



LUCOEX Conference

June 2-4, 2014

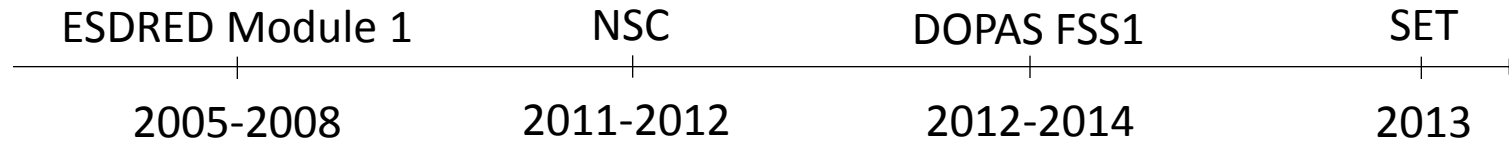
From ESDRED to NSC, SET and FSS: Fabrication and use of compacted Wyoming sodic bentonite in Andra's sealing experiments

Sébastien PAYSAN

+ 33 6 81 55 31 63

sebastien.paysan@laviosa.com

Timeline



Main challenge

Our main objective has been to reproduce the lab scale at an industrial scale with an equal quality and the same high performance of materials

Project	ESDRED Module 1
Material	A100 Na Bentonite + Silica sand
Dried mass ratio	70/30
Shaped	Ring
Total mass used	75 T
Unit mass	4 T
Dimensions	\varnothing out = 2,30 m \varnothing in = 70 cm Thickness = 50 cm
Water content	Mixture = 12 %
Compacting pressure or force	40 000 T
Geometric density	2,20
Dry density	1,96
Productivity	16 parts in 36 h
Time of cycle	1 h



Project	NSC (Noyau de SCelllement)
Material	A100 Na Bentonite + Silica sand
Dried mass ratio	40/60
Shaped	Rectangular blocs
Total mass used	200 T
Unit mass	13 kg (15 000 parts)
Dimensions	l x w = 30 x 20 cm Thickness = 10 cm
Water content	Bentonite = 17 %
Compacting pressure or force	80 MPa
Geometric density	2,15 – 2,20
Dry density	1,95
Productivity	60 parts / h
Time of cycle	40 sec

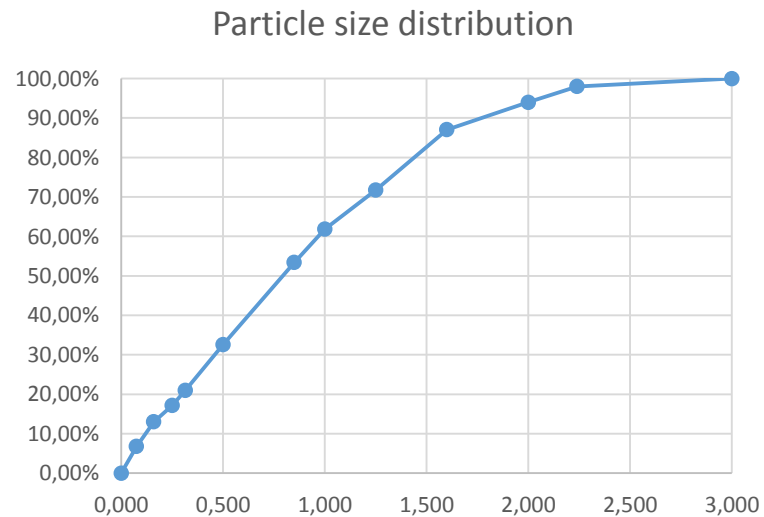


Project	DOPAS FSS (Full Scale Sealing)
Material	A100 Na Bentonite
Dried mass ratio	100
Shaped	Pellets
Total mass used	1 200 T
Unit mass	45 g
Nb of pellets produced	> 25 millions
Dimensions	Ø 32 mm
Water content	5 %
Compacting pressure or force	32 T
Geometric density	2,13 – 2,18
Dry density	2,03 - 2,08
Productivity	1 T/h
Time of cycle	6 sec



Video of 32mm pellets production

Project	DOPAS FSS (Full Scale Sealing)
Material	A100 Na Bentonite
Dried mass ratio	100
Shaped	Powder
Total mass used	400 T
PSD (Particle size distribution)	0 to 2,5 mm
Water content	5 %
Bulk density	1,25 – 1,35
Dry density	1,20 – 1,30
Productivity	500 kg/h



Crusher

Project	SET (Scellement à l'Espace Technologique)
Material	A100 Na Bentonite + Silica sand
Dried mass ratio	80/20
Shaped	Blocs with angle
Total mass used	12 T
Unit mass	6 kg
Dimensions	Assembled pair l x w = 30 x 20 cm Thickness = 10 cm
Water content	Mixture = 11,5 %
Compacting pressure or force	120 MPa
Geometric density	2,19 – 2,21
Dry density	1,97
Productivity	60 parts / h
Time of cycle	40 sec



Video of blocks emplacement through robot

Project	SET (Scellement à l'Espace Technologique)
Material	A100 Na Bentonite
Dried mass ratio	100
Shaped	Pellets
Total mass used	15 T
Unit mass	0,45 g
Dimensions	Ø 32 mm
Water content	Mixture = 5 %
Compacting pressure or force	5 T
Geometric density	2,05
Dry density	1,95
Productivity	50 kg / h
Time of cycle	5 sec



Summary

Project	ESDRED Module 1	NSC	DOPAS FSS	SET	SET
Material	Na Bentonite + sand	Na Bentonite + sand	Na Bentonite	Na Bentonite + sand	A100 Na Bentonite
Dried mass ratio	70/30	40/60	100	80/20	100
Shaped	Ring	Rectangular blocs	Pellets	Blocs with angle	Pellets
Total mass used	75 T	200 T	1 200 T	12 T	15 T
Unit mass	4 T	13 kg	45 g	6 kg	0,45 g
Dimensions	∅ out = 2,30 m ∅ in = 70 cm Thickness = 50 cm	l x w = 30 x 20 cm Thickness = 10 cm	∅ 32 mm	Assembled pair l x w = 30 x 20 cm Thickness = 10 cm	∅ 32 mm
Water content	Mixture = 12 %	Bentonite = 17 %	5 %	Mixture = 11,5 %	Mixture = 5 %
Compacting pressure or force	40 000 T	80 Mpa	32 T	120 MPa	5 T
Geometric density	2,20	2,15 – 2,20	2,13 – 2,18	2,19 – 2,21	2,05
Dry density	1,96		2,03 - 2,08	1,97	1,95
Productivity	16 parts in 36 h	60 parts / h	1 T/h	60 parts / h	50 kg / h
Time of cycle	1 h	40 sec	6 sec	40 sec	5 sec



Acknowledgements to European Union & Andra

Special thanks to CEA-LECBA involved with us in those projects

Thank you for attention