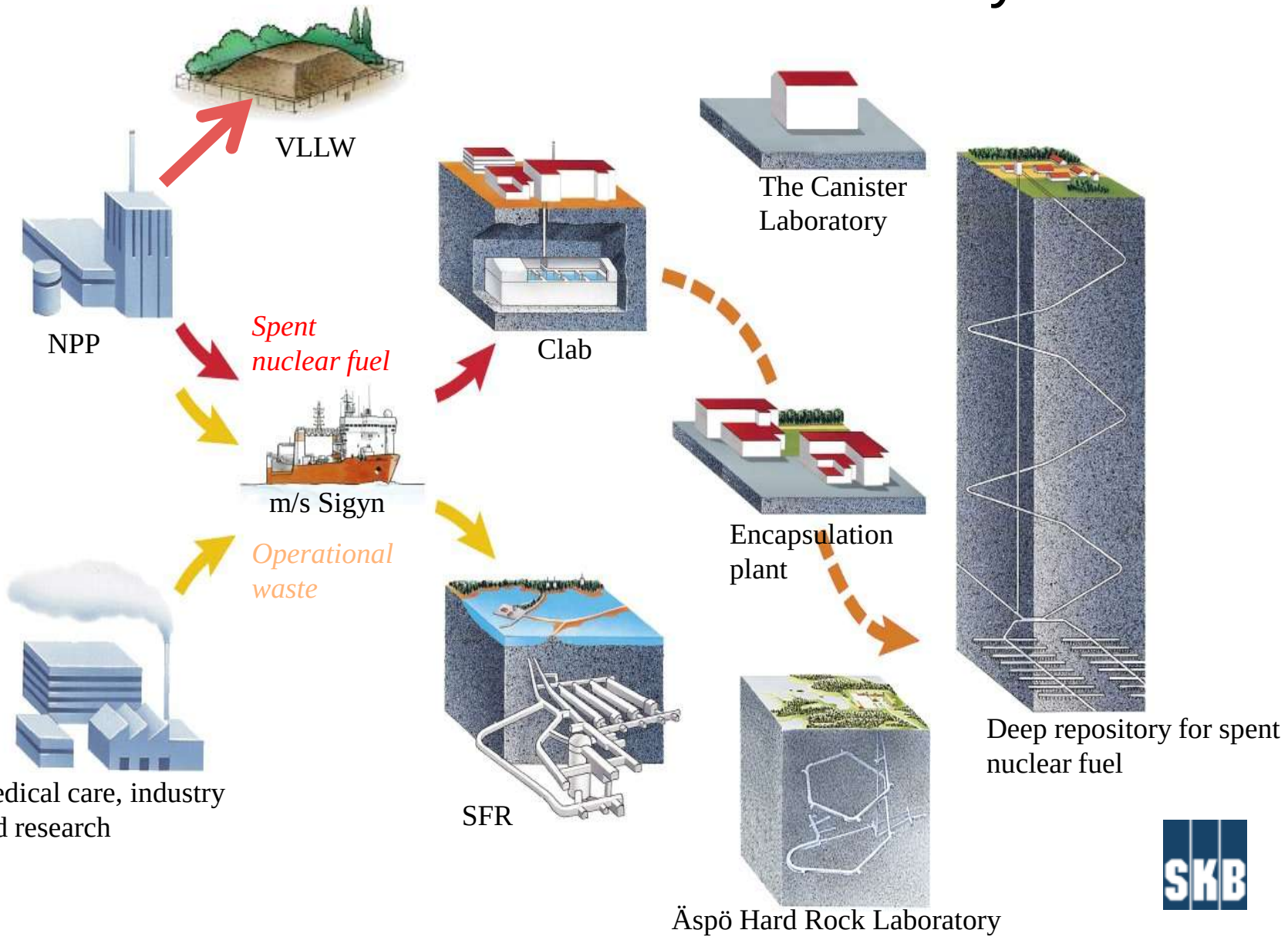
Deposition vehicle Tests

Bo Nirvin, Project Manager

Facilities within the Swedish RWM-system



Deposition vehicle, prototype #1

•Length	11.8 m
• Width	3.7m
• Height	4.6 m
• Weight empty	90 ton
• Weight of canister and shielding tube	50 ton
• Weight total	140 ton
• Drive	Electric motor
• Speed	1 – 10 m/min

Deposition vehicle , prototype #2

• Length	14.1 m
• Width	3.1m
• Height	4.2 m
• Weight empty	72.4 ton
• Weight of canister	27.6 ton
• Weight total	≈100 ton
• Motor power	261 kW
• Drive	hydrostatic
• Speed	5 km/h
• Operation mode	full automatic
• Turning radius, outside	8.75 m

Inner frame and Buffer (dummy)

Raising of the canister

Shielding wall with extension

Supervising the canister immersion

Deposition cycle

1. Loading a canister in the reloading position
2. Navigation in the tunnels
3. Positioning above the deposition hole
4. Deposition in the deposition hole
5. Navigation in the tunnels

Those five sequences are repeated for every canister.

