

From Field Operations to Economics. Breaking the Barriers. Next Level of Integration.

Adil Mukanov
PetroKazakhstan Kumkol Resources JSC



What's Next?

SIS Global Forum 2017

September 13-15

Le Palais des Congrès de Paris

Schlumberger

Agenda

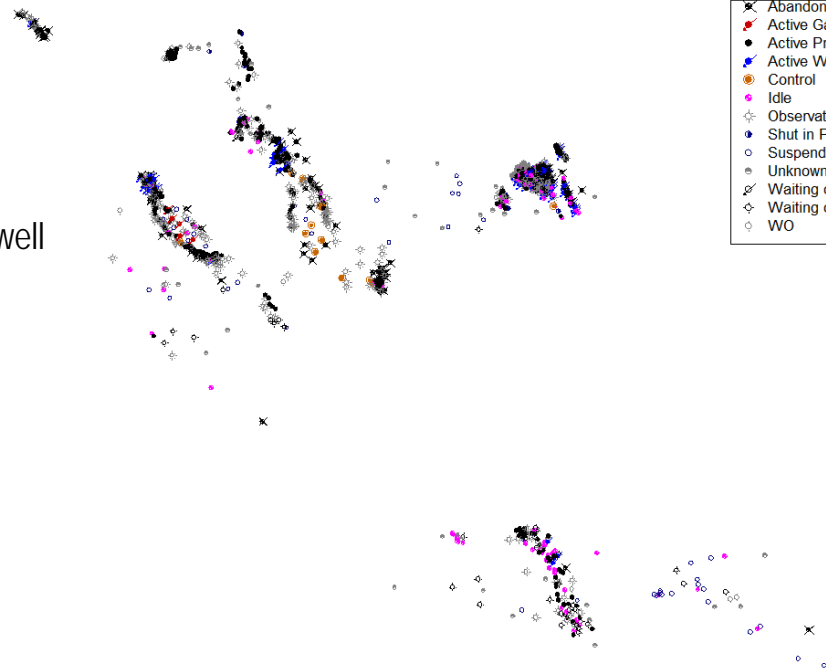
- Company overview
- Challenge description
- Solution overview
- Solutions details
- Conclusion

Company overview - PetroKazakhstan Kumkol Resources JSC



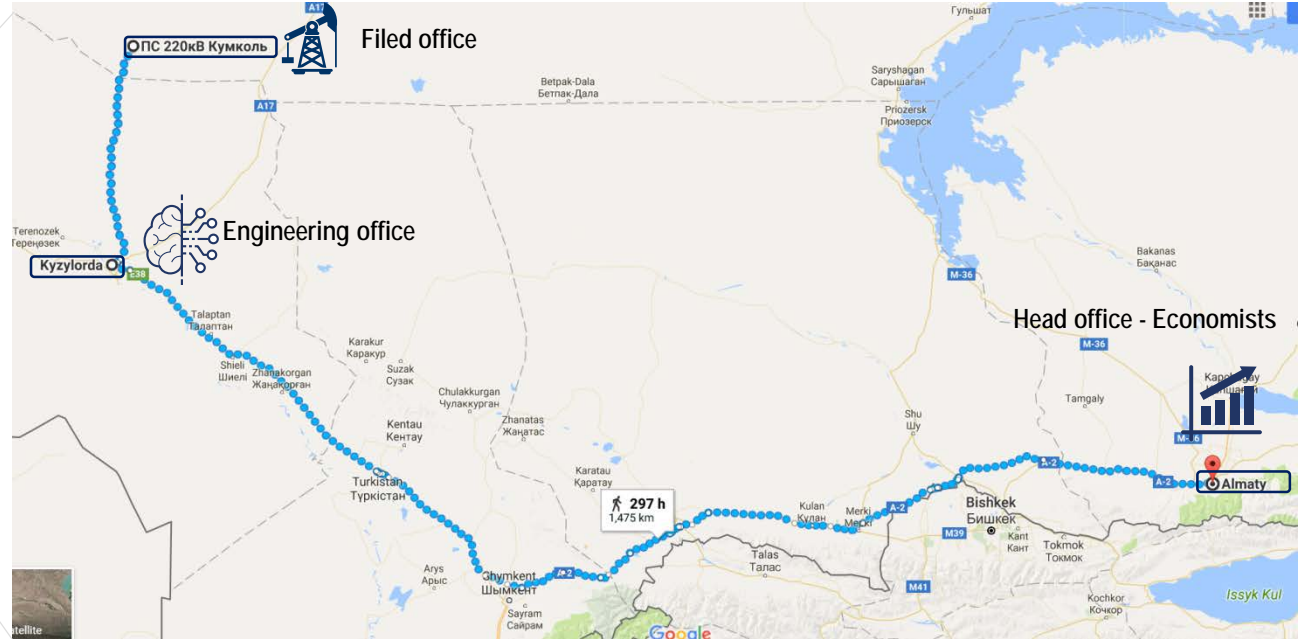
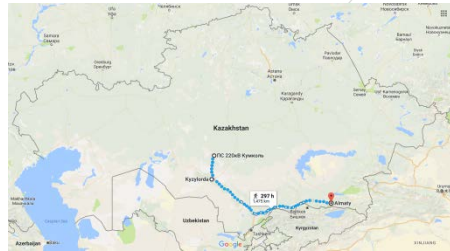
Company overview - PetroKazakhstan Kumkol Resources JSC

- 20 fields
- > 30 years of production history
- ~ 1400 wells
- > 15 parameters collected from each well on daily basis
- ~ 6 million parameters annually
- Huge number of excel files
- 3 locations
 - Kumkol – Field site
 - Kyzylorda – Engineering office
 - Almaty - Economists



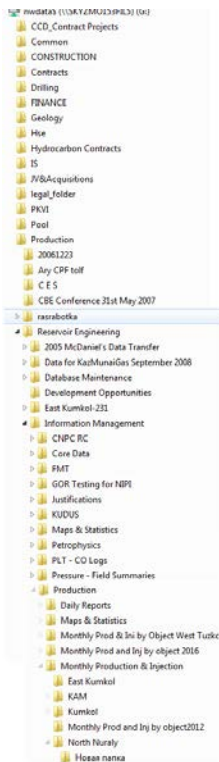
- Abandoned
- Active Gas Injection
- Active Production
- Active Water Injection
- Control
- Idle
- Observation
- Shut in Production
- Suspended
- Unknown
- Waiting on injection
- Waiting on production
- WO

