

OSAMAT ENV/EE/000227

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OSAMAT – Oil Shale Ash Use in Road Construction



Arina Koroljova
Eesti Energia AS
Estonia





OSAMAT Project Goals

- OSA is a valuable construction material
- OSA utilisation is safe for the environment





Oil Shale Ash

- Is a product of combustion of oil shale under $t=1400\text{ }^{\circ}\text{C}$ (pulverized firing) and $t=900\text{ }^{\circ}\text{C}$ (circulated fluidized bed combustion)
- Calcareous



Type of OSA	Boiler type, firing temperature	Specific surface, kg/m^2	CaO	CaO free, %	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MgO	SO ₃	K ₂ O	Na ₂ O
CYCL PF	Pulverised firing, up to $1400\text{ }^{\circ}\text{C}$	86-150	56	18-24	22,1	11,9	4,9	4,0	1,5	1,5	0,1
BF PF	Pulverised firing, up to $1400\text{ }^{\circ}\text{C}$	280-320	39	6-14	25,7	6,7	3,9	4,7	7,3	3,7	0,1
EF CFB	Circulated fluidised bed combustion, firing temperature up to $900\text{ }^{\circ}\text{C}$	450-800	28	1,6-8	38,6	5,8	5,1	4,5	4,1	4,5	0,2

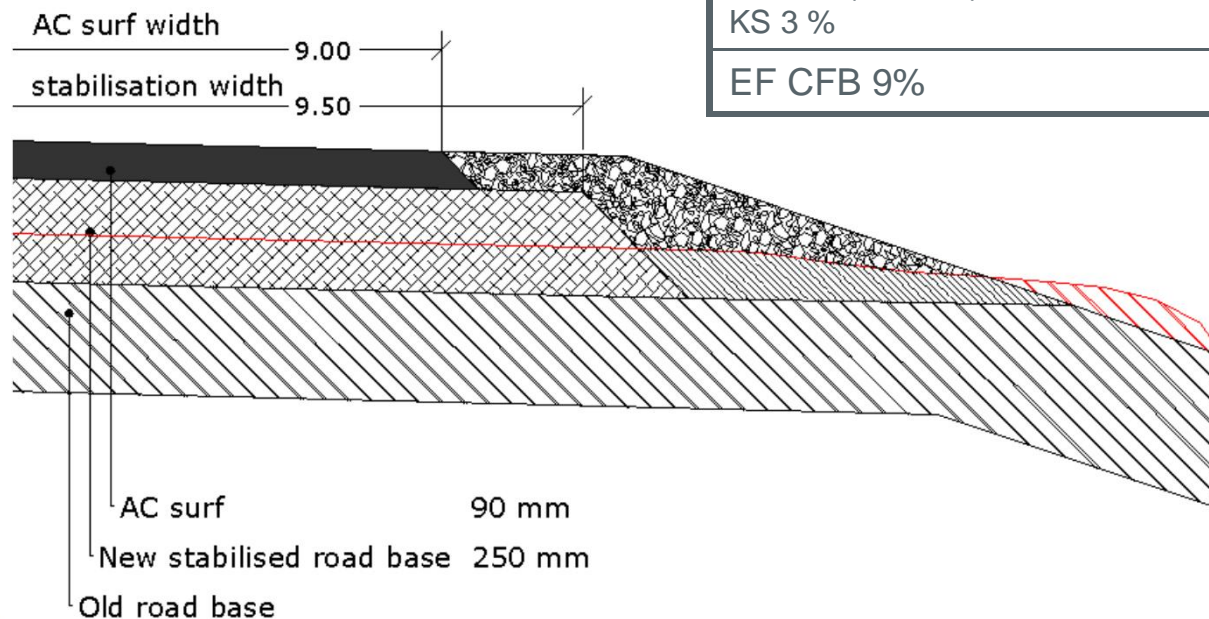




Pilot construction (1)

- Narva-Mustajõe layer stabilisation
 - Pilot section length - 1630 m
 - 3 types of OSA used

