Reservoir Dredging
Circular sediment management

Tehri Dam / Uttarakhand, India

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Introduction

Royal IHC Merwede

- Dutch shipbuilding since the 17th century
- Innovative and effective dredging equipment
- Life-cycle support
- 3% turnover for R&D

The technology innovator.
Introduction

IHC MTI

• R&D for Royal IHC
• Dredging Laboratory
• Measuring & Diagnostics
• Consultancy Services
• 75 years of experience

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Reservoir sedimentation

- Reservoir storage and efficiency loss
- Inlet blockage
- Abrasion of (hydro) mechanical parts
- Sediment imbalance in the river
- Ecological impact
Dredging as one of the solutions

- Raising or closing the dam
- Routing
- Removal
- Yield reduction

Examples:
- Flushing
- Sediment
- by-pass
- **Dredging**
- Etc.

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Why dredging?

- Controlling the sediment balance sustainably (low turbidity)
- Using the existing reservoir, no new constructions needed
- Efficient use of water
- Controlled reservoir management

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Sediment re-use or re-allocation
Circular Management Plan

• Important issue is the relocation of the sedimentered material.

• Most reservoirs are located in mountainous area’s

• Possible re-use depends on properties, soil types and local needs

Dredged sediment

Creating islands etc.

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Solutions using **dredging**

- Create land (fertile soil can be used to create land within the reservoir or region)
- Re-use of sand (for example to create building material)
- Bring back sediment in to the river to restore the natural sand balance

*Rock armour layers*  
*Building elements*

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Pilot project Reservoir Dredging

- Royal IHC, Deltares & NETICS
- Alar Infrastructures & local contractor(s)
- India
- Uttarakhand (UJVNL)
- TT-pump IHC
- Geotubes
- Subsidy Dutch government
- Self-finance

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Pilot project Reservoir Dredging

Special equipment: IHC TT-pump

- Compact submergible dredge pump
- Equipped with jet nozzles to boost production
- Widely applicable (pontoon, crane etc.)
- Depth > 50m
- Highly wear-resistant

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IHC TT-pump

- Efficiency highly depending on specific grain distribution

- Coarse sediments (gravel, sand) → Breaching can occur

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The breaching process (Vlasblom, 2003)

- ‘The occurrence of continues or local instabilities on a slope causing a density flow downwards from the slope’

- Production calculation with vertical movement:

\[
Q(H) = \frac{dV(t)}{dt} = \frac{dV(t)}{dH} \cdot \frac{dH}{dt} = \frac{\pi}{\tan^2 \beta} H^2 v_v = \frac{\pi}{\tan^2 \beta} H^2 (\tan \beta - \tan \alpha) v_w
\]

- Volume of the pit:

\[
V(t) = \frac{\pi}{3} \frac{H^3}{\tan^2 \beta}
\]

- Vertical movement \( V_v \):

\[
v_h = \frac{v_v}{\tan \beta} = v_w \left(1 - \frac{\tan \alpha}{\tan \beta}\right)
\Rightarrow v_v = v_w (\tan \beta - \tan \alpha)
\]

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Constrains for reservoir dredging influencing the selection of the dredging method

- Sediment type
- Dumping site location
- River morphology
- Depth
- Capacity

- Transportability
- Power and fuel supply

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The Crawler
One of IHC’s latest game changing dredging innovation

- Autonomous Operated Dredger

- IHC dredge pump for high efficiency
- Auger dredge head for high concentration accurate dredging
- Hydro pack on crawler, electrical umbilical
- Archimedes screws for traction on silt
- Remotely operated from shore

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IHC MTI
Word-class dredging advisory services

Thank you for your attention!

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