

Integrating well data with ease, interpreting with accuracy and presenting with quality



Michelle Hollerbach Silva Senergy AS / Software

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ODM is a subsurface application for the integration, interpretation and presentation of well based data.

- 1. Integrate & work with ALL well-data in a single package Interpret with confidence knowing you have the full dataset before you
- Extremely strong geological & presentation tools
 Fast correlations, stratigraphic awareness, spectacular presentations ODM designed for geology
- 3. Manage field history and monitor performance Reservoir management tool to integrate and understand well, field-history and spatial data

ODM – Data Management



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Well Header File	Well	Formation	Member	Bed	
weil neauer file	14/07-A01	2722.47 (Prob.) - 2825.80 (Prob.) Sandhurst	3628.95 (Conf.) - 3703.93 (Conf.) Upper Pelican	3628.95 (Conf.) - 3633.52 (Conf.) Bed E	
		2825.80 (Prob.) - 2992.53 (Poss.) Dartmouth	3703.93 (Conf.) - 3797.50 (none) Lower Pelican	3	
Log File		2992.53 (Poss.) - 3499.71 (Conf.) Persimmon		⇔ A6 8	
Logimonn		3499.71 (Conf.) - 3628.95 (Conf.) Musk Ox 3628.95 (Conf.) - 3797.50 (none) Pelican		Comment - Lanca of Temper - 1600.00 Temper - 1000.00 Temper - 1000.00 Tempe	
	14/07-A02	2922.73 (Prob.) - 2971.19 (Prob.) Sandhurst	3945.33 (Conf.) - 4015.44 (Conf.) Upper Pelican	· · · · · · · · · · · · · · · · · · ·	⇔ A6
Polygon File	147079402	2971.19 (Prob.) - 3146.76 (Poss.) Dartmouth	4015.44 (Conf.) - 4037.38 (none) Lower Pelican	Hotopoly	
		3146.76 (Poss.) - 3813.05 (Conf.) Persimmon	4015.44 (Coni.) - 4057.56 (none) Lower Pelican		122.11201 - 10.01000 i (0005) 00011 - 00011
Single-Well ASCII File		3813.05 (Conf.) - 3945.33 (Conf.) Musk Dx			
Dirigie-weil ADCIT Lile		3945 33 (Conf.) - 4037 38 (none			
	14/07-A03	2668.83 (Prob.) - 2756.00 (Prob. Search/Replac	e elican		
Multi-Well ASCII File	14/01/100	2756.00 (Prob.) - 2905.38 (Post	elican		
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		3516.48 (Conf.) - 3671.01 (Cont			
		3671.01 (Conf.) - 3956.00 (none Replace : R	otlibgend	3	
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		4269.94 (Poss.) - 4747.26 (Con)+ Eddinedbo		
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Geolog		4557.67 (Conf.) - 4735.98 (Conf.) Musk Ox		4	
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OpenSpirit	14/07-A06	3151.63 (Prob.) - 3211.98 (Prob.) Sandhurst	4460.75 (Conf.) - 4591.81 (none) Upper Pelican	4	
oberobilieu		3211.98 (Prob.) - 3398.83 (Poss.) Dartmouth		4	
		3398.83 (Poss.) - 4238.85 (Conf.) Persimmon		4	
OpenWorks		4238.85 (Conf.) - 4460.75 (Conf.) Musk Dx			
oponnonon		4460.75 (Conf.) - 4591.81 (none) Pelican			
D-L-I	14/07-A07	3122.98 (Prob.) - 3168.09 (Prob.) Sandhurst	4418.08 (Conf.) - 4526.28 (Conf.) Upper Pelican	4	
Petrel		3168.09 (Prob.) - 3353.11 (Poss.) Dartmouth	4526.28 (Conf.) - 4600.65 (none) Lower Pelican	4	
		3353.11 (Poss.) - 4192.83 (Conf.) Persimmon		4	
		4192.83 (Conf.) - 4418.08 (Conf.) Musk Ox		4	
00110111		4418.08 (Conf.) - 4600.65 (none) Pelican		4	
ODM Dictionary	14/07-A07Z	3257.09 (Prob.) - 3314.70 (Prob.) Sandhurst	4504.03 (Conf.) - 4587.85 (Conf.) Upper Pelican	4	
· • • • • •		3314.70 (Prob.) - 3509.77 (Poss.) Dartmouth	4587.85 (Conf.) - 4718.91 (none) Lower Pelican	4	
ODM Project Data/Chart		3509.77 (Poss.) - 4368.09 (Poss.) Persimmon			
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ODM DB Synchroniser					

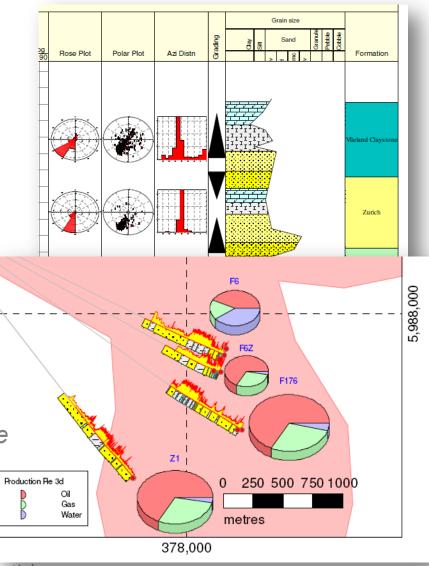
Integrate & work with ALL well-data



Canvas to understand widest variety of data available:

- Geology
- Stratigraphy
- Core data
- Drilling
- GIS
- Grids
- History (production, injection etc.)