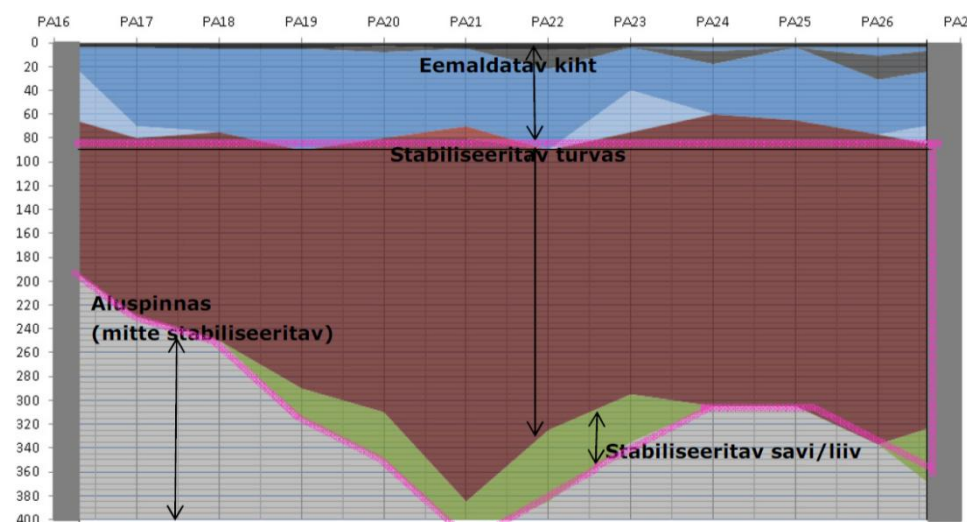
OSA type, recipe	Section length, m
Cyclone (Cycl 5% + KS 5%)	780
BF PF (deSOx) (EF PF 6 % + KS 3 %)	650
EF CFB 9%	200





Pilot construction (2)

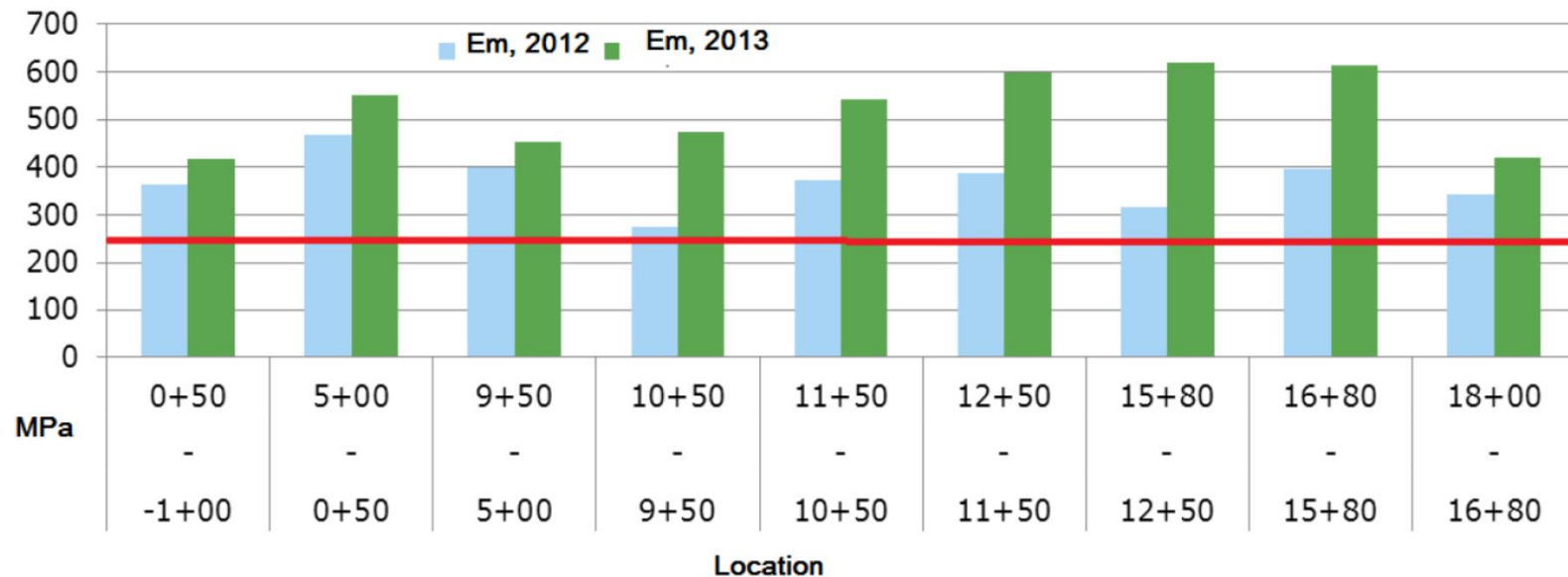
- **Simuna-Vaiatu mass-stabilisation**
 - Section length – 500 m, depth – 4 m, stabilised peat volume – 10 800 m³





