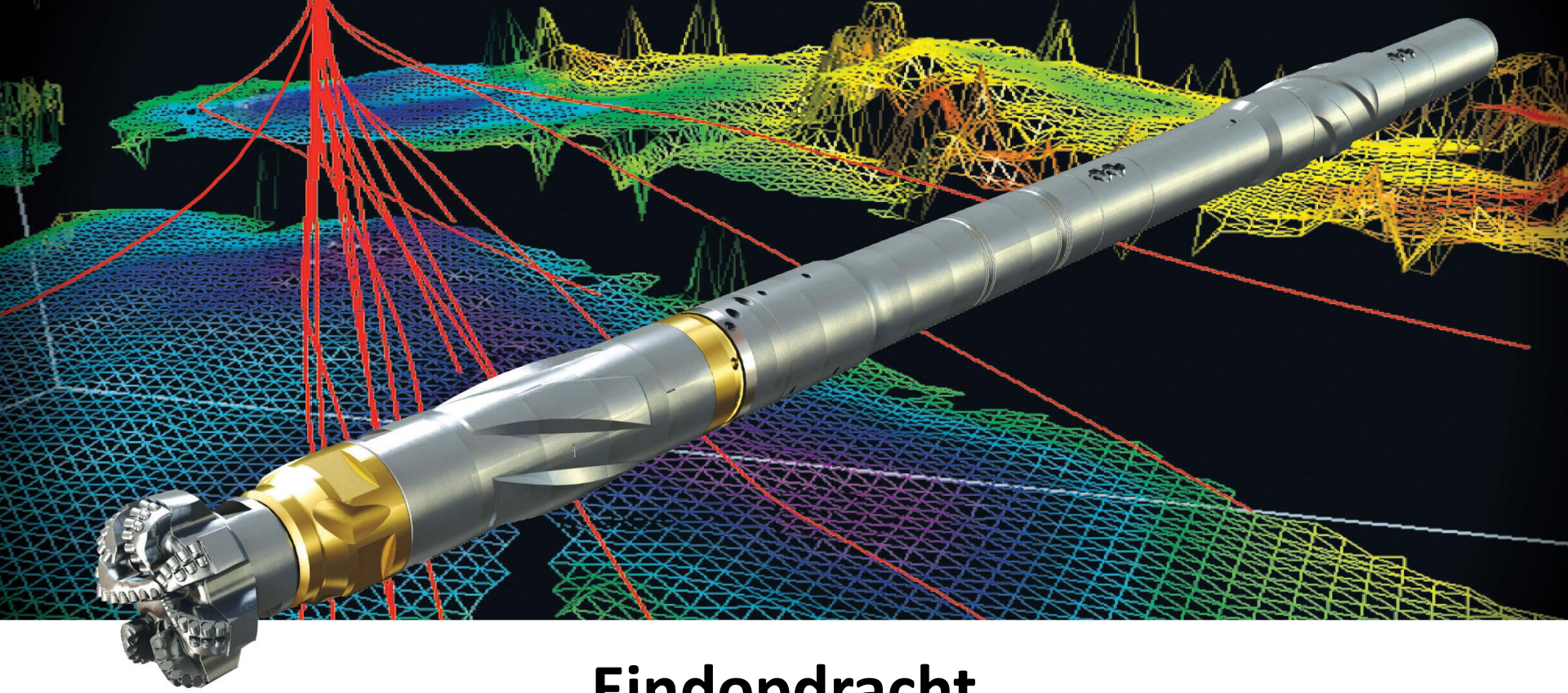


Eindopdracht

RSS Drilling

30 januari 2014 – Den Helder

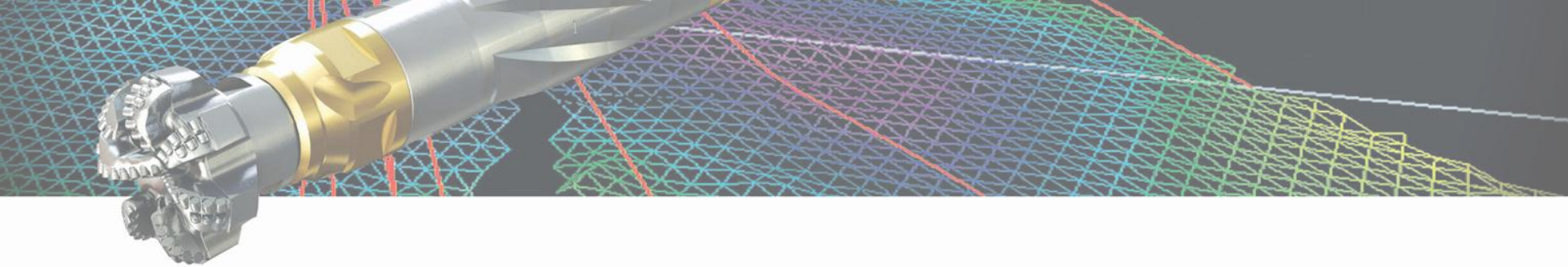
Maritime Campus NETHERLANDS

NOGEPA

NHL HOGESCHOOL

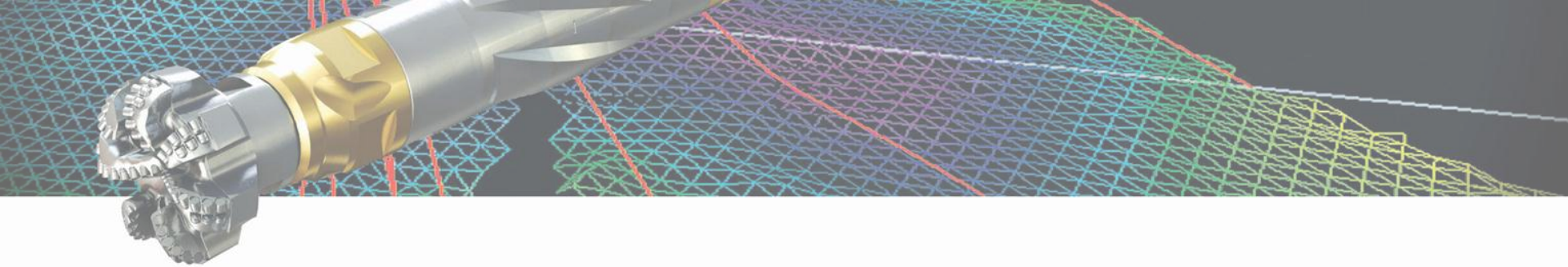
GDF SUEZ

GDF SUEZ E&P Nederland B.V.



Programma

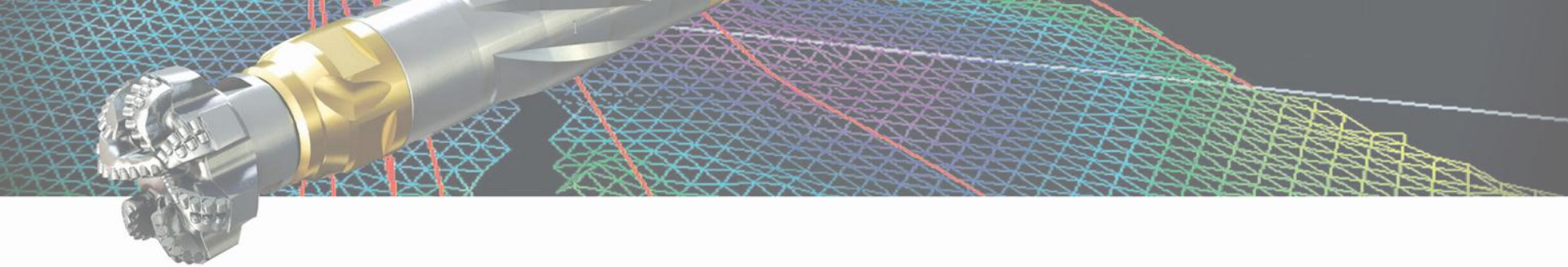
1. Opdrachtomschrijving
2. Coring
3. Rotary Steerable Systems
4. Onderzoeksmethode
5. Risk assessment
6. Conclusie



1. Opdrachtomschrijving

Eisenpakket van GDF SUEZ:

1) Rotary Steerable System
   - Gamma Ray, Sonic en Resistivity tools zo dicht mogelijk op het bit
   - 120 ^{o} Celcius
   - 600 bar op 4000 meter
   - Max. Dogleg 4°/10 meter, 8 3/8” hole
   - Voorbeelden van logs
   - Leveranciers
2) Coring:
   - Tools
   - Reservoireigenschappen (olie vs. gas)



