

The Norwegian Moon landing



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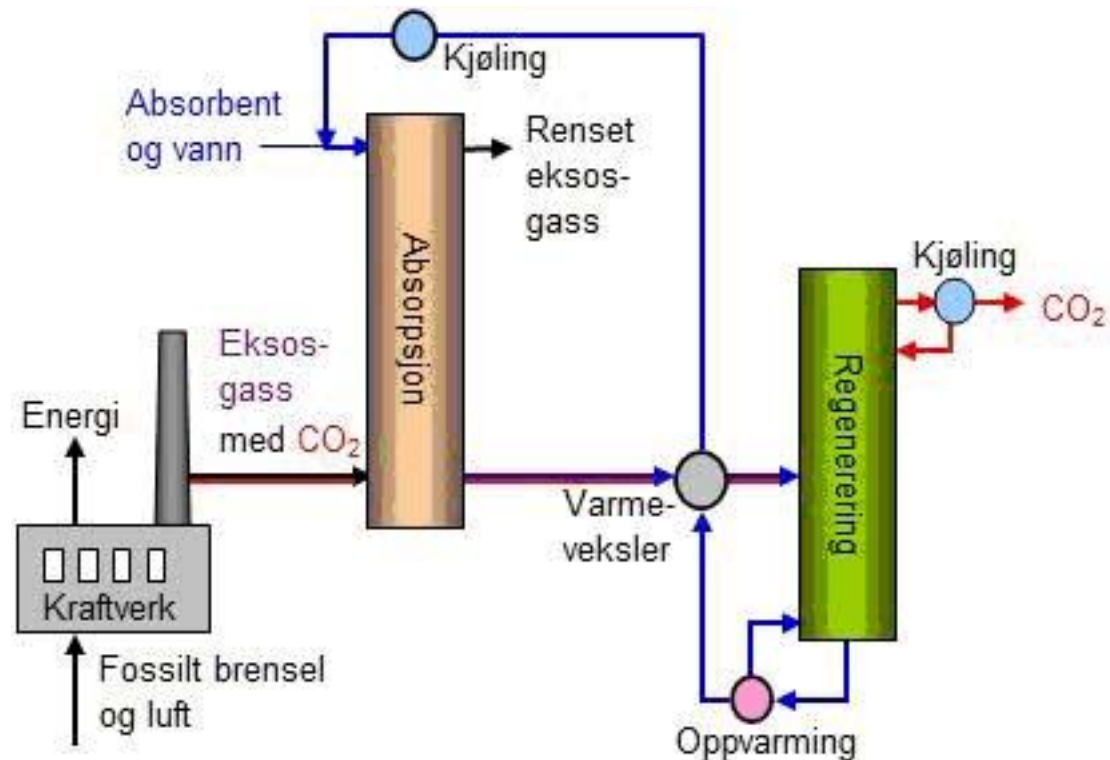
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Chilled Amonia Process (CAP) demo plant at Mongstad Refinery outside Bergen, Norway.



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CO₂ capture process.



App 50% of the global CO₂ comes from the energy production

Polyurea lining is app 3 times cheaper compared to vinylester laminate.



Gama Evolution G-250H

Output 14 kg/min at 9 kg/min at 140 bar to 240 bar 

Heated hoses of 93 meter



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Demands



Property	Requirement	Test standard
Surface roughness	>40 grit sand paper	None
Surface tensile strength of substrate	1,5 N/mm ²	EN 1542, EN 14879-1
Moisture content of substrate and crack	Depending on method	According to EN 1504-10
Wet film thickness (WFT) [?]	-30% and +50% of target value	ISO 2808
Dry film thickness [?]	-30% and +50% of target value	ISO 2808
Continuity/spark test [?]	100% continuous [?] dry film [?]	ASTM D5162
Adhesion	>1 MPa	EN ISO 4624, test plates
Hardness	35 Barcol	EN 59, test plates