Narva-Mustajõe design criteria and observation results

- Load bearing capacity – 260 MPa





Narva-Mustajõe design criteria and observation results

- Compressive strength development

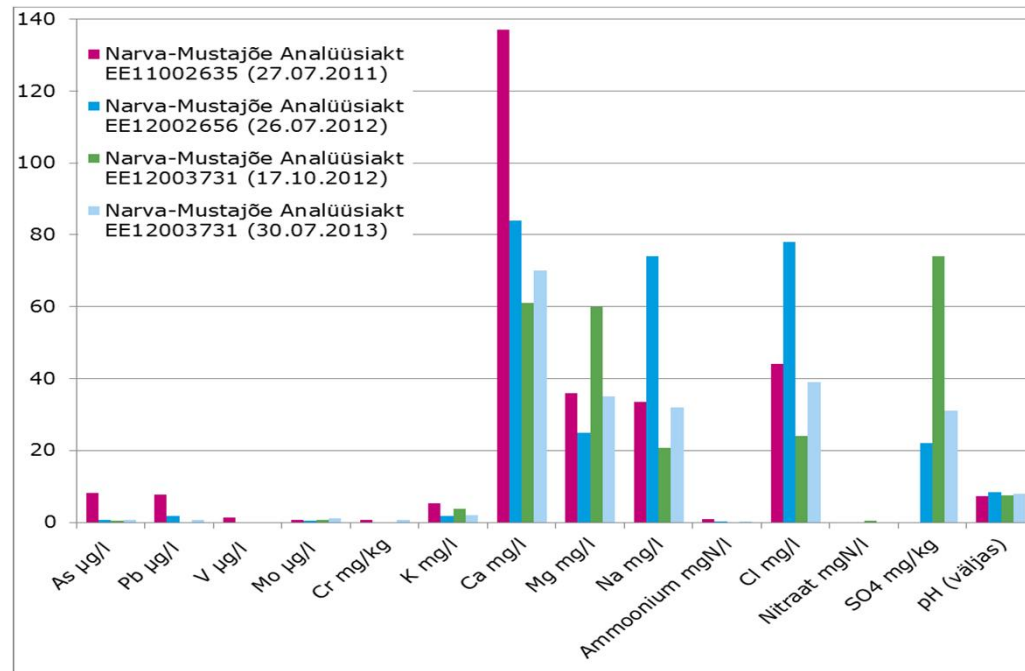
Construction period	Age of structure	Location	Depth, m	Sample diameter, mm	Height, mm	28 d UCS, MPa
Autumn- 2011	1 year	0+72	0.09-0.19	93	104	9,4
Autumn- 2011	1 year	3+83	0.13-0.23	93	102	8,5
Autumn- 2011	1 year	5+50	0.08-0.18	93	103	2,1
Autumn- 2011	1 year	8+23	0.1-0.2	93	105	2,0
Autumn- 2012	1 month	9+70	0.08-0.18	93	98	4,5





Narva-Mustajõe design criteria and observation results

- Pavement condition analysis
 - Cracks emergence in the sections 2011, no cracks in the section 2012
- Leachability



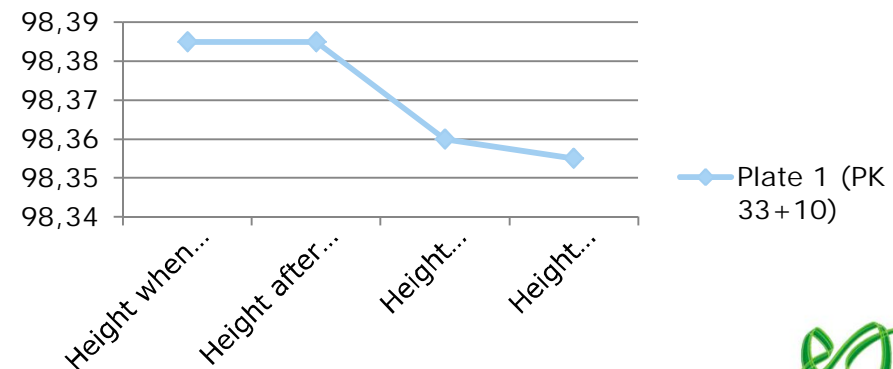


Simuna-Vaiatu design criteria and observation results

- Settlement observation (0.857 cm in average)

	Plate 1 (PK 33+10)	Plate 2 (PK 34+10)	Plate 3 (PK 35+10)	Plate 4 (PK 36+10)	Plate 5 (PK 37+10)
Height when installed	99,449 (25.07.2013)	99,584 (19.08.2013)	99,620 (25.09.2013)	99,476 (30.08.2013)	99,374 (23.09.2013)
Height after cutting the pole	98,385 (27.09.2013)	98,817 (12.09.2013)	98,865 (27.09.2013)	98,732 (27.09.2013)	98,558 (27.09.2013)
Height 08.01.2014	98,36	98,793	98,865	98,685	98,52
Height 27.06.14	98,355	98,775	98,86	98,698	98,535