'ODM [is] utilised as a 'digital oilfield' and the 'missing link' between downhole and aerial information' – **Middle-Eastern co.**



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Data management



- All discrete data will be tagged to an Interpreter
 - Might designate the name of an individual interpreter, the name of the data provider or for final, quality-checked data the name of your organization
- Different interpretations of the same data are easier to manage and compare.

Name	Description	Creator	Interpretati	on						
1 [None]	Data with no interpretatio		Read Only:		Read/Write:					
2 Coorporate	Coorporate official data		MGR	>>						
3 ADMIN	Interpreter for user ADMI		IAIN							
4 Ichron	Data from ICHRON									
5 GUEST	Interpreter for user GU	Durine Well: Li	thostratigraphy - Fo	ormation					-	
6 IAIN	Interpreter for user IA:	47 🖬 🕶 🎒 🗌	՝ 🖻 🛍 🏭	× ₹_ \$ Fom	nation	-	[None]	ft m 🧕 💋 🗄		
7 MGR	Interpreter for user MG					1	[None]		· _	
8 USER	Interpreter for user US	Top Depth (m)	Top Boundary	Base Depth (m)	Base Boundary	Legend	ADMIÑ	Interpretation	Top Age	Base Age
9 Lene	Lene's Interpretation	-50,00m	No boundary	0,00m	Fault	Ovsterst	COORPORATE GUEST (RO)	[None]	0,00	0.00
0 Michelle	Michelle's Interpretatio	0,00m	Fault	80,00m	Confident	Durine	IAIN (RO)	[None]	455,00	460,00
1 Petrostrat	Data from PETROSTRA						Ichron iUSER (RO)			
2 Neftex	Data from NEFTEX	80,01m	Confident	250,00m	Confident	· ·	MCP (PO)	[None]	460,00	469,00
		250,01m	Confident	400,00m	Possible	Balnake	Michelle	[None]	469,00	475,00
		400,01m	Possible	475,00m	?Unconformable	Sangom	NEFTEX	[None]	475,00	481,00
		475,01m	?Unconformable	615,00m	?Unconformable	Sailmho	Petrostrat USER	[None]	481,00	484,00
		615,00m	?Unconformable	762,00m	Confident	Eilean D		[None]	484,00	510,00
		762,00m	Confident	795,01m	Confident	Ghrudaid	ih	[None]	510,00	520,00
		795,01m	Confident	803,00m	Confident	Salterell	a Grit	[None]	520,00	523,00
Add	Remove Vise Inte	803,00m	Confident	823,00m	Confident	Fucoid B	eds	[None]	523,00	525,00
		823,01m	Confident	983,00m	Unconformable	Eriboll S		[None]	525,00	540,00
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		983,00m	Unconformable	1064,00m	Confident	Orthogn		[None]	0,00	0,00
		1206,00m	Confident	1353,00m	Confident	Bay of S	toer Fm	[None]	1130,00	11

Data browser: viewing all interpretations of same tops, with option to filter down on a chosen interpreter name

Populating your database

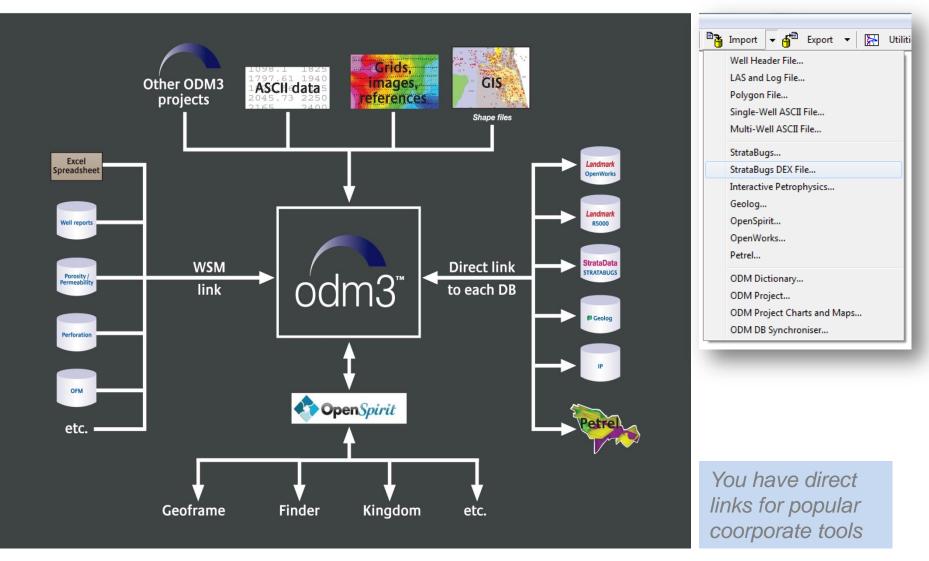
ODM can be populated with the following data types from Diskos and the NPD:

- Import ASCII, LAS, LIS/DLIS (via IP) files to ODM
 - Well header files from NPD or Diskos
 - Logs, composite (NPD standard), MWD/LWD
 - Deviation survey, wellpath, checkshots & velocity log
 - Tops (lithostrat, chronostrat, sequence strat)
 - Pressure & fluid data, drilling data, mudlogs, well tests, geochemistry, petrography, mineralogy, biostratigraphy, core photos, lithology data and descriptions, CPI...
- References
 - Hyperlinks to reports & documents (PDF, Microsoft Office), image file formats (JPEG, GIF, TIFF, CGM) and to webpages (e.g. link to NPD FactPage for each well).
- Production data
 - ODM's Reservoir Performance Module (RPM) import/link to production data, water geochemistry and drilling reports, completion reports, well evaluation reports...





Populating your database



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ODM – IP – Petrel



ODM-IP

- Both packages have equivalent data links
- 2-way transfer of wells, well headers info, wellpaths, logs (within Sets) and tops
- Grids (surfaces) and polygons imported from Petrel to ODM3
- Saved Sessions

ODM-PETREL

- Single user interface in ODM handles 2-way data transfer to Petrel
- Wells, well header info, wellpaths, checkshots, logs and tops
- Grids (surfaces) and polygons imported from Petrel to ODM3

Saved Sessions

Petrel

A growing number of companies are using ODM in conjunction with Petrel and IP, for which ODM offers a flexible and straightforward 'wells database' solution.

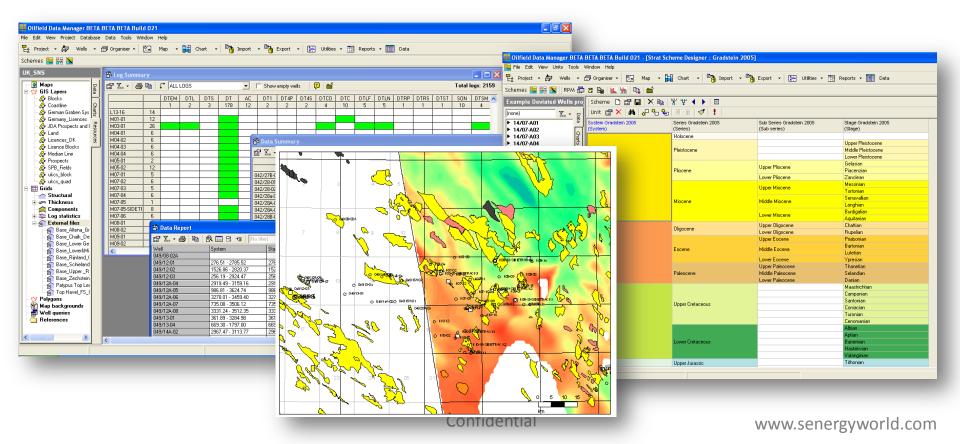
IP-PETREL

- Accessed from Petrel, allowing 2-way transfer of data
- Wells, well header info, wellpaths, logs and tops



Full data reporting, map interface for fast access

- Queries, search/replace data, data summary charts
- All data accessible direct from GIS maps



Summary Reports



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6506/11-7	4				253,0	0m	Confident	1041,0	00m	Confident	NAUST F	м		
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All active wells in your project and what each one contains individually Browse the data directly

Summary Reports



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07/1-1	11											Details									
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07/2-1 T2	9									1		Range	510,87m - 37	38,29m							
07/2-2 T2	9											Maximum	176,115								
07/2-3	16											Created	03-sep-2012	13:15							
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what data you've not						ı'\/ <i>C</i>	n c	ot					513,46	50,348	_					Curve Tools	
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Essential geological tools

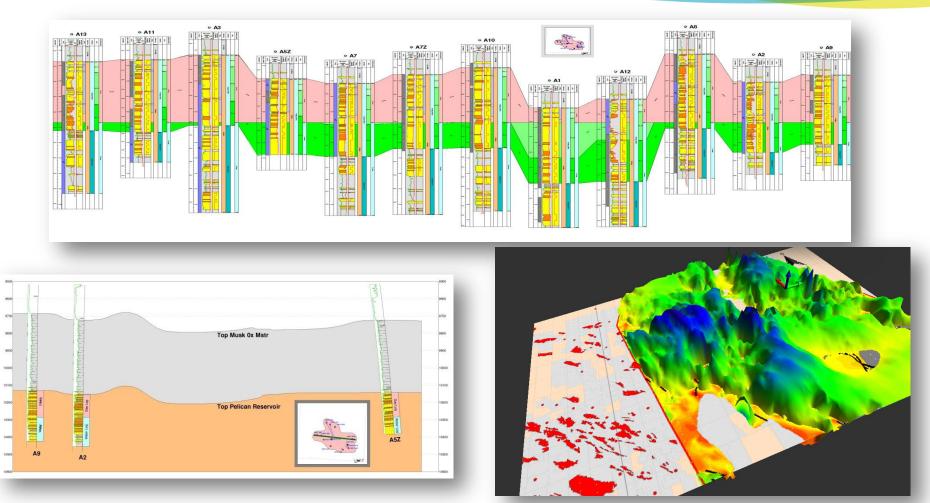
- Control subsurface data with log-scripting, curve cut-offs, core-shifting and more
- Full set of data reports to understand stratigraphy, zonal analysis, surface
 intersection reports