2. Coring

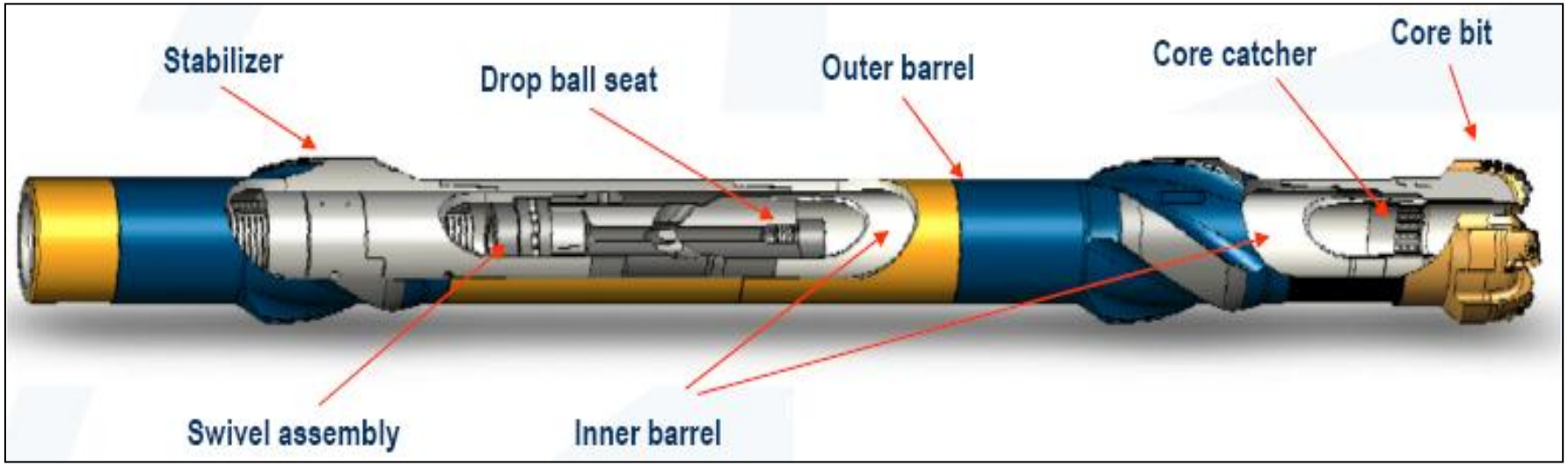
2.1 Algemeen

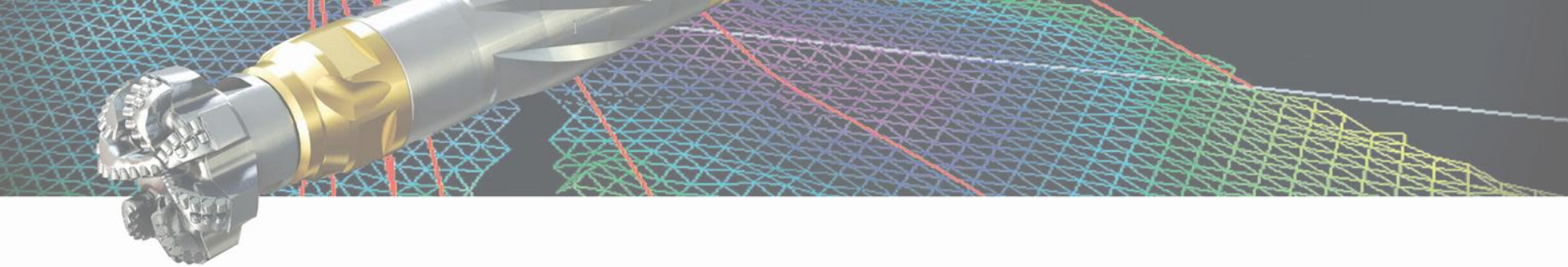
2.2 Tools

2.3 Mud

2.4 Core gel

2.5 Reservoireigenschappen





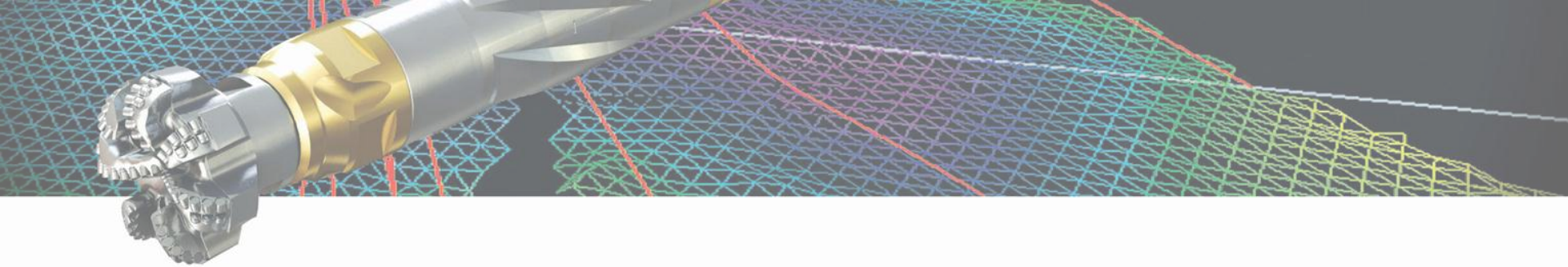
3. Rotary Steerable System

3.1 Directional drilling

3.2 Steerable mud motor vs. Rotary Steerable System

