Dredging in the Port of Antwerp:

Ing. Agnes Heylen
Environment Manager
Antwerp Port Authority
Port of Antwerp - intro

- North west Europe
- Distance to the sea: approximately 100 km
Port of Antwerp - intro

Classic port activities:

- storage and transshipment
- petro chemistry
- container terminals
- 2 shipyards
DREDGED MATERIAL

- Source of dredged material
- Dredging techniques
- Disposal and/or processing techniques
1. Source of dredged material

1.1 Causes of sedimentation

1.2 Source of sedimentation
1.1 Causes of sedimentation

Quantitative:

- **Carried down by streams and rivers:**
  - (Soil erosion) + deposition caused by contact salty and fresh water: 80%
  - Human activity: 19%
  - Atmospheric deposition: 1%
1.1 Causes of sedimentation

Quality negatively influenced by:

- Dumping or discharging (legal or illegal)
- Spillage from transhipment activities

Annual deposition: ~ 550,000 TDS
1.2 Source of sedimentation

Fact: sediment accumulation
Cause: density flow
1.2 Source of sedimentation

- Sedimentation in tidal zones
- Sedimentation in non-tidal zones
- Relocation of sediment
- Sedimentation of sewer disposal and spillage
- Locks

Sedimentation in the port of Antwerp
2. Dredging techniques

Operational dredging activities:

- river Scheldt: Flemish government
- docks: port authority with own fleet
3. Techniques for disposal and processing of dredged material

3.1. Process

3.2. Current practice

3.3. Future practice - AMORAS
3.1. Process

Non-process-related reuse:
- Landscaping
- Land restoration

Process-related reuse:
mainly for construction material

Separation and mechanical dewatering

Dumping in the waterway

Shore dumping (wet dumping)

Underwater cell (wet dumping)

(Controlled) dumping (dry dumping)

Port of Antwerp
3.2. Current practice

3.2.1. Underwater dumping: underwater cell
=> "Less" polluted dredged material (complies with VLAREA criteria for reuse as construction material)

3.2.2. Dumping on land: shore dumping
=> "More" polluted spoil (complies with VLAREM II criteria for dumping sites)
3.2.1. Dumping underwater

Delwaide dock underwater cell

**Dumping cost:**
approx. 8 €/m³ or 16 €/TDS

**Capacity:**
3,100,000 m³ or 1,500,000 TDS

**Environmental permit:**
Permitted until 2011
Probably filled up in July 2007
Delwaide dock underwater cell

|---|------|------|------|------|------|

Port of Antwerp
End: dumping in Delwaide dock underwater cell =>
Start: dumping in Churchill dock underwater cell

Building

Delwaide dock:
3 mio. m³

Churchill dock:
2 mio. m³

Today

Port of Antwerp
Interim solution: underwater cell Churchill dock
3.2.2. Dumping on land

Zandvliet shore dumping

Dumping cost: approx. 3 €/m³ or 4.50 €/TDS

Capacity: 750,000 m³ or 500,000 TDS (shore dump 1a)

Environmental permit: till April 2012
Maritieme container trafiek

- Total volume: 8.7 million TEU
- Average annual growth: 9%
- Exceptional growth in 2007: 14%

Loaded
Unloaded

Port of Antwerp
Zandvliet shore dumping
Non-process-related reuse:
- Landscaping
- Land restoration

Process-related reuse:
mainly for construction material

Process

Sediment

Dumping in the waterway

Separation and mechanical dewatering

Underwater cell (wet dumping)

Shore dumping (wet dumping)

(Controlled) dumping (dry dumping)

Dumping on land
Underwater cell (wet dumping)

Lagooning

Sediment

Future

On land

Under water

Shore dumping (wet dumping)

Controlled dumping (dry dumping)
Exploitation versus expansion

130 ha
3.3. Future practice: AMORAS

= Antwerp Mechanical Dewatering, Recycling & Application of Sludge

- Pilot trials
- Flow chart
- The heart of the installation: the chamber filter press (= CFP)
- Practical implementation
- Useful application/reuse
1. Location
Underwater Cell

Sand Separation 30 ha

Storage 20 ha

Pipeline Route

Dewatering
3.3.2. Process

Dredged Material Acceptance: Underwater cell + dredger

Sand Separation
Depending on the environmental quality and/or percentage of sand fraction

Thickening
4 pools with a content of 120,000 m³ + a rotating arm

Dewatering
After thickening additives are added.
Dewater by means of 12 chamber filter presses (size 25x5x5m) (min 60% dry matter)

Storage
Filter cakes are stored in ‘Zandwinningsput’.
Capacity for min. 30 years (50m high).
3.3.2. Proces

Some Important Numbers:

• Amount of dredged material to treat: 400,000 to 600,000 tons of dry matter/year

• Pump capacity booster pumps (dredged material from OWC to BIV): 3000 m³/h

• Thickening pools: 4x120,000 m³; outer radius of the thickening pools: 194 m

• 12 filter presses: each with a content of 21.5 m³ and with 193 plates of 2x2 m
3.3.3. Environmental-Ecological Aspects

Environmental friendly installation:

- Water: low consumption and re-using
- Soil: use of films and drainage
- Air: treatment at the source – no disturbing smell (suction capacity: 200,000 m³/h)
- Noise: closed buildings
- Studies about re-using the filter cakes
3.3.3. Environmental-Ecological Aspects

Creation of a nature reserve:

- Compensation measures for disappearing of Zandwinnings
- In 2008 created Opstalvalleigebied phase 1:
  3 waterpools, 2 cane fields, 16m high buffer dam
- Montering in 2009: OK
3.3.4. Cooperation

Partners:

Opdrachtgever: Vlaamse Overheid
Departement Mobiliteit en Openbare Werken
Afdeling Maritieme Toegang

Stakeholder:
Gemeentelijk Havenbedrijf Antwerpen

Aannemer:

THV Jan De Nul - Dredging International
(DEME), Envisan en DEC
3.3.4. Cooperation

Partners:

Engineering studies office:
- TV MWH – Seghers Keppel

Safety Coordination:
- Coor nv

Storage Specialist:
- Bova M.C. nv
3.3.5. Finances

Assigned amount: 482 million €
(incl. VAT, construction costs, finance costs, exploitation costs)

- Phase 1 Construction:
  118 million € (incl. VAT)

- Phase 2 Exploitation
  27 million € / yr. (incl. VAT)
  (of which 5 million € /year financing)

www.amoras.be