Challenge overview: Data flow from field office to head office



Challenge overview: Data analysis - how it was before

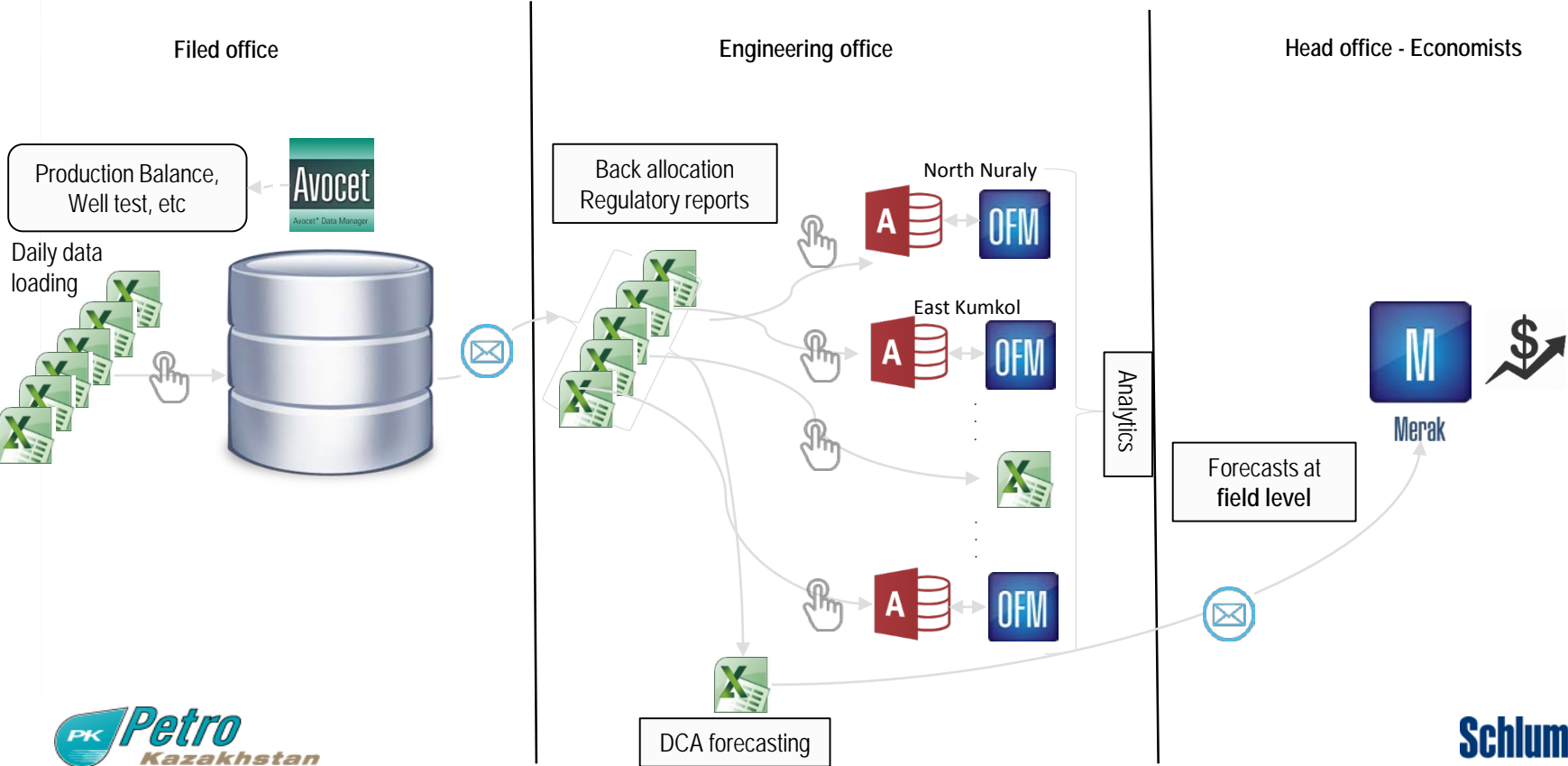
- 7 steps/folders to get file;
- Separate excel files for each field, for each day
- Need to built plots for each well.
- Overloaded emails



- Hosana namca 4/6/2016 12:25 PM File folder
- North Nuraly_Prod August 2016_2.xls 9/6/2016 10:05 AM Microsoft Office Excel

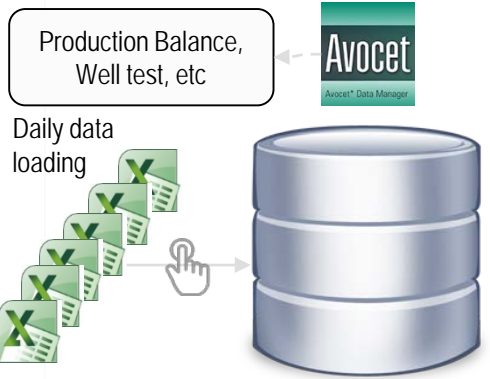
#	GS	#well	Object	water cut%	tonne per day	RPM	efficiency	Amps	HZ	Tr	Cr	date fluid level	fluid level	fluid level interval	perforation interval	CSG Show	sand %	
9	SK1	SK-47	Ю-1		0					0.0	2.0	12 сен 16	709	3.0	1270-1297	1245.1	0.0382%	
120	SK1	SK-48	М-1	132	86%	15	30	31	31	55.0	2.8	0.5	12 сен 16	917	0.5	1110-1140	1074.0	0.0301%
121	SK1	SK-81	Ю-1	125	93%	7	24	24	23	51.0	2.5	1.8	23 авг 16	747	1.0	1323.5-1332.3	1193.2	0.0365%
124	SK1	SK-08	Ю-1	74	74%	10	17	17	18	50.0	3.0	2.0	09 сен 16	1031	2.0	1277.5-1290	1248.9	0.0278%
125	SK1	SK-01	Ю-1		0					2.0	2.0	15 авг 16	84	2.8	1318-1320	1266.2	0.0377%	
126	SK2	SK-5	Ю-1	597	94%	22	433	420	411	58.0	4.8	1.0	13 авг 16	512	1.0	1308-1320	1243.5	0.0155%
127	SK2	SK-10	Ю-1	24	80%	4	19	19	20	52.0	2.8	0.0	28 авг 16	728	0.0	1304-1319	1279.4	0.0215%
128	SK2	SK-15	М-1	248	97%	6	41	42	43	50.0	6.5	0.0	08 сен 16	851	0.0	1111.8-1121	1090.0	0.0189%
129	SK2	SK-20	Ю-1	614	97%	15	441	438	430	59.0	13.5	1.0	08 сен 16	425	1.0	1296-1320	1261.2	0.0176%
130	SK2	SK-22	Ю-1	528	96%	17	57	58	56	57.0	4.8	0.5	26 авг 16	596	0.5	1316-1322	1278.1	0.0225%
131	SK2	SK-27	Ю-1	250	98%	8	54	53	51	47.0	6.0	1.2	11 сен 16	875	0.0	1304-1312	1257.4	0.0168%
132	SK2	SK-41	М-1	282	98%	5	41	40	40	49.0	4.8	0.0	09 авг 16	862	0.0	1125-1127	1099.1	0.0156%
131	SK2	SK-42	Ю-1	189	92%	11	315	339	325	45.0	5.0	0.0	28 авг 16	492	0.0	1281-1292	1251.7	0.0219%
134	SK3	SK-11	М-1	784	97%	19	367	371	360	52.0	7.0	0.0	27 авг 16	530	0.0	1092-1118	994.7	0.0247%
135	SK3	SK-83	Ю-1	616	93%	29	41	41	40	58.0	13.0	0.5	27 авг 16	794	0.0	1312-1316	1240.3	0.0227%
136	SK1	SK-95	Ю-1	874	67%	51	900	107	900	53.0	0.8	1.0	12 сен 16	498	1.0	1287-1305	1114.0	0.0205%

