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

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Agenda

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

Company overview - PetroKazakhstan Kumkol Resources JSC

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