3.3 MWD en LWD

3.4 Marktonderzoek



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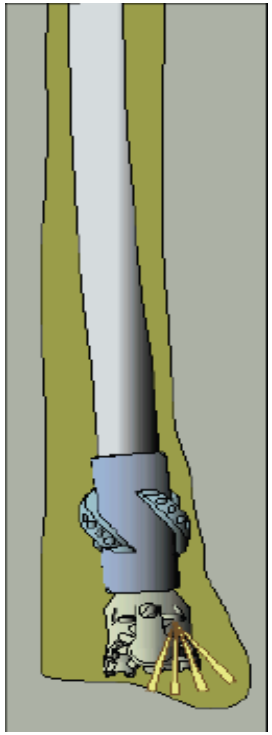

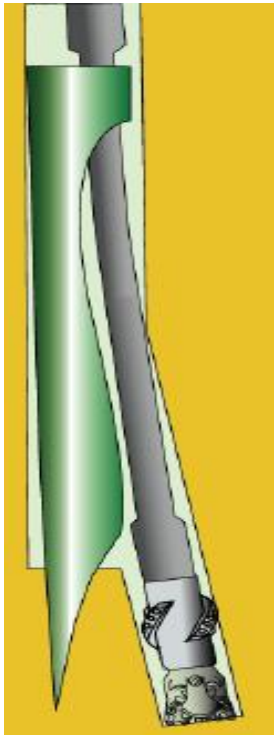

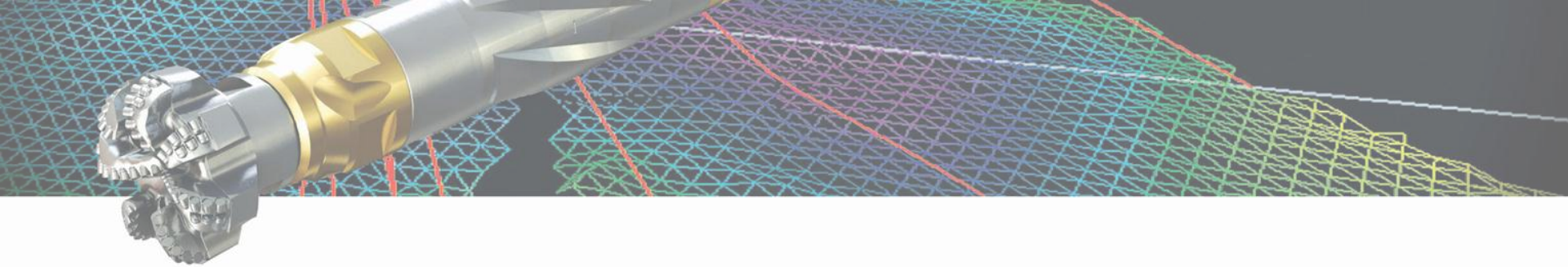

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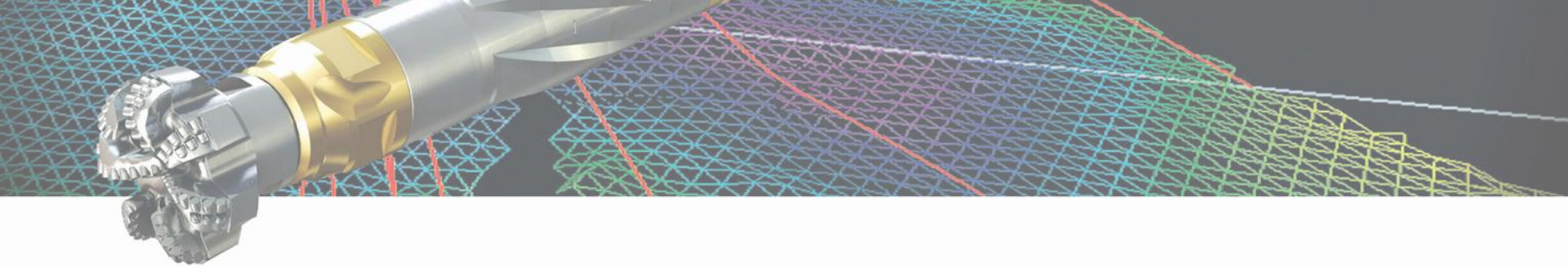