Challenge overview: Architecture - before

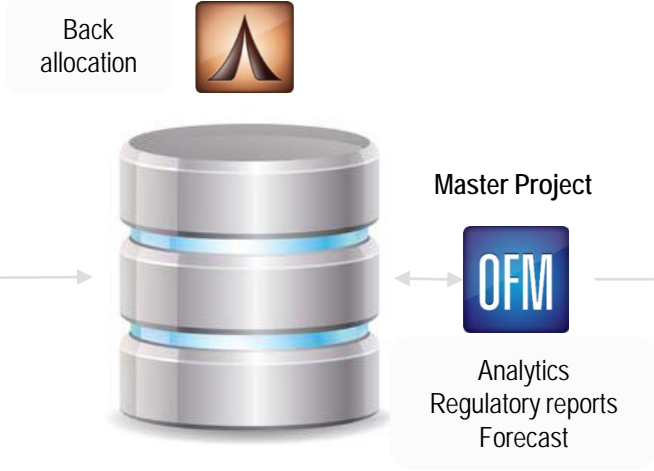


Solution overview: Architecture - today

Filed office



Engineering office

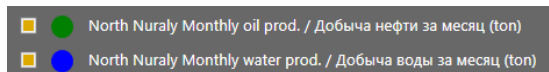
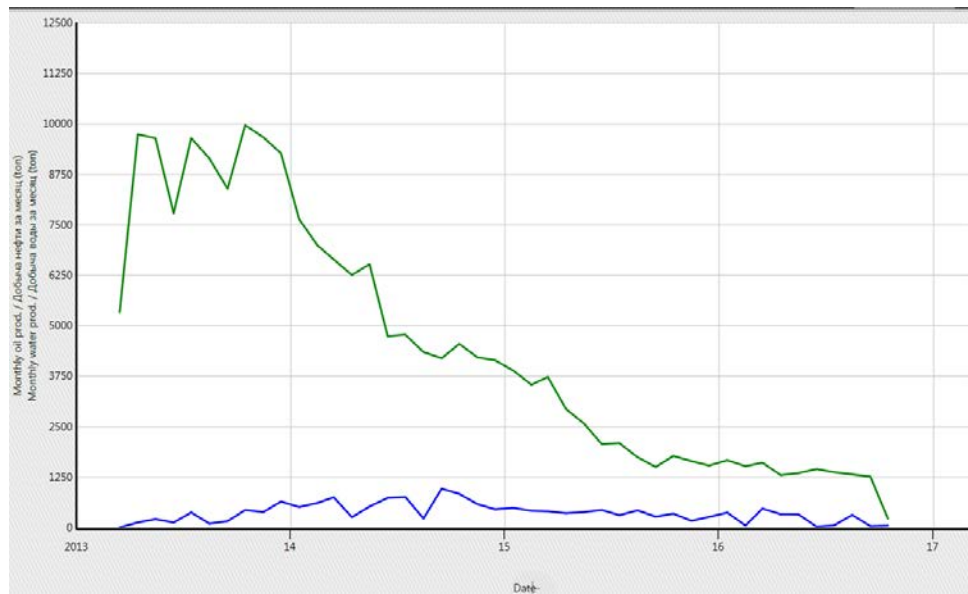


Head office - Economists

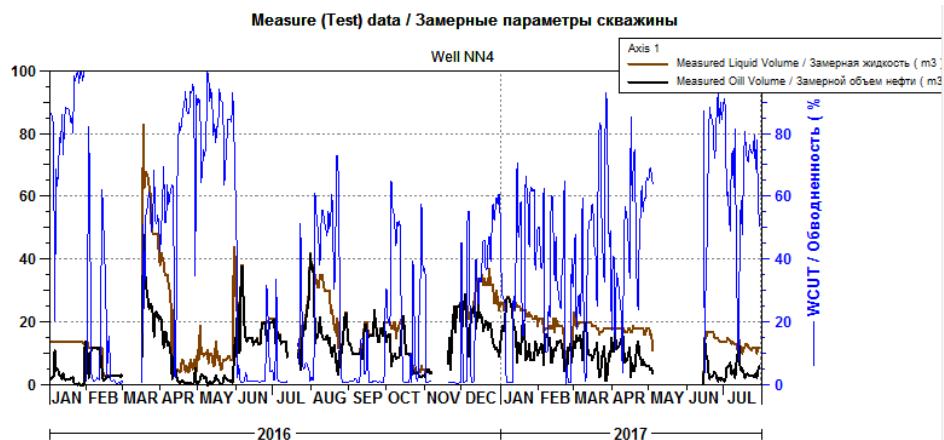


Solutions details

Automatic data update.