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Chemical load where tested by Sintef Building and Infrastructure Institute

1. Resistance to chemical attack was determined according to NS-EN 13529-2003
2. One reference concrete slab(300x300 mm) and 9 concrete slabs treated with Micorea S3 (300x300 mm)
3. Testing was performed with 2 different fluids:
 - Process water
 - 20% ammonium hydroxide

Test results

	Reference		Process water	20% ammonium hydroxide
Adhesion to concrete, average value, Reference.	2,39	1 day, MPa	2,65	2,68
	2,39	7 days, MPa	2,56	2,57
Shore D	61	1 day,	53	59
	61	7 days	59	53

Visual evaluation?

	Standard	Micores S3	
		1 day	7 days
Blistering	ISO 4628-2	0	0
Flaking	ISO 4628-5	0	0
Optical ? changes	ISO 4628-1	0	0
Cracking	ISO 4628-4	0	0
Penetration ? of solution ? through coating?		None	None



Figure 7: One sample after 7 days subjection to 20% ammonium hydroxide



Figure 5: One sample before tests

The concrete should be of good quality, water tight with no, or few pores, in the surface.

This was not the result.

The concrete where full of pores and had to be evened out with a putty.



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The contractor was responsible for the surface, and wanted to apply a cement based putty on the whole surface.

We said no!!! No, no, no..

The result was epoxy based putty.



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VISUAL DETECTION OF PORES.



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BUILD UP

1. Epoxy based putty, sanded
2. Conductive primer
3. Polyurea, app 3 mm thickness

The contractor, Hurum Plasterindustri, only had access to the site at night time.

The spray machine was placed outside.

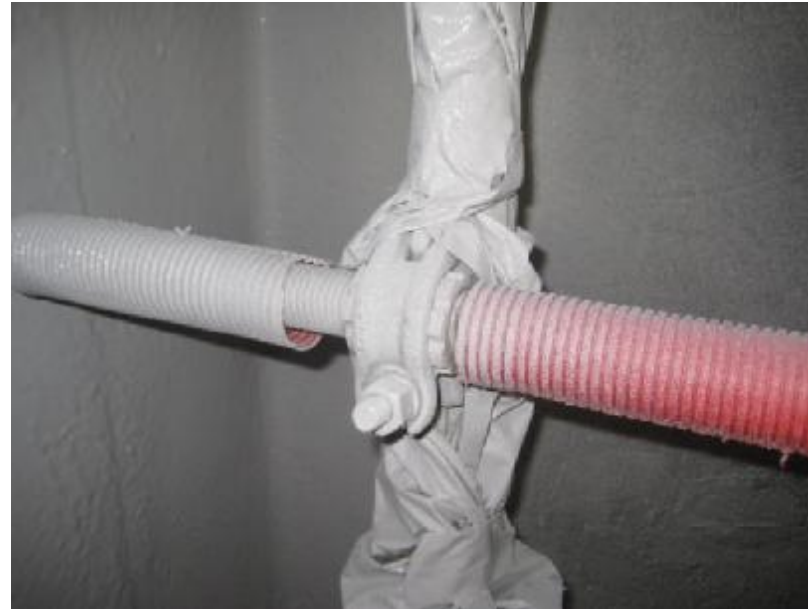




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PROBLEMS WITH THE SCAFFOLD PROTECTION.

You need to take this job very seriously, or you use a lot of money to clean later on.



DIFFICULT DETAILS IN SMALL CONTAINERS

The smallest chamber was 1,2 m wide.