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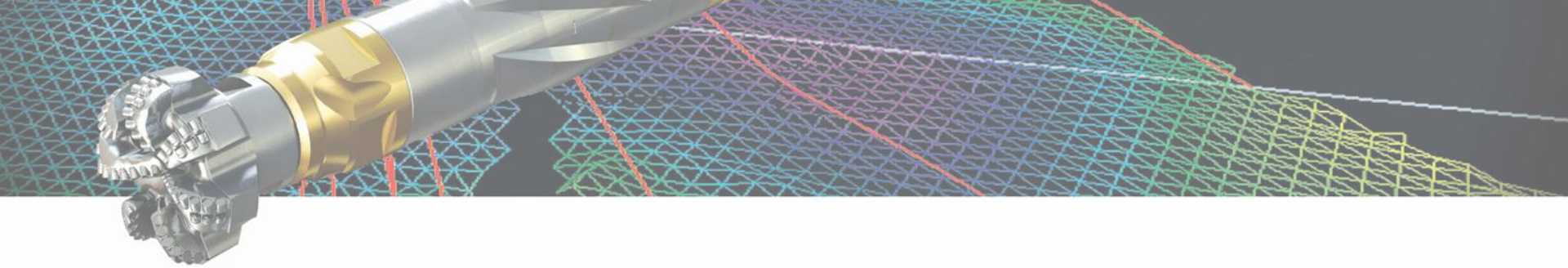

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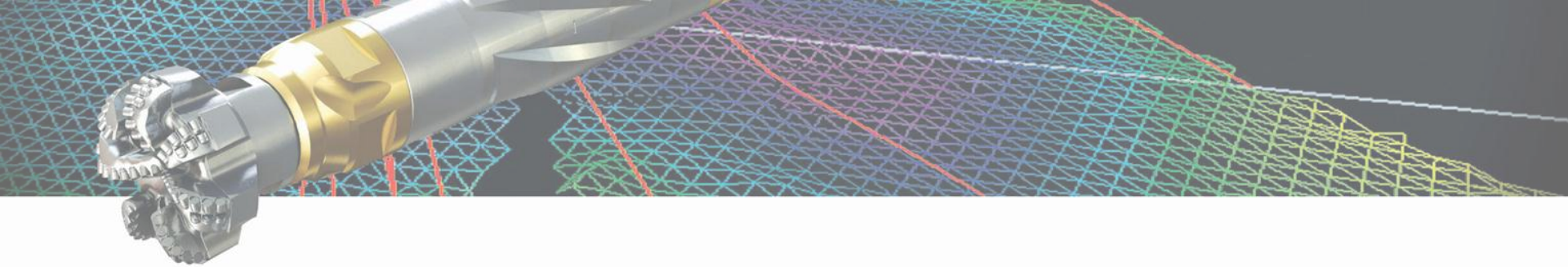
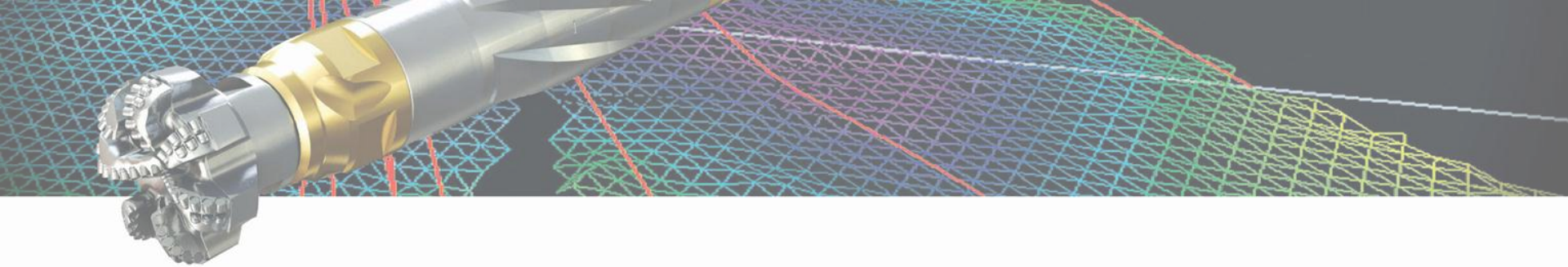