Data analysis in OFM



Filter (43 Completions) ▾ ×

- Category
 - Completions
 - Wellbores
 - ALIAS
 - FIELD

Filter (30 Completions) ▾ ×

- HORIZON
 - A-1
 - A-2

Filter (9 Completions) ▾ ×

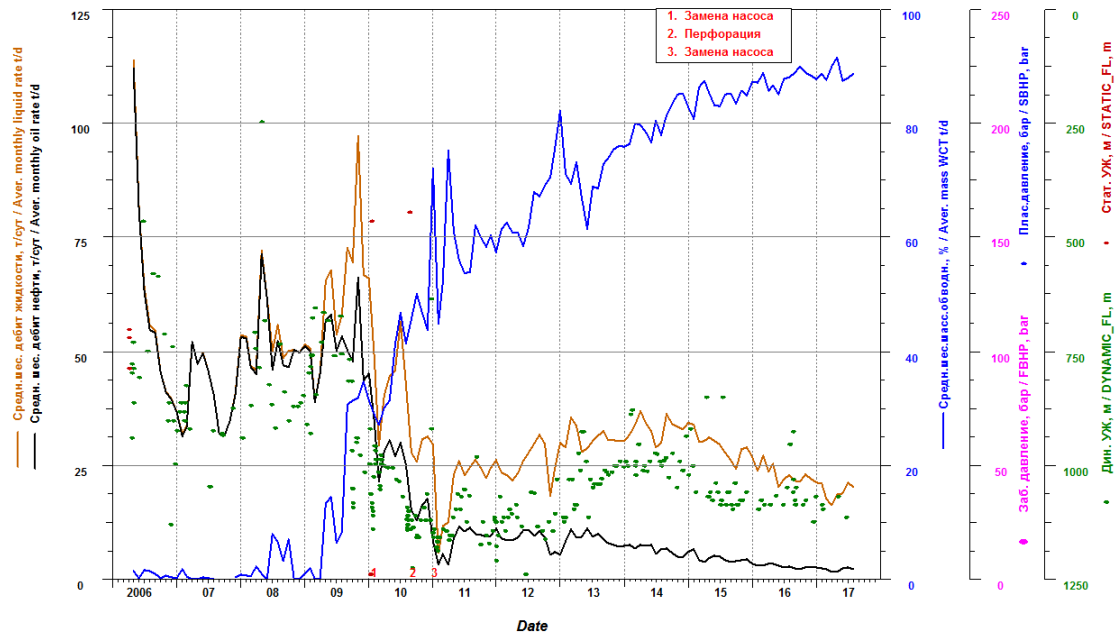
- Not defined
- PZ
- PZ-M-0-1-B-M-2-B-M-0-
- LIFT_TYPE
 - ESP pump

Navigation (1 Compl... ▾ ×

Completions (9)

- Completions
 - NN10:J-ds
 - NN108:J-ds
 - NN11:J-ds
 - NN167:J-ds
 - NN214:J-ds
 - NN226:J-ds
 - NN230:J-ds
 - NN3:J-ds
 - NN4:J-ds