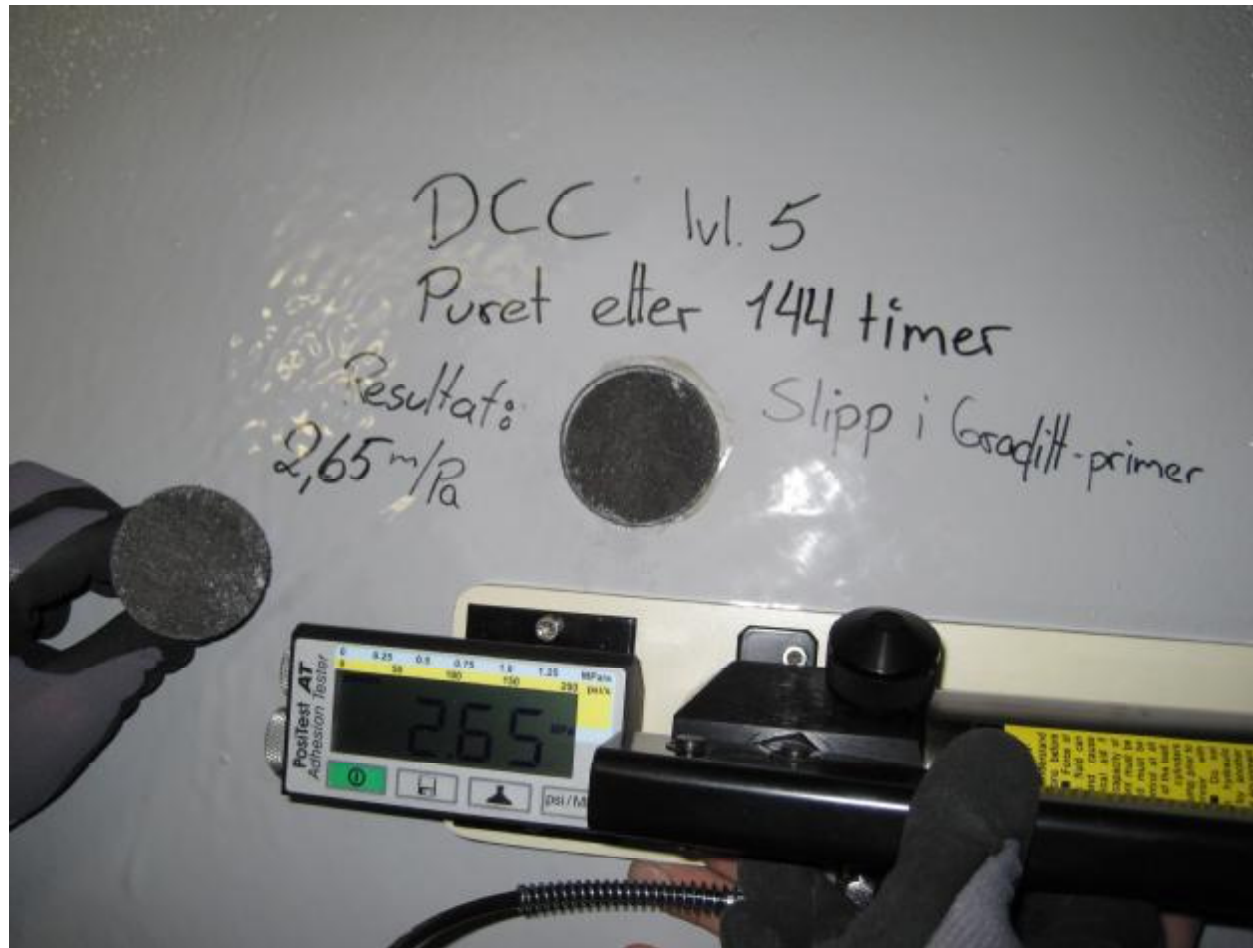


**THIS TRIAL
PLANT WILL
BE 5 TIMES
BIGGER IN A
FULL SCALE
PLANT!**



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PULL OFF TEST



Spark test where performed at site to ensure a pour free surface



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A PLAY GROUND FOR NEW SOLUTIONS

We will make different new test with different formulations and build d ? ? ? up, to reduce cost for future application and to ensure the best quality ? for similar full scale projects in future.