4. Onderzoeksmethode

General morphological overview

Variables	Importance factor	Baker Hughes AutoTrak G3	Value (*)	Rating	Score (rating * importance factor)	GyroData WellGuide 7-100	Value (*)	Rating	Score (rating * importance factor)	Halliburton GeoPilot Dirigo 7600	Value (*)	Rating	Score (rating * importance factor)	Schlumberger PowerDrive X6	Value (*)	Rating	Score (rating * importance factor)
		-				-				-				-			
Gamma Ray (m)	5		3,0	2,5	12,5		1,8	5,5	27,5		1,0	7,6	37,8		2,0	5,1	25,6
Resistivity (m)	4		8,6	6,7	27,0		9,9	5,1	20,5		11,7	2,9	11,7		6,4	9,5	38,0
Dogleg (deg/100ft)	4		6,5	3,1	12,5		11,0	8,8	35,0		10,0	7,5	30,0		8,0	5,0	20,0
Sonic (m)	3		20,0	3,3	10,0		16,7	5,6	16,7		16,7	5,6	16,7		13,2	7,9	23,7
Accuracy (degrees)	1		0,1	10,0	10,0		0,1	10,0	10,0		0,1	10,0	10,0		0,1	9,5	9,5
Total score (BHA-specific):					**72,0**				**109,7**				**106,1**				**116,8**

(*) According to technical datasheet

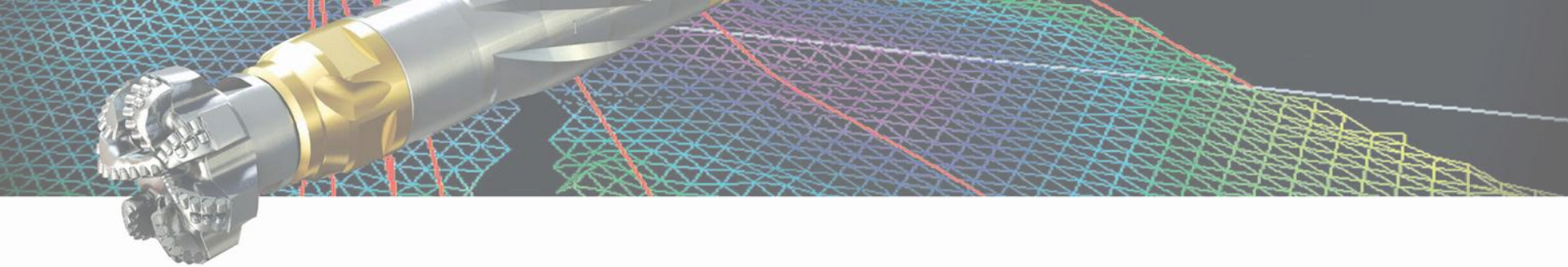


4. Onderzoeksmethode

Morphological overview for maximum dogleg

Variables	Importance factor	Baker Hughes AutoTrak Curve	Value (*)	Rating	Score (rating * importance factor)	GyroData WellGuide 7-100	Value (*)	Rating	Score (rating * importance factor)	Halliburton GeoPilot Dirigo 7600	Value (*)	Rating	Score (rating * importance factor)	Schlumberger PowerDrive Archer	Value (*)	Rating	Score (rating * importance factor)
		- -				- -				- -				- -			
Dogleg (deg/100ft)	5		15,0	7,5	37,5		11,0	3,5	17,5		10,0	2,5	12,5		15,0	7,5	37,5
Gamma Ray (m)	2		3,5	1,3	2,5		1,8	5,5	11,0		1,0	7,6	15,1		4,0	0,0	0,0
Accuracy (degrees)	1		0,2	5,0	5,0		0,1	10,0	10,0		0,1	10,0	10,0		0,1	9,5	9,5
Total score (BHA-specific):					**45,0**				**38,5**				**37,6**				**47,0**

(*) According to technical data sheet



4. Onderzoeksmethode

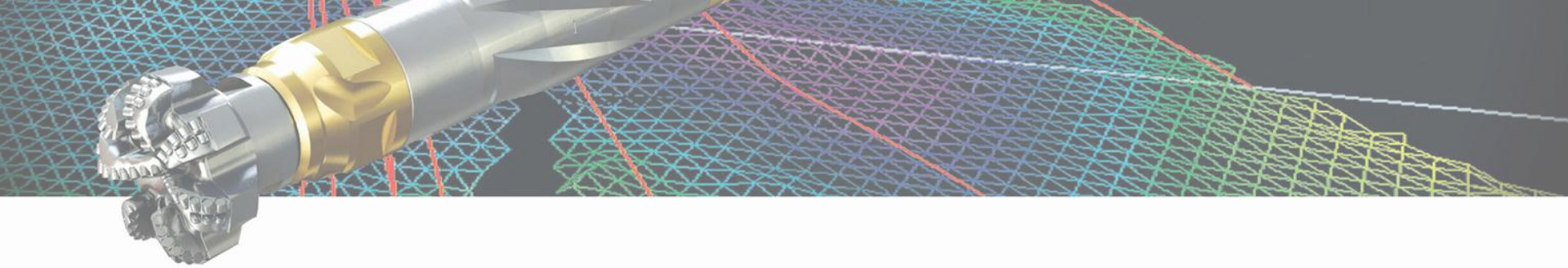
Resultaten

General

1	Schlumberger PowerDrive X6	(116,8)
2	GyroData Wellguide 7-100	(109,7)
3	Halliburton GeoPilot Dirigo	(106,1)
4	Baker Hughes Autotrak G3	(72,0)

