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Emission control

To guarantee the required emission levels from the generator fleet at the upcoming Drilltec project in De Wijk, the set up and operating procedures are as stated below.

Emission level
The required emission level, for NOx is maximum 1.3 gr/kWhr. This is the overall average emission level of De Wijk project and effects, for Bredenoord, the energy production of the Bredenoord generators.

Equipment set up
To achieve this low NOx level, a part of the installed generators is equipped with an exhaust after treatment to reduce the NOx level, the SCR. Four of twelve generators are equipped with a SCR.

Effect of SCR
The effect of the SCR is that it reduces the NOx emission level with 85% to a level of 15% of the starting value

Performance of the generator
All 12 installed 400kVA generators are equipped with Scania DC13-71A engine with emission category Stage 3 or Com3a. The average NOx emission of the whole load range is 4.0 gr/kWhr. The performance of the generator regarding NOx emission is different at various load. As shown below, the best performance regarding NOx is at a load of 75%

Load (%)	NOx (gr/kWhr)
10%	7,9
25%	3,4
50%	3,1
75%	2,8
100%	4,9

A generator load of 75% in combination with a SCR will reduce the NOx level to 0,42 gr/kWhr (15% of 2.8gr/kWhr).

Control of percent load
To achieve the mentioned best performance area of the generator should be loaded to 75% load. The control of the starting and stopping is locked in the engine control system, called Power management. In this system there is a setpoint called " spinning" reserve. The system tries to create an optimum reserve of 25% by starting and stopping generators depending on load demand.

In the overview below the emission level per loadstep is shown in case the Power management setpoint of Spinning Reserve is set at 25%.

action	max load per engine 75% (kW)	load	load per engine	load percent/engine	Nox per engine	emission calculation				
					0,012	engines with Denox (pcs)	engines wihout Denox (pcs)			
	240				2,8					
start engine no : 2		250	125	39%	3,2					
	240	480	240	75%	2,8					
start engine no : 3		490	163	51%	3,1					
	240	720	240	75%	2,8					
start engine no : 4		730	183	57%	3,0			Nox in	Nox out	sum
	240	960	240	75%	2,8	4,00		2,80	0,42	1,68
start engine no : 5		970	194	61%	3,0		0,00	2,8	2,8	0
	240	1200	240	75%	2,8		**total average Nox (gr/kWhr)**			**0,42**
start engine no : 6		1210	202	63%	2,9					
	240	1440	240	75%	2,8					
start engine no : 7		1450	207	65%	2,9					
	240	1680	240	75%	2,8					
start engine no : 8		1690	211	66%	2,9	4,00		2,9	0,44	1,74
	240	1920	240	75%	2,8		4,00	2,9	2,90	11,6
start engine no : 9		1930	214	67%	2,9		**total average Nox (gr/kWhr)**			**1,67**
	240	2160	240	75%	2,8					
start engine no : 10		2170	217	68%	2,9					
	240	2400	240	75%	2,8					
start engine no : 11		2410	219	68%	2,9	4,00		2,9	0,43	1,73
	240	2640	240	75%	2,8		7	2,9	2,9	20,19
start engine no : 12		2650	221	69%	2,9		**total average Nox (gr/kWhr)**			**1,99**
	240	2880	240	75%	2,8	4,00		2,8	0,42	1,68
		3456	288	90%	4,0		8,00	2,8	2,8	22,40
							total average Nox (gr/kWhr)			**2,01**
						4,00		4	0,6	2,4
							8	4	4	32
							total average Nox (gr/kWhr)			**2,87**

De Wijk-Load forecast

DrillTec provided a load forecast for the planned drill project at De Wijk, customer NAM. Load durations and level can fluctuate, depending on circumstances of ground etc.

Average kW per hour over the project is 645kW, which will be produced by generators equipped with SCR (NOx level 0.4 – 0.6 gr/kWhr).

Summary

The average load, 645kW, will be supplied by generators which are equipped with SCR and guarantee a low NOx emission level. Only at expected maximum loads the NOx level will be slightly higher than the required 1.3 gr/kWhr. The duration of the maximum load is only expected during 13% of the total project time.

Consequently the overall NOx emission level will be below the requested 1.3 gr/kWhr.

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Emission level

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Operations Manager Solutions

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