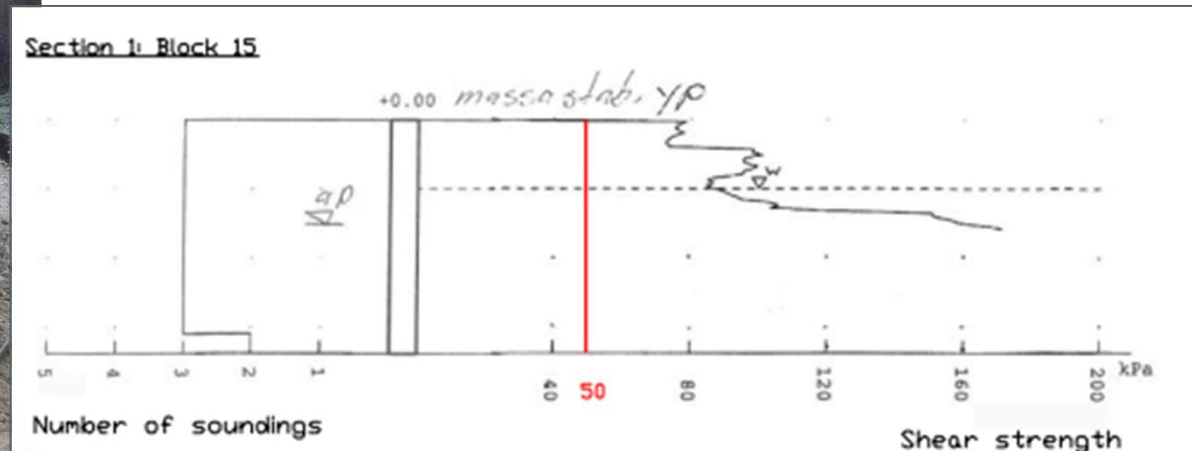
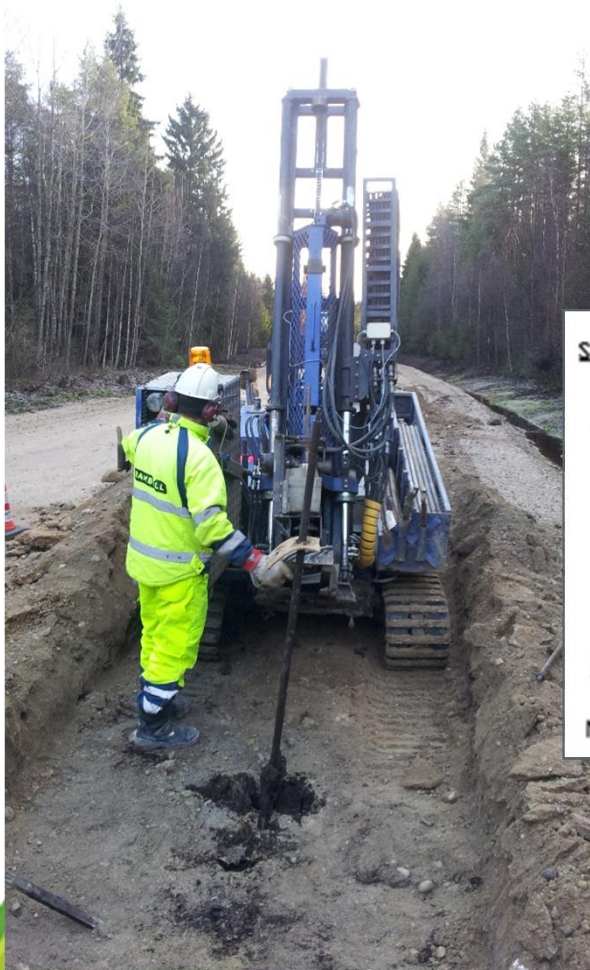
Plate 1 (PK 33+10)





Simuna-Vaiatu design criteria and observation results

Vane shear strength – 50 kPa





Outcomes so far...

- High load bearing capacity
- High strength development
- Lower ash content in the mixture
- No environmental impact
- Mass-stabilised body settlement takes half a year
- Further technical and environmental monitoring is required





Thank you!

Arina Koroljova
Project Manager
Ash Sales Department
Eesti Energia AS
+372 71 67 095
+372 5373 2277
Skype arina.koroljova
arina.koroljova@energia.ee
www.energia.ee