Data analysis in OFM - Plots



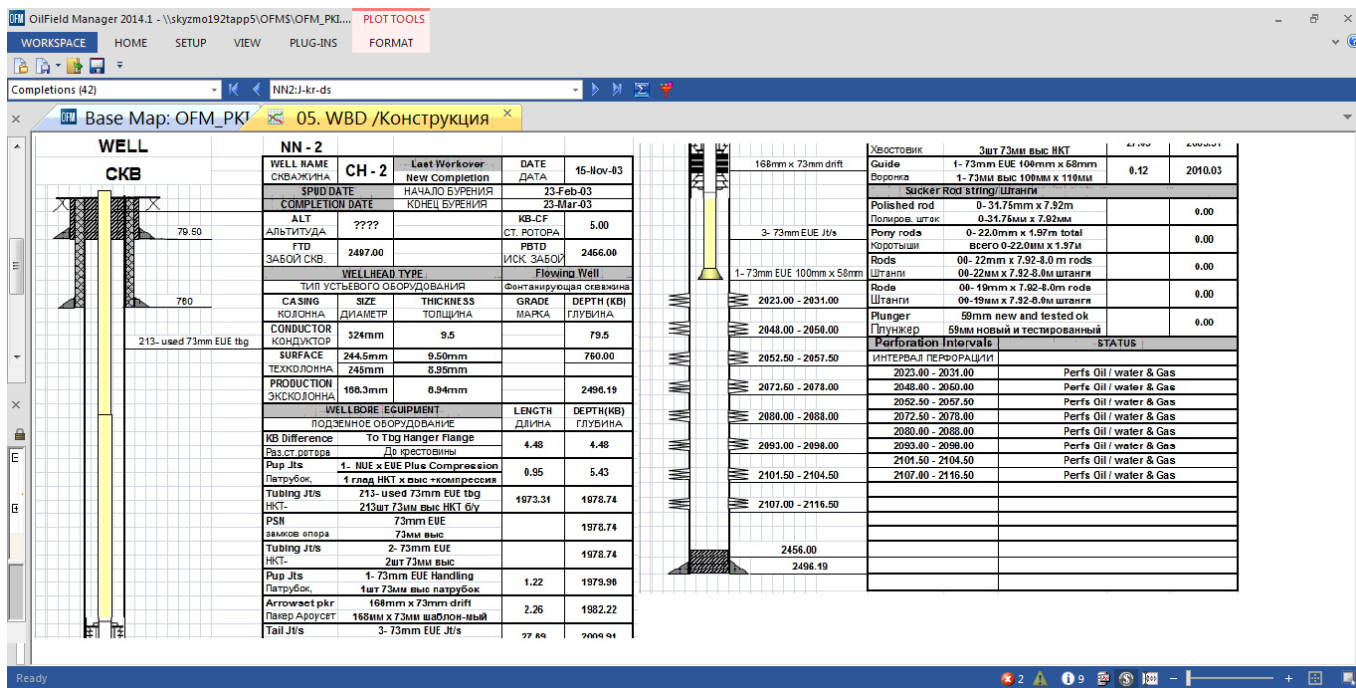
Data analysis in OFM - Tables

Monthly Production Report / Месячный Отчет по Добыче

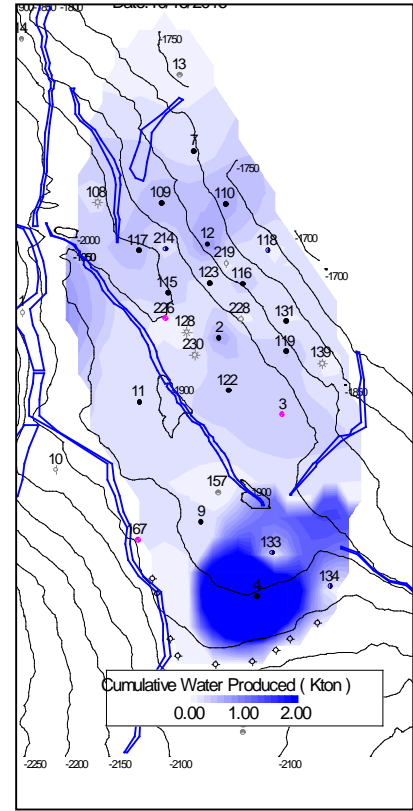
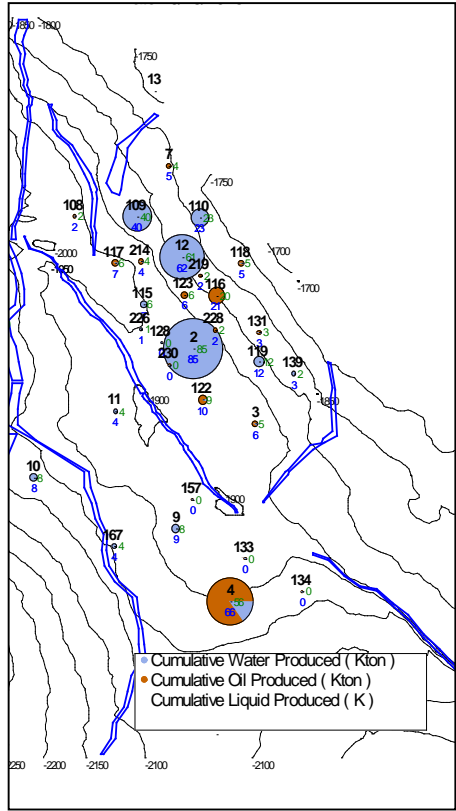
Well NN11

Well Name / Имя скважины	Horizon / Зона(Горизонт)	Field / Месторождение	Date / Дата	Lift Type/ Способ эксплуатации	Monthly working	Monthly working	Monthly oil	Monthly water	Monthly fluid	Monthly gas	Average monthly	Average monthly oil	Average monthly	Average monthly fluid	Monthly gas	
					hours / Кол. отработ. часов за месяц	days / Кол. отработ. суток за месяц	production / Добыча нефти за месяц	production / Добыча воды за месяц	production / Добыча жидкости за	WCT (by mass) / Среднемесячная обводненность (по	rate / Среднемесячный дебит нефти	water rate / Среднемесячный дебит воды	rate / Среднемесячный дебит жидкости	production / Добыча газа за месяц		
1	NN11	J-ds	North Nuraly	15-Oct-13	Free flow	201	8.39	161.88	26.63	188.51	96.51	0.14	19.29	3.17	22.46	96.51
2	NN11	J-ds	North Nuraly	15-Nov-13	Free flow	710	29.60	355.94	21.52	377.47	168.32	0.06	12.03	0.73	12.75	168.32
3	NN11	J-ds	North Nuraly	15-Dec-13	Free flow	737	30.71	245.59	9.15	254.74	123.66	0.04	8.00	0.30	8.29	123.66
4	NN11	J-ds	North Nuraly	15-Jan-14	Free flow	682	27.56	152.07	8.00	160.07	77.25	0.05	5.52	0.29	5.81	77.25
5	NN11	J-ds	North Nuraly	15-Feb-14	Free flow	680	27.51	162.56	5.77	168.33	90.74	0.03	5.91	0.21	6.12	90.74
6	NN11	J-ds	North Nuraly	15-Mar-14	Free flow	342	14.25	136.82	3.21	140.03	82.87	0.02	9.60	0.23	9.83	82.87
7	NN11	J-ds	North Nuraly	15-Apr-14	Rod pump	464	19.32	171.82	7.60	179.42	15.18	0.04	8.89	0.39	9.29	15.18
8	NN11	J-ds	North Nuraly	15-May-14	Rod pump	738	30.75	155.25	14.05	169.31	81.19	0.08	5.05	0.46	5.51	81.19
9	NN11	J-ds	North Nuraly	15-Jun-14	Rod pump	719	29.97	129.88	3.71	133.60	75.02	0.03	4.33	0.12	4.46	75.02
10	NN11	J-ds	North Nuraly	15-Jul-14	Rod pump	743	30.97	131.85	3.20	135.05	49.57	0.02	4.26	0.10	4.36	49.57
11	NN11	J-ds	North Nuraly	15-Aug-14	Rod pump	744	31.00	127.13	3.83	130.96	49.84	0.03	4.10	0.12	4.22	49.84
12	NN11	J-ds	North Nuraly	15-Sep-14	Rod pump	708	29.51	71.53	2.44	73.97	28.04	0.03	2.42	0.08	2.51	28.04
13	NN11	J-ds	North Nuraly	15-Oct-14	Rod pump	724	30.15	92.59	2.12	94.71	36.30	0.02	3.07	0.07	3.14	36.30
14	NN11	J-ds	North Nuraly	15-Nov-14	Rod pump	718	29.90	171.47	9.62	181.09	67.23	0.05	5.74	0.32	6.06	67.23
15	NN11	J-ds	North Nuraly	15-Dec-14	Rod pump	744	31.00	164.73	21.04	185.78	64.58	0.11	5.31	0.68	5.99	64.58
16	NN11	J-ds	North Nuraly	15-Jan-15	Rod pump	743	30.97	99.12	2.77	101.89	38.86	0.03	3.20	0.09	3.29	38.86
17	NN11	J-ds	North Nuraly	15-Feb-15	Rod pump	667	27.78	73.19	3.27	76.46	28.70	0.04	2.63	0.12	2.75	28.70
18	NN11	J-ds	North Nuraly	15-Mar-15	Rod pump	743	30.97	70.23	1.69	71.92	27.53	0.02	2.27	0.05	2.32	27.53
19	NN11	J-ds	North Nuraly	15-Apr-15	Rod pump	720	30.00	73.31	2.27	75.58	28.74	0.03	2.44	0.08	2.52	28.74
20	NN11	J-ds	North Nuraly	15-May-15	Rod pump	744	31.00	94.88	6.47	101.35	37.20	0.06	3.06	0.21	3.27	37.20
21	NN11	J-ds	North Nuraly	15-Jun-15	Rod pump	718	29.93	55.65	2.15	57.81	21.82	0.04	1.86	0.07	1.93	21.82
22	NN11	J-ds	North Nuraly	15-Jul-15	Rod pump	742	30.92	54.98	0.84	55.82	21.55	0.01	1.78	0.03	1.81	21.55
23	NN11	J-ds	North Nuraly	15-Aug-15	Rod pump	695	28.96	33.10	1.42	34.52	12.98	0.04	1.14	0.05	1.19	12.98
24	NN11	J-ds	North Nuraly	15-Sep-15	Rod pump	720	30.00	36.85	0.60	37.45	14.45	0.02	1.23	0.02	1.25	14.45
25	NN11	J-ds	North Nuraly	15-Oct-15	Rod pump	743	30.94	47.25	3.06	50.31	18.52	0.06	1.53	0.10	1.63	18.52
26	NN11	J-ds	North Nuraly	15-Nov-15	Rod pump	719	29.97	43.05	2.09	45.14	7.46	0.05	1.44	0.07	1.51	7.46
27	NN11	J-ds	North Nuraly	15-Dec-15	Rod pump	742	30.92	48.66	1.49	50.15	8.43	0.03	1.57	0.05	1.62	8.43
28	NN11	J-ds	North Nuraly	15-Jan-16	Rod pump	743	30.97	63.20	0.86	64.06	10.95	0.01	2.04	0.03	2.07	10.95
29	NN11	J-ds	North Nuraly	15-Feb-16	Rod pump	696	29.00	33.34	0.38	33.72	5.77	0.01	1.15	0.01	1.16	5.77
30	NN11	J-ds	North Nuraly	15-Mar-16	Rod pump	744	31.00	47.06	0.82	47.89	8.15	0.02	1.52	0.03	1.54	8.15
31	NN11	J-ds	North Nuraly	15-Apr-16	Rod pump	720	30.00	48.01	1.18	49.19	8.32	0.02	1.60	0.04	1.64	8.32
32	NN11	J-ds	North Nuraly	15-May-16	Rod pump	742	30.92	49.45	0.90	50.35	8.57	0.02	1.60	0.03	1.63	8.57
33	NN11	J-ds	North Nuraly	15-Jun-16	Rod pump	720	30.00	46.95	0.60	47.56	8.13	0.01	1.57	0.02	1.59	8.13
34	NN11	J-ds	North Nuraly	15-Jul-16	Rod pump	624	26.00	39.06	0.83	39.89	6.77	0.02	1.50	0.03	1.53	6.77
35	NN11	J-ds	North Nuraly	15-Aug-16	Rod pump	360	15.00	21.98	0.35	22.34	3.81	0.02	1.47	0.02	1.49	3.81