Dogleg

1	Schlumberger PowerDrive Archer	(47,0)
2	Baker Hughes Autotrak Curve	(45,0)
3	GyroData Wellguide 7-100	(38,5)
4	Halliburton GeoPilot Dirigo	(37,6)



5. Risk assessment

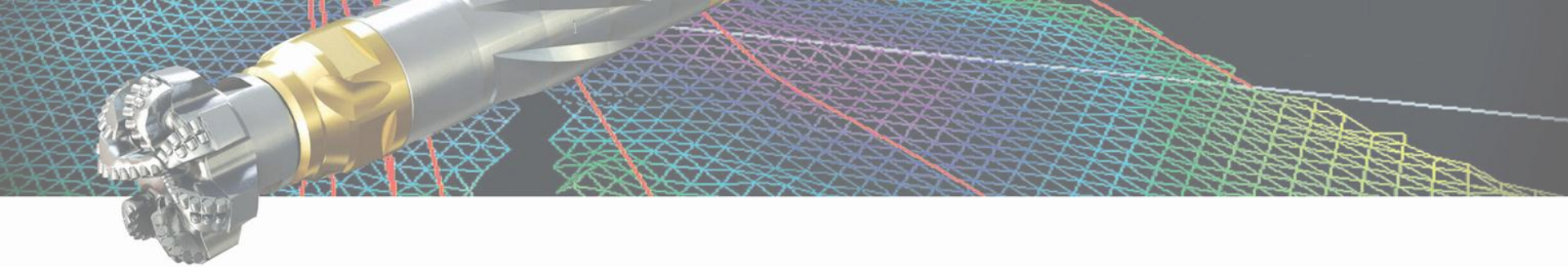
5.1 Afbakening en methode

5.2 Risicoanalyse

5.3 Barrieres

P	x	D	x	E	=	R
Probability		Duration		Effect		Risk

R	Risk	Measures to be taken
>320	Very high	Stopping activity, do not start to work
160…320	High	Take immediate measures
70…160	Substantially	Correction is needed
0…70	Possible / slightly	Attention

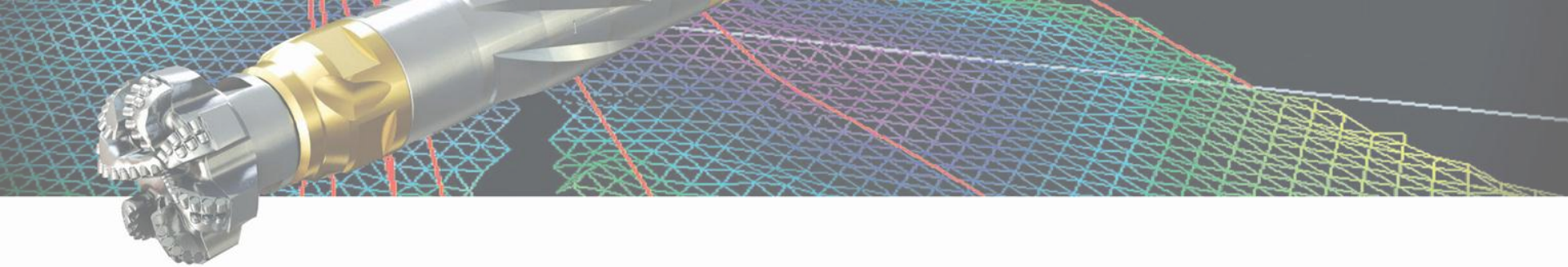


5. Risk assessment

Step:		Hazards:
1	Logistics with forklift	Tipping forklift, collision, damaging equipment
2	Lifting operations (entire process)	Falling loads, not well balanced loads, damaging equipment
3	Logistics with supplier vessel	Damaged cargo, losing the cargo, delivery time, collision with the RIG
4	Collars storage on the RIG	Tripping and entrapment hazard to people, rolling equipment
5	Assembling BHA in the derrick	Components and tools fall into the well of on deck, torque collars
6	Drilling with the RRS	Rotating drill string, moving equipment and collars, torque collars
7	Measurement while drilling	Using the wrong values, MWD tools in wrong angle in the RSS, hotspot in non-magnetic materials, magnetic field is influenced by sunspot

Step:	P Probability		D Duration		E Effect		R Risk
1	6	x	3	x	15	=	270
2	3		3		40		360
3	3		2		40		240
4	3		6		7		126
5	3		6		15		270
6	3		10		15		450
7	3		6		15		270

If R >70 barriers must be determined to take away the risk or decrease.



