong></td>
<td>By using Green valve (or environmental valve) in overflow, air entrainment can be reduced, concentrating overflow-outflow, reducing susceptibility for dispersal of fines. This results in decreased turbidity as the overflow material is transported vertically down more rapidly due to density effects.</td>
</tr>
<tr>
<td><strong>Description</strong></td>
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<tr>
<td><strong>Applicability</strong></td>
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<tr>
<td>Fits on most modern TSHD.</td>
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<td>Can also be installed on barges, when being hydraulically loaded.</td>
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<tr>
<td><strong>Limitations</strong></td>
<td></td>
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<tr>
<td>Most effective when relatively large portion of fines in dredged mixture.</td>
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<tr>
<td>Modern equipment required. Not all TSHD can be equipped with green valve systems.</td>
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<tr>
<td>Involves more complicated process control.</td>
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<tr>
<td>Not to be used where agitation losses are desirable part of the process.</td>
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<tr>
<td><strong>Advantages</strong></td>
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<tr>
<td>Concentrated overflow reduces extent and content of turbidity plume.</td>
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<tr>
<td><strong>Disadvantages</strong></td>
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<tr>
<td>Slightly reduced loading capacity might marginally extend project duration.</td>
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<tr>
<td>Some cost increase.</td>
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<tr>
<td><strong>Predictability</strong></td>
<td>Yes by modelling.</td>
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<tr>
<td>Plume development might be predicted. Biological consequences are often not very clear, only qualitative assessment possible.</td>
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<tr>
<td><strong>Monitoring</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td></td>
</tr>
<tr>
<td><strong>References</strong></td>
<td></td>
</tr>
<tr>
<td>G.H. van Raalte</td>
<td>&quot;The effect of an ‘environmental’ or so called ‘green’ valve on the behaviour of turbidity plumes&quot;, Boskalis, June 2005</td>
</tr>
</tbody>
</table>
Environmental Windows (U.S.)

A temporal constraint placed upon a dredging or dredged material disposal operation to protect biological resources or habitat. The window is the period during which dredging may occur. A seasonal restriction represents the period during which the operation is prohibited.

… are a temporary moratorium on dredging, which equates to zero tolerance of risk
… are institutionalized by default
… have no predetermined performance standards
The Precautionary Principle

“Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation”.

Principle 15 of the UN Rio Declaration on Environment and Development (1992)
Is dredging clean sediment a risky business?

• With the exception of responses to exposure to contaminated sediments, many other forms of impact remain hypothetical and exceedingly few have been shown to be biologically meaningful at the population level

• Proving the negative (no impact) is essentially impossible
Turbidity, Nature, and Human Activities
Dredging impacts
EU Communications

“Where there is scientific uncertainty, implement evaluation procedures and take appropriate preventive action in order to avoid damage to human health or to the environment.”


“The precautionary principle should be considered within a structured approach to the analysis of risk which comprises three elements: risk assessment, risk management, risk communication. The precautionary principle is particularly relevant to the management of risk.”

EU Communication on the precautionary principle (2000)
Identification of Environmental Effects

Physical Change

- Dredging equipment presence
- Re-suspension of sediment matrix into water column
- Removal of sediment
- Placement of sediment
- Altered topography/bathymetry
- Sediment

Examples of impact

- Behavioural/physiological responses to increased suspended solids
- Rock blasting

Potential Environmental Effect

- Release of particulate matter

From Effects to Management Practices

Physical Change

- Re-suspension of sediment matrix into water column
- Release of particulate matter

<table>
<thead>
<tr>
<th>Number</th>
<th>Management Practice</th>
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<tbody>
<tr>
<td>M1</td>
<td>Select appropriate contracting approach and contract format</td>
</tr>
<tr>
<td>M2</td>
<td>Select the contractor based on best value or use pre-qualification to limit the bidders to qualified bidders.</td>
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<tr>
<td>M3</td>
<td>Use performance specifications (instead of method specifications) to allow operator flexibility</td>
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<tr>
<td>M4</td>
<td>Prepare project and site specific environmental and construction monitoring program.</td>
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<tr>
<td>M5</td>
<td>Use Adaptive Management approach during construction</td>
</tr>
<tr>
<td>P1</td>
<td>Reduce Dredging Requirements (i.e., horizontal and vertical extents)</td>
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<tr>
<td>P2</td>
<td>Optimise/increase dredging design for environmental benefit</td>
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<tr>
<td>P3</td>
<td>Make changes to physical system to reduce sedimentation into project area</td>
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<tr>
<td>P4</td>
<td>Reduce or eliminate the need to dredge through using natural recovery and capping/cover options</td>
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</tbody>
</table>
BMP selection process

- Project Description and Conceptual Design
- Environmental Characterisation
- Assessment of Impact and Risk
- Final Project Design
- Project Construction
- Monitoring
- Risk acceptable?
- MP Selection
BMP Evaluation Matrix

- **Preferred practices**
  - Combined Practices 1+2

- **Marginal practices**
  - Practice 2
  - Practice 1

- **Least preferred practices**
  - Practice 3
  - Practice 4

- **Last-resort practices**
  - Practice 5

- **Effort**

- **Effectiveness**

- More than reasonable effort in relation to size of project

- Minimum desired effect

- Uncertainty in effort

**Dredging Management Practices for the Environment**

**ENVICOM**

**WG No. 13**

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Definition of Best Management Practice

“A practice, or combination of practices, that is determined after problem assessment, examination of alternative practices, and appropriate stakeholder participation to be an effective, practicable (including technological, economic, social and institutional considerations) means of preventing, or reducing the potential environmental impacts associated with dredging related operations.”

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Recommendations

• Each dredging project has to be assessed on its own.
• A comprehensive description of the project and an exhaustive examination of the environment may be necessary.
• Consider all management practices on an equal basis.
• Do not institutionalize management practices, but invest in the development of new and better alternatives.

• Be open. Communication at all stages is essential. It is no guarantee for success, but it’s prerequisite.
Active Working Group members

Consultants:
Christine Adnitt - UK Haskoning Ltd
Stefan Bolam – UK CEFAS
Caroline Fletcher – UK HR Wallingford LTD
Philip Spadaro – USA Blasland, Bouck & Lee, Inc.
Thomas S. Wang – USA Anchor Environmental, LLC

Research:
Raul Castro – Spain AZTI Fisheries & Food Technological Institute
Peter Whitehead – UK ABP Marine Environmental Research Ltd

Contractors:
Wouter Dirks – Netherlands Van Oord Dredging
Gerard van Raalte – Netherlands Hydraulic Boskalis Dredging
Makoto Fujino – Japan TOA Corporation
Frederik Mink - Belgium EuDA

Authorities:
Koenraad Mergaert – Belgium Ministry of the Flemish Community
Douglas Clarke – USA U.S. Army Engineer Research and Development Center
André van Hassent – Netherlands Port of Rotterdam
Axel Netzband - Germany Hamburg Port Authority