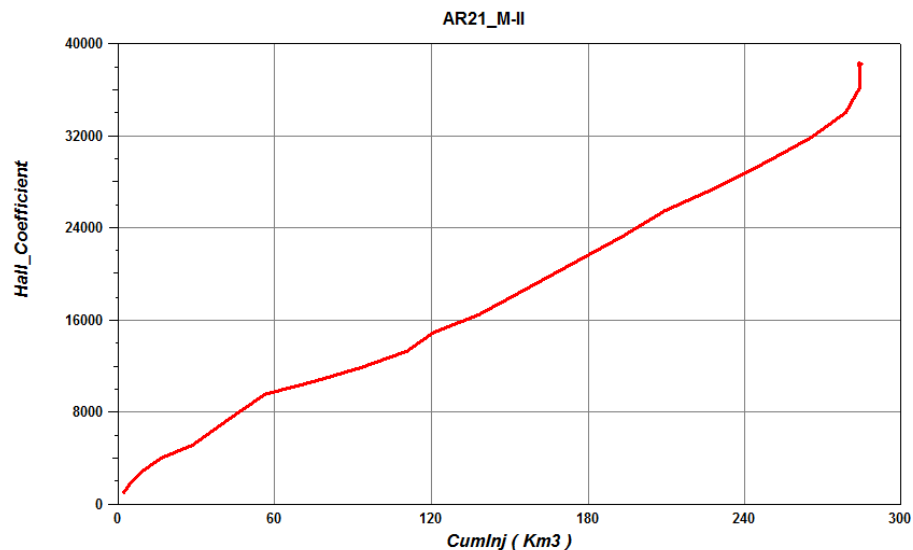
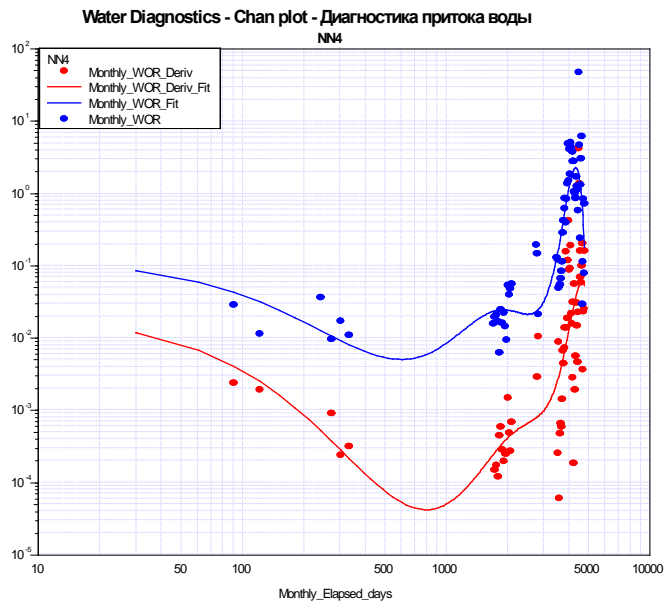
Data analysis in OFM – Wellbore Diagrams



Data analysis in OFM – Mapping



Data analysis in OFM – Chan/Hall plots



Regulatory monthly reports – 20 fields

- Daily allocation – better precision
- Report in one click
- Minimum human factor

Ежемесячный эксплуатационный отчет
 Предприятие АО "ПетрoКазхастан Куколь Ресорси"
 Месторождение Северный Нуралы
 Дата : Апрель 2017