The purpose of the tests

- At fully automatic operation and testing collect data from, and evaluate, the reliability and accessibility of the machine and its sub systems as well as the amount of service efforts needed at continuous operation.

- During fully automatic navigation and positioning verify that deposit will be executed at satisfactory precision and kept safety at applicable demands.

What is tested

1. Basic operating functions :
   - ✓ Drive forward and backward
   - ✓ Steering with the different steering modes
   - ✓ Brake functions
   - ✓ Operating the support legs

2. Supplementary functions for positioning:
   - ✓ Positioning of the deposition hoist
   - ✓ Actions of the hoist at tilting
   - ✓ Actions at canister deposition

3. Supplementary functions for navigation:
   - ✓ Automaticity at navigation
   - ✓ Support system at navigation

Tests

- So far accomplished tests:
  - ✓ Test # 1, sequence 1 – 40 96 interruptions, 10 separate reasons
  - ✓ Test # 2, sequence 41 – 80 63 interruptions, 7 separate reasons
  - ✓ Test # 3, sequence 81 – 120 13 interruptions, 5 separate reasons
  - ✓ Test # 4, sequence 121 – 160 15 interruptions, 6 separate reasons
  - ✓ Test # 5, sequence 161 – 162 1 interruption, 1 separate reason

- Remaining number of tests (approximately):
  - ✓ Test # 5, sequence 163 – 200
  - ✓ Test # 6, sequence 201 – 240
  - ✓ Test # 7, sequence 241 – 280
  - ✓ Test # 8, sequence 281 – 320
  - ✓ Test # 9, sequence 321 – 360
  - ✓ Test #10, sequence 361 – 400