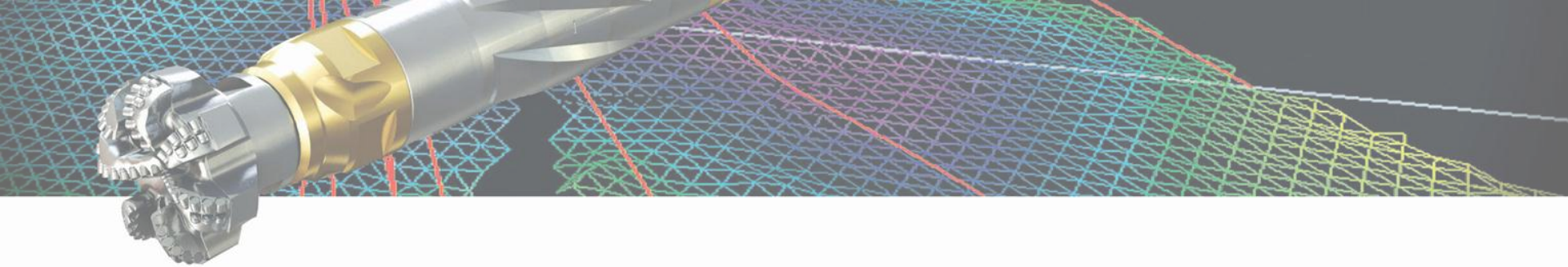
5. Risk assessment

Control measures:

1. Specific forklift training, approved materials, marking walking route, clear view during work, obstacle-free route.
2. Specific lifting training, checked lifting equipment, approved materials, define center of gravity, minimum of people on site, permanent contact between crane driver and assistant, free area during lifting, above beaufort 6 no lifts.
3. Cargo in offshore crate, securing cargo, proven supplier, well maintained supplier vessel, vessel equipped with DP
4. Use of wedges, instruct personnel, no walking zone around collars unless necessary
5. Cleanand dray drill floor, using slips and dogcoller, inspected and cleaned thread, ure correct torque for the collars
6. Specific drilling training, using iron roughneck and automatic pipe handling unit, minimum of people on drill floor
7. Specific MWD training, calibrate magnetic system, inspect the MWD tools in the BHA, inspect the non-magnetic materials for hotspots

Step:	P Probability		D Period		E Effect		R Risk
1	3	x	3	x	7	=	**63**
2	3		3		7		**63**
3	1		2		15		**30**
4	3		6		3		**54**
5	1		6		7		**42**
6	1		10		7		**70**
7	3		6		3		**54**

If, after taking action R > 70 more barriers must be determined to take away the risk or decrease.

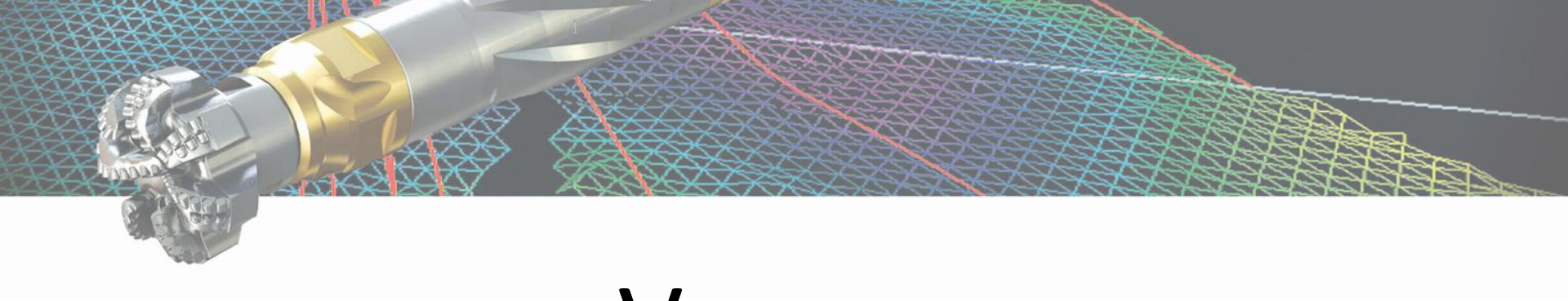


6. Conclusie

Coring: Coregel en WBM

BHA: Schlumberger PowerDrive X6

Schlumberger PowerDrive Archer



Vragen

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