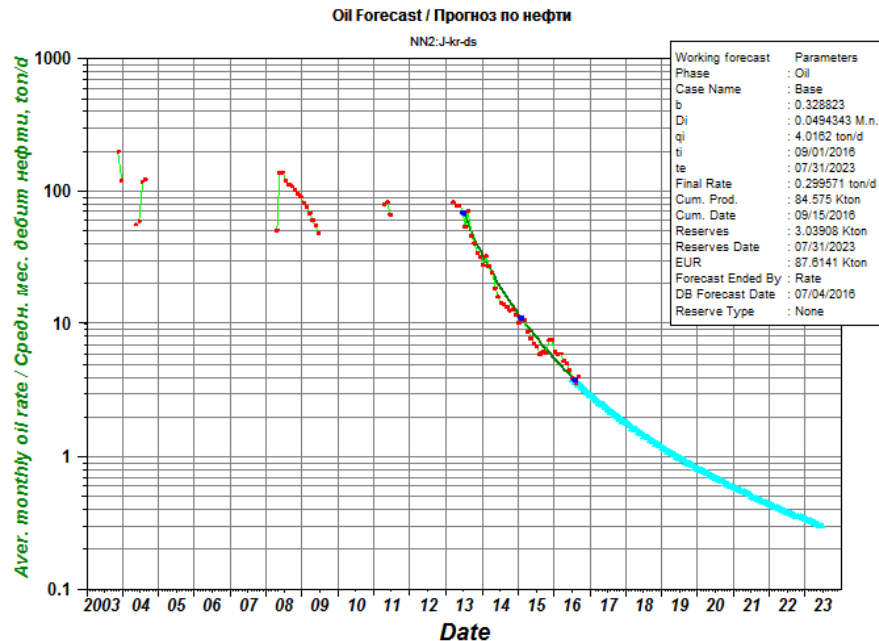
№№№	№№№	Горизонт	Спос. эспл.	дебит, дебит, м³/сут			Объем, м³	дебит, дебит, м³/сут			Объем, м³	Водо нефть, т		Добыча воды, т		
				нефть	вода	газ		нефть	вода	газ		изм. за месяц	изм. за начало года	изм. за начало года	изм. за начало года	
#	Well No	horiz. zone	explo-ration	oil	water	fluid	water ing.	av. daily flow rate	oil	water	fluid	water recovered, t	from the beginning of year	from the beginning of exploitation	from the beginning of exploitation	
16	1	NN1	J-ns-Pz	СОНТ	0	0	0	0	0	0	0	0	0	0	0	0
17	1	NN1	J-ns-Pz	УГН	0	0	0	0	0	0	0	0	0	0	0	0
18	Итого по горизонту			СОНТ	0	0	0	0	0	0	0	0	0	0	0	0
19	Итого по способу			УГН	0	0	0	0	0	0	0	0	0	0	0	0
20	1	NN10	J-ns	СВАБ	0	0	0	0	0	0	0	0	0	0	0	0
21	2	NN10	J-ns	СВАБ	0	0	0	0	0	0	0	0	0	0	0	0
22	2	NN10	J-ns	УГН	3.41	0.03	3.44	1	2.75	0.03	1	68 81569	349 3144	3344 85127	0.73849	2.98709
23	3	NN108	J-ns	СВАБ	0	0	0	0	0	0	0	0	0	0	0	0
24	3	NN108	J-ns	УГН	0	0	0	0	0	0	0	0	0	0	0	0
25	3	NN108	J-ns	СОНТ	0	0	0	0	0	0	0	0	0	0	0	0
26	3	NN108	J-ns	УГН	0	0	0	0	0	0	0	0	0	0	0	0
27	4	NN109	J-ns	СОНТ	0	0	0	0	0	0	0	0	0	0	0	0
28	5	NN11	J-ns	СВАБ	0	0	0	0	0	0	0	0	0	0	0	0
29	5	NN11	J-ns	СОНТ	0	0	0	0	0	0	0	0	0	0	0	0
30	5	NN11	J-ns	УГН	0	0	0	0	0	0	0	0	0	0	0	0
31	6	NN116	J-ns	СОНТ	3.82	0.02	3.84	1	3.08	0.02	1	76 99953	415 46269	21154 0598	0.56886	2.47343
32	9	NN117	J-ns	СВАБ	0	0	0	0	0	0	0	0	0	0	0	0
33	9	NN117	J-ns	СОНТ	2.62	0.01	2.64	1	2.10	0.01	1	53 01593	223 88811	6828 75274	0.34501	1.97825
34	10	NN118	J-ns	СВАБ	0	0	0	0	0	0	0	0	0	0	0	0
35	10	NN118	J-ns	СОНТ	3.77	0.02	3.79	0	3.05	0.02	1	64 56859	251 62343	6349 80881	0.38881	3.08554
36	11	NN119	J-ns	СОНТ	2.47	0.01	2.48	0	1.99	0.01	1	23 67149	146 78365	2005 22667	0.12627	1.27467

Data analysis in OFM

3x times reduction in time to analyze production data

Production forecasting in OFM

- Decline Curve Analysis - DCA
- Oil, water, liquid forecasting
- Forecasting at well level
- Results automatically available for economists



Economical analysis Merak Peep

Peep Version 2015.2 - OFM_2016_NN4_Oct [Case]

Home View Forecast Reports Tools Plug-ins

Go to report: Economic Summary (Company)

Units: Alternate Scale: Medium

Reports Report navigation Report Unit settings Results Report export

base documents

- OFM
 - North Nuraly
 - North Nuraly_OFM TEMPLATE
 - OFM_2016_NN2_Oct
 - OFM_2016_NN4_Oct
 - OFM_2016_NN7_Oct
 - OFM_2016_NN9_Oct
 - OFM_2016_NN10_Oct
 - OFM_2016_NN11_Oct
 - OFM_2016_NN110_Oct
 - OFM_2016_NN115_Oct
 - OFM_2016_NN116_Oct
 - OFM_2016_NN117_Oct
 - OFM_2016_NN118_Oct
 - OFM_2016_NN119_Oct
 - OFM_2016_NN123_Oct
 - OFM_2016_NN131_Oct
 - OFM_2016_NN214_Oct
 - OFM_2016_NN226_Oct
 - OFM_2016_NN228_Oct
 - Remaining value
 - Aryskum
 - Contract 1057
 - Contract 1928
 - Doshan
 - East Kumkol
 - KGM
 - Kumkol South
 - Kyzylkaya
 - Maybulak
 - North Nuraly