ystem Gradstein 2005 System)	Series Gradstein 2005 (Series)	Sub Series Gradstein 2005 (Sub series)	Stage Gradstein 2005 (Stage)	Depth	Core Images: No Depth Shift	Depth Shift Values	Core Image: Last Value	Core Image: Interpolated
	Holocene (0.00 - 0.01)						Depth Shifted	Depth Shifted
			Upper Pleistocene (0.01 - 0.13)	100				
	Pleistocene (0.01 - 1.81)		Middle Pleistocene (0.13 - 0.78) Lower Pleistocene (0.78 - 1.81)	0				
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	Pliocene (1.81 - 5.33)	Upper Pliocene (1.81 - 3.60)	C Script Properties	- 50			-	
eogene (0.00 - 23.03)		Lower Pliocene (3.60 - 5.33)						
		Upper Miocene (5.33 - 11.61)	Title : Porosity from density curve ove	r Upper Pt			-	
	Miocene (5.33 - 23.03)	Middle Miocene (11.61 - 15.97)	Output : POROSITY	150		1		
		Lower Miocene (15.97 - 23.03)	Params :	Paste 200	-	1		
	Oligocene (23.03 - 33.90)	Upper Oligocene (23.03 - 28.40) Lower Oligocene (28.40 - 33.90)	🔽 Smooth data	- 250		<		-111
		Upper Eccene (33.90 - 37.20)	E Auglichie to all a second at	-				
			Available to other projects	- 300		7		
aleogene (23.00 - 65.50)	Eocene (33.90 - 55.80)	Middle Eocene (37.20 · 48.60)	Script: 🗅 🔚 🐰 🛍 🛍 🕅	- 350		}		
		Lower Eocene (48.60 - 55.80)						
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retaceous (65.50 - 145.50)			PORDEN = (den Matrix			/		
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	Lower Cretaceous (99.60 - 145.50)		Else	650				
			PORDEN = -999.25	- 650		1		
				700		1		
			End If	- 700		1		CON THE OWNER

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ODM – As a Subsurface Tool

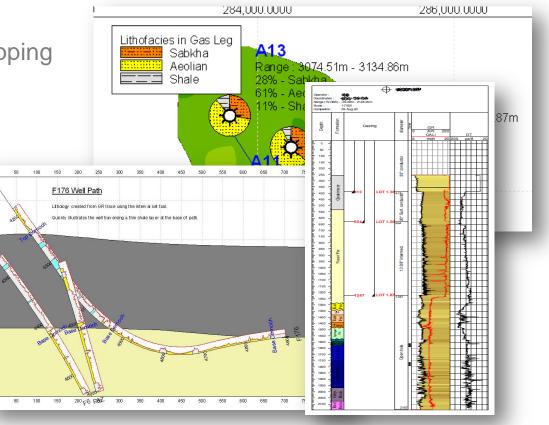






With full geology functionality, mapping front end & relational database back-end, ODM can be used for:

- Exploration & play fairway mapping
- Development & reservoir performance analysis
- Well-planning & drilling
- Pre-modeling work



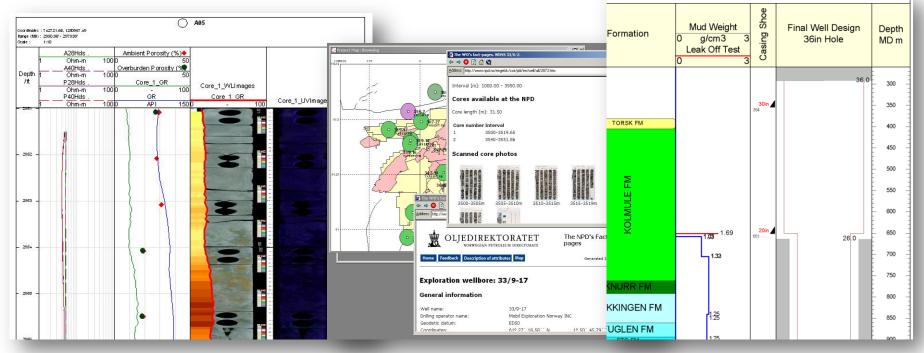
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ODM Subsurface



Total data integration

- Fully understand your dataset by viewing ALL available data to give *better understanding of the subsurface*
- Integrate logs, geology, strat data, drilling, engineering sedimentology, core, scanned images & more in a single chart