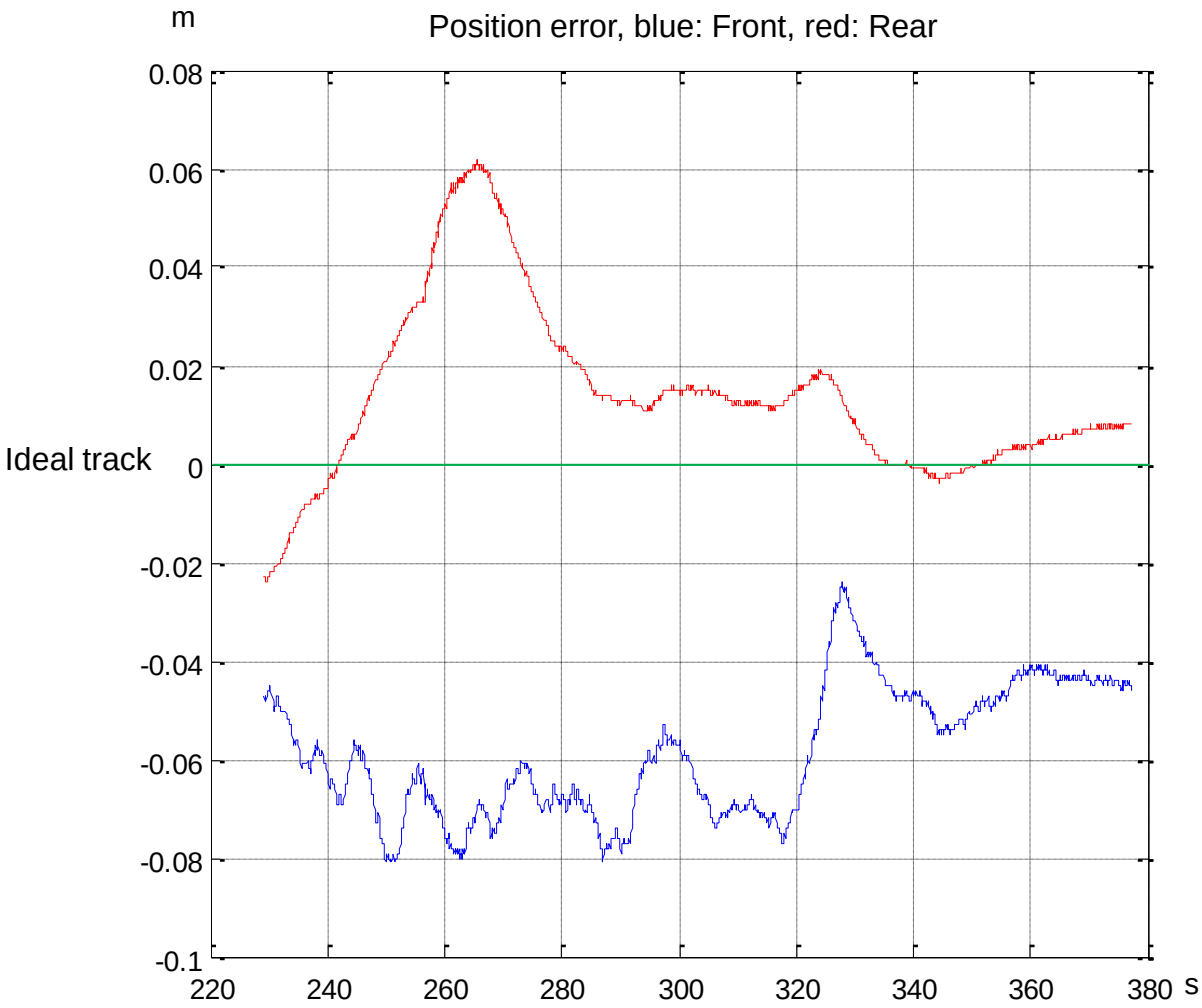
Documentation of tests

Navigation	
Sequence	no
Date	
X-position on RDT at start	m
Y-position on RDT at start	m
Canister loaded	
Chosen destination for drive	
Time for start	hour
X-position on RDT at stop	m
Y-position on RDT at stop	m
Time for stop	hour
Chosen destination for drive	
Time for start	hour
X-position on RDT at stop	m
Y-position on RDT at stop	m
Time for stop	hour
Longitudinal position +/-	mm
Transversal position +/-	mm
Navigation stopped	
X-position on RDT at stop	m
Y-position on RDT at stop	m
RDT error message	
RDT error message comments	
Time for stop	hour
Divergence report	no
Continued navigation	
Time for start	hour

Positioning	
Date	
Time for start	hour
Adjustment of the frame, Left	%
Adjustment of the frame, Rear	%
Adjustment of the frame, Right	%
Adjustment of the frame, Front	%
Fine positioning of the frame, Left	%
Fine positioning of the frame, Rear	%
Fine positioning of the frame, Right	%
Fine positioning of the frame, Front	%
OMRON value 1	pix
OMRON value 4	pix
Positioning stopped	
RDT error message	
RDT error message comments	
Time for stop	hour
Divergence report	no
Continued positioning	
Time for start	hour

Deposition	
Date	
Distance down to stop	m
Distance up to stop	m
Distance down to stop	m
Distance up to stop	m
Distance down to stop	m
Distance up to stop	m
Time for stop	hour
Deposition stopped	
RDT error message	
RDT error message comments	
Time for stop	hour
Divergence report	no
Continued deposition	
Time for start	hour

Track following



Divergence report

1. The rear scanner turns off after about 30 seconds.
2. Corrosion of a gear drive for the shielding hatch.
3. Skew setting of the shielding flap.
4. The inductive sensors for the bayonet work intermittently.
5. Moisture in the computer screens.
6. 3 errors in the twist lock feature: dirt in the valve assembly, play in a contact and confusion of air hoses.
7. The transmitter for the grip-out malfunctioned.
8. The computers were switched off at start of the vehicle.
9. There are continual errors with the twist lock
10. The inclinometer showed absurd values.

Actions taken after reported divergences

1. The scanner was dismounted and sent back to the deliverer for exchange.
2. New gear drive installed, stainless steel.
3. Slide guides installed, robalon.
4. Position sensor was loose, tightened bolts and locked with lock-tight.
5. Computer screens replaced and mounted in moisture-proof boxes.
6. The valve assembly was cleaned, the contact was replaced, changed places for two cables in the switch cabinet.
7. Transmitter for the grip-out malfunctioned, replaced.
8. Power failure at vehicle start-up, UPS installed.
9. A deep examination of the grapple unit showed that a cable get jammed at specific positions. The cable was disconnected, examined and remounted in another position.
10. A gasket was damaged. The inclinometer was totally destroyed internal by corrosion, replaced by a new one.

Inductive sensor (4)

The inductive sensors for the bayonet gripping work intermittently.

Position sensor was loose, tightened bolts and locked with lock-tight.

Grapple unit, cable drawing (9)

Continual errors with the twist lock

A cable get jammed at specific positions.

The cable was disconnected, examined and mounted at another position.

The Inclinometer (10)

Totally destroyed internal by corrosion.

The damaged gasket.

Thank you

bo.nirvin@skb.se