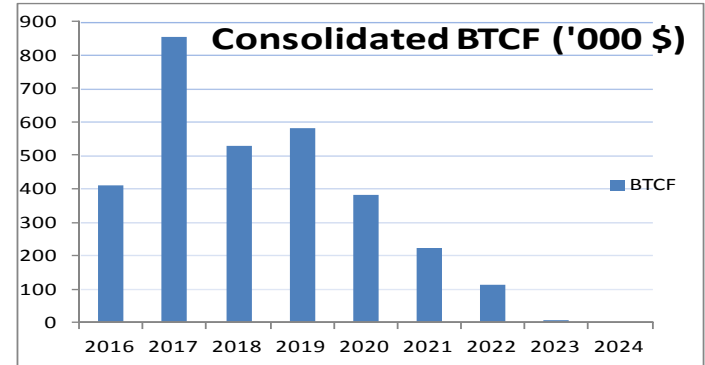
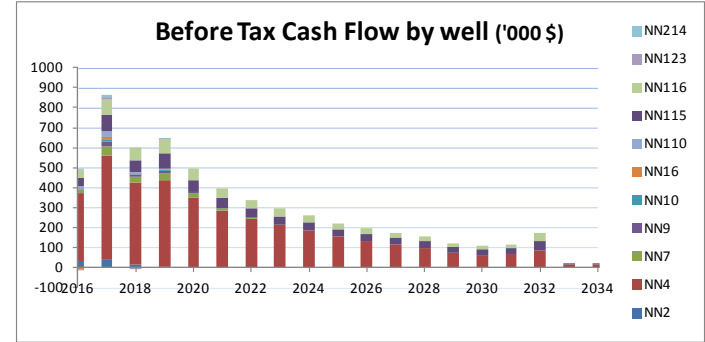
OFM_2016_NN2_Oct [Case] OFM_2016_NN4_Oct [Case]

Products

Scenario: Base Forecast: Link: Base_Merak - Oil

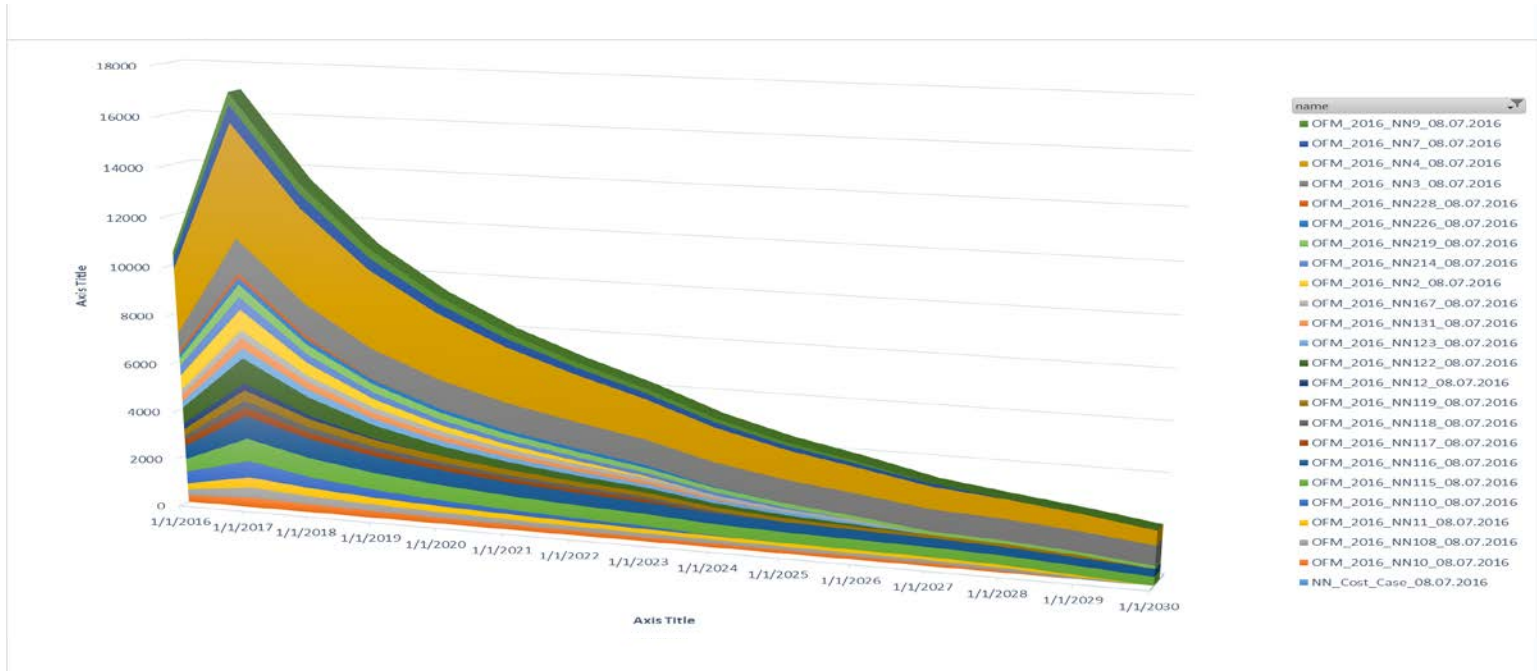
Num. wells: **Manual**

Date	Oil Number of Wells	Oil Rate T/d	Oil Volume T (31 537.95)	Oil Density Degrees API	Oil Mass Rate T/d	Oil Total Mass T (31.54)
2016 07		15.1493	469.6270	42.7600	15.1492	469.6250
2016 08		14.9035	462.0090	42.7600	14.9034	462.0070
2016 09		14.6624	439.8730	42.7600	14.6624	439.8710
2016 10		14.4259	447.2030	42.7600	14.4258	447.2010
2016 11		14.1938	425.8160	42.7600	14.1938	425.8130
2016 12		13.9662	432.9520	42.7600	13.9661	432.9500
2017 01		13.7392	425.9140	42.7600	13.7391	425.9120
2017 02		13.5271	378.7590	42.7600	13.5270	378.7570
2017 03		13.3189	412.8870	42.7600	13.3189	412.8850
2017 04		13.1076	393.2290	42.7600	13.1076	393.2270
2017 05		12.9003	399.9090	42.7600	12.9002	399.9070
2017 06		12.6967	380.9020	42.7600	12.6967	380.9000
2017 07		12.4970	387.4070	42.7600	12.4969	387.4050
2017 08		12.2977	381.2290	42.7600	12.2977	381.2270
2017 09		12.1053	363.1590	42.7600	12.1052	363.1570
2017 10		11.9164	369.4090	42.7600	11.9164	369.4070



Economical analysis Merak

Production forecast: from field to well level (Field North Nuraly)



Summary

- Data sharing improvements:
 - ✓ Automatic link to field
 - ✓ Automatic link to saved production forecasts
- Back allocation in Avocet – **on daily basis**
- Regulatory repotting – **one click**
- Enhanced reservoir surveillance and monitoring
- Forecasting at well level
- Achieving systemizations of data flow

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