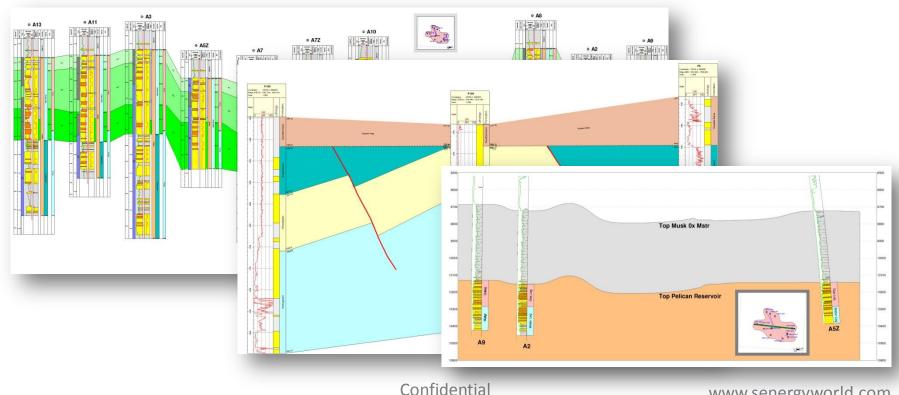


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Fast, fantastic well-composite and correlations

- Extremely fast and geological correlations, built directly from the GIS-enabled map •
- Infinite flexibility in well-composite design

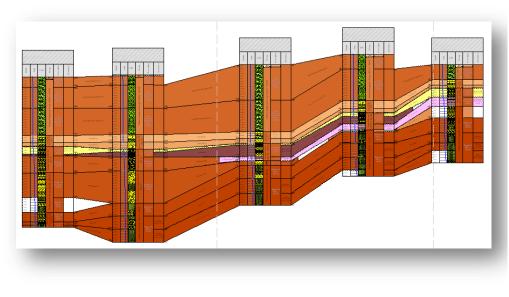


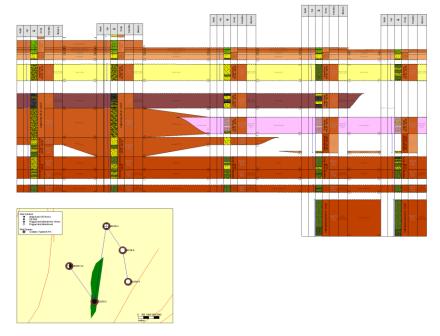
ODM Subsurface



Full stratigraphic awareness

- Display data in MD, TVD, TVDSS, TWT, TST & Age
- Build and maintain stratigraphic columns and chronostratigraphic schemes
- Create instant Wheeler charts using auto-





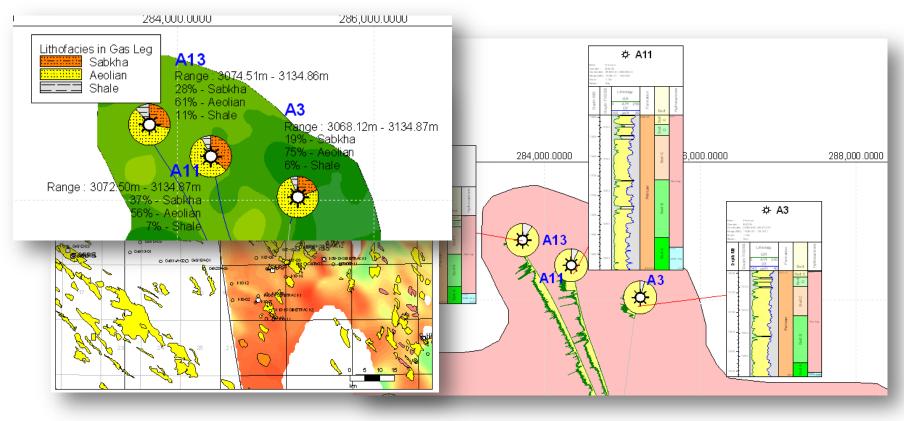
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ODM Subsurface



Subsurface on maps

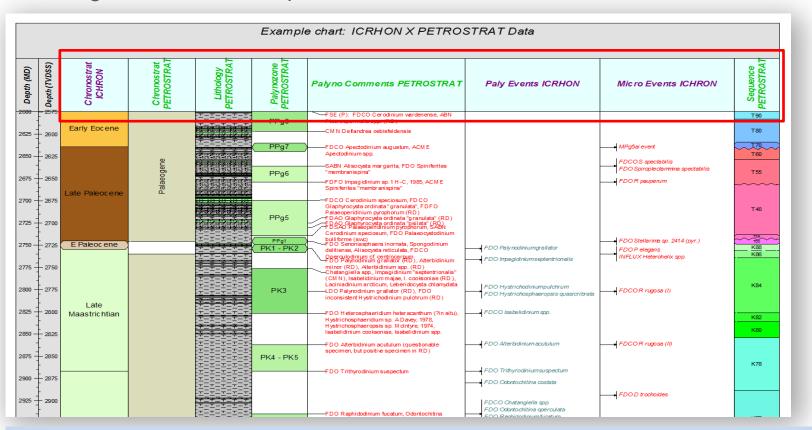
- Access all well-data and tools from GIS & grin enabled maps
- Bubbles, polygons, log stats, well summaries etc. on maps



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The same data type from different vendors are displayed along side allowing an accurate interpretation and Qc.

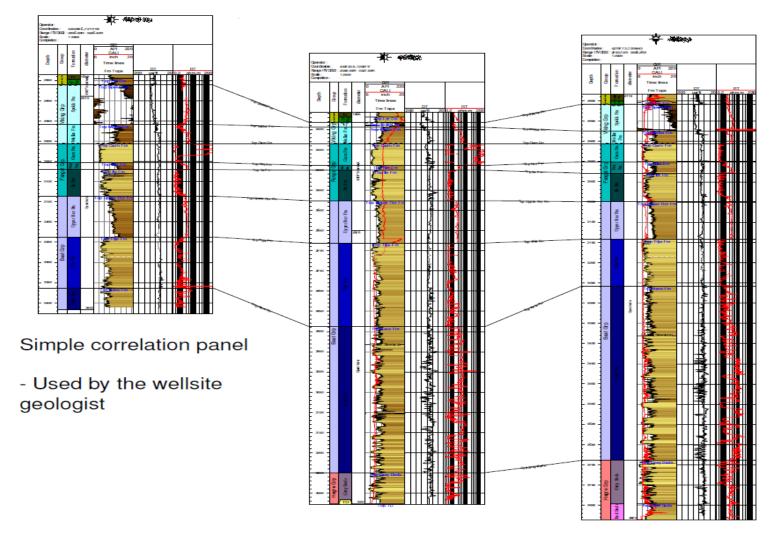


Once the data is displayed the tops can be moved interactivaly.

Well planning



Simple correlations can be built quickly

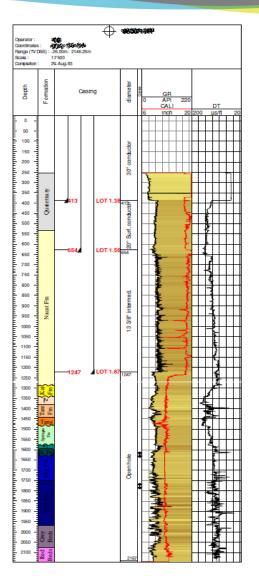


Well planning

Senergy software

Store engineering & drilling data easily next to well data for existing wells

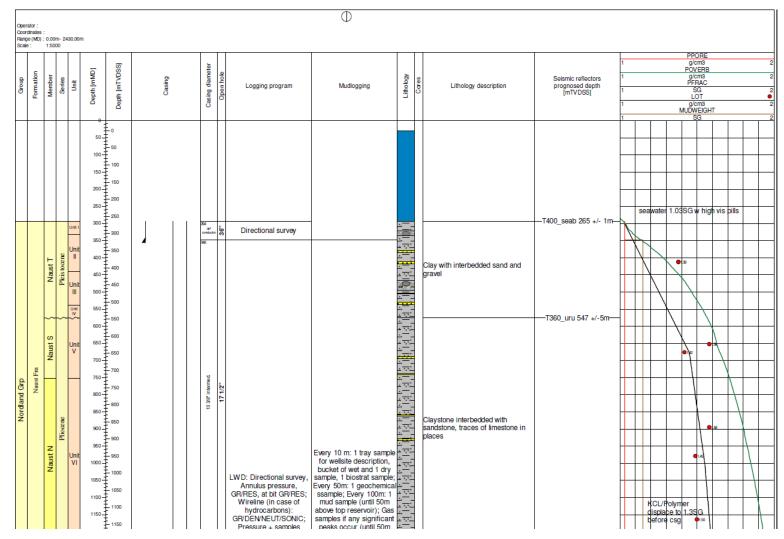
- Casing, leak-off tests, mudweights, lithology etc.
- Flexible templates allow users to display any data in the database on any wellstick
- Relational database back-end for comparison of data
- Full data reporting, edits & searching



Well planning



Well planning template example



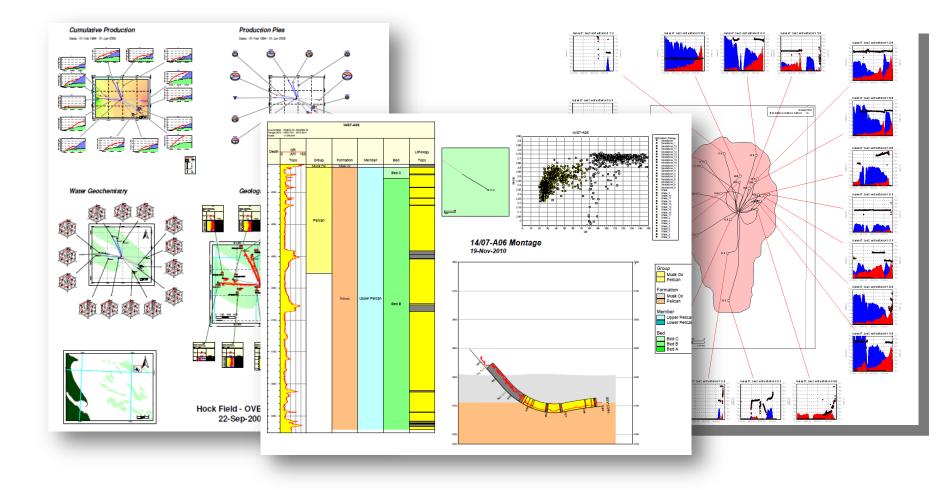


Create well-review montages and wellbooks

- Create review maps and attach user-defined graphs to show production, pressure, injection, pump activity etc.
- Animate field history
- Create production dashboards
- Create single-well templates with full geological and well history & use these to auto-create digital wellbooks
- Display data-tables from each well on charts
- Charts automatically display latest data when opened

Images on next slides

ODM – Reservoir Performance



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Reservoir Performance Module benefits:

- Visualisation production, injection, pressure, financial data etc. like never before
- Identification reservoir communication, pressure declines, un-exploited regions & new targets etc.
- Auto-build and auto-maintain of wellbook & field reviews charts
- Integration with subsurface & GIS data
- Field history animation
- Performance dashboards & summary tables

Unprecedented visualisation for field history

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Linkage to any data source, database or spreadsheet

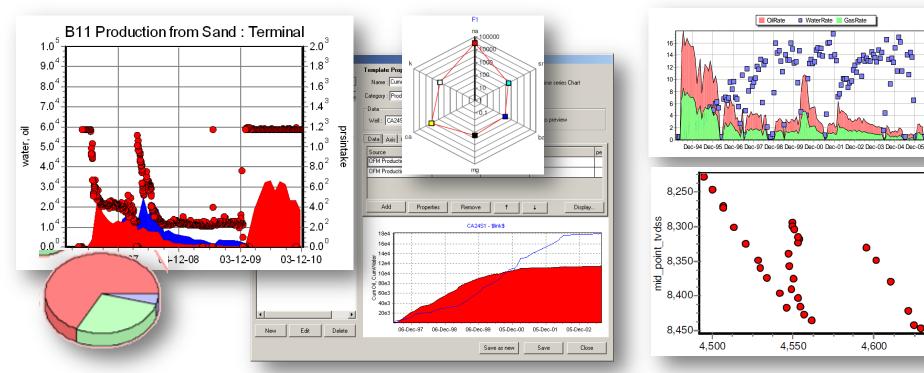
- Import from OFM, proprietary databases and/or spreadsheets
- Button-click synchronisation with any/all external data

Synchronise Well Data Tables	Offifield Data Manager	- 7 ×
Wells Data Results Image: Dependitions Image: Dependitions Synchronise Image: Production Image: Dependitions Synchronise Image: Production data Image: Dependitions Image: Dependitions Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependition data Image: Dependititition data <	Edt Verw Window Help Project Te Browser Wels Con Map + Torganiser Te Contact - Conta	
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Custom build field history displays

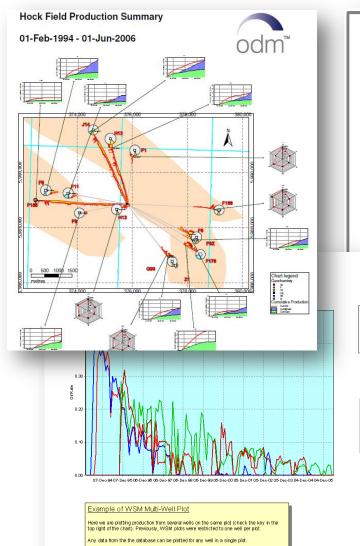
- Full charting control for any imported field-history data
- Display data from different sources on a single chart
- Save, edit and use entire libraries of user-created templates



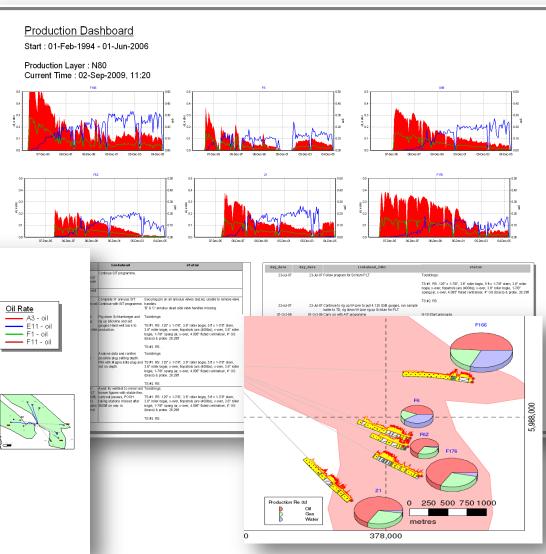
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Reservoir Performance Module





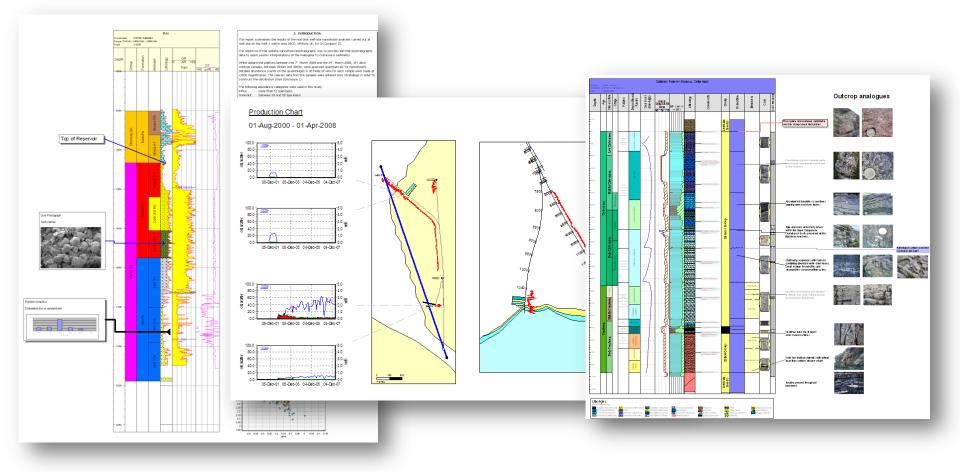
ODM 3.6 will improve on this and allow production to be appreciated for specific well sets.



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ODM - Presentation





www.senergyworld.com

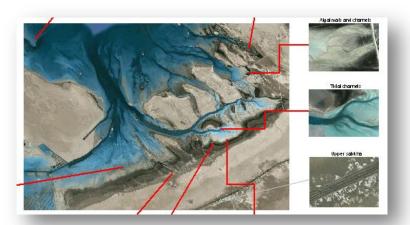
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Totally integrated montaging interface allows:

Presentation quality montages created directly in ODM

- Linked maps, cross-sections, X-plots & production all on a single montage
- Auto-update from to always show latest data
- Edit montages while remaining connected to data
- Cut/paste all montages directly into MS Office
- Print directly to plotter, printer, PDF, CGM, bmp or emf
- Screen-capture & email functionality built-in

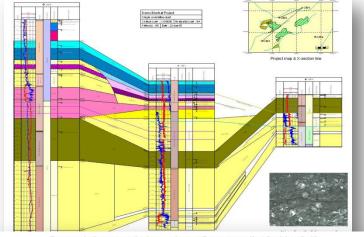
Better charts, better presentations mean better understanding



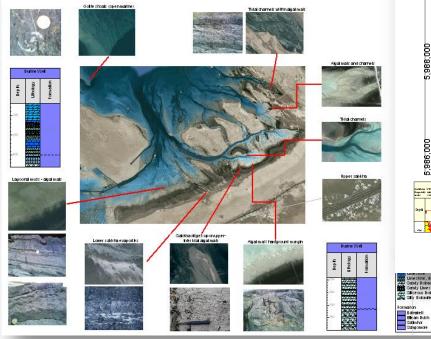
senergy

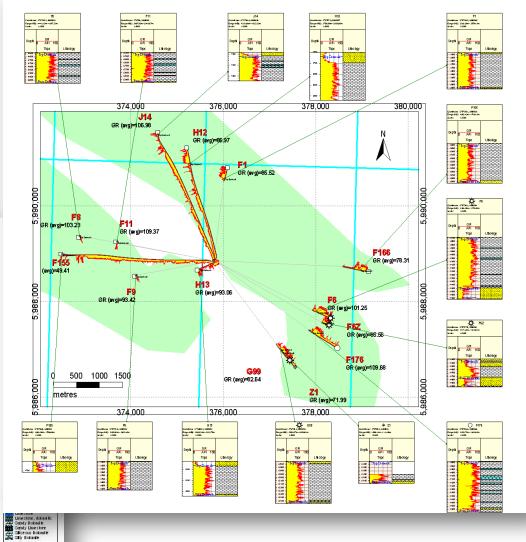
Presentations & Montaging



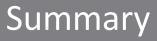


Reservoir & outcrop facies analogue (Durness wells / Arabian Gulf)





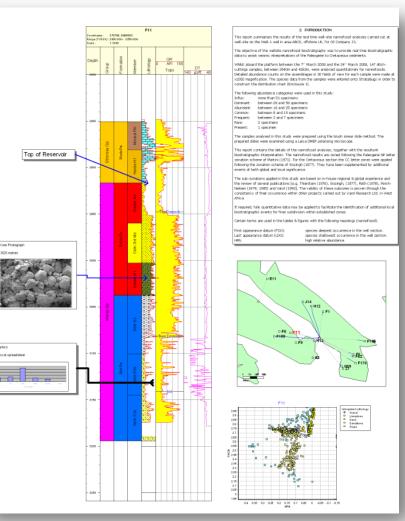
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ODM

- Totally integrated workflows between geology, drilling, GIS, field history and more
- Excellent geological interpretation and visualisation tools
- Can act as geological database & front-end to Petrel
- Reservoir monitoring and animation
- Data management and manipulation tools to control data
- Data links to industry standard systems
- Presentation of quality montages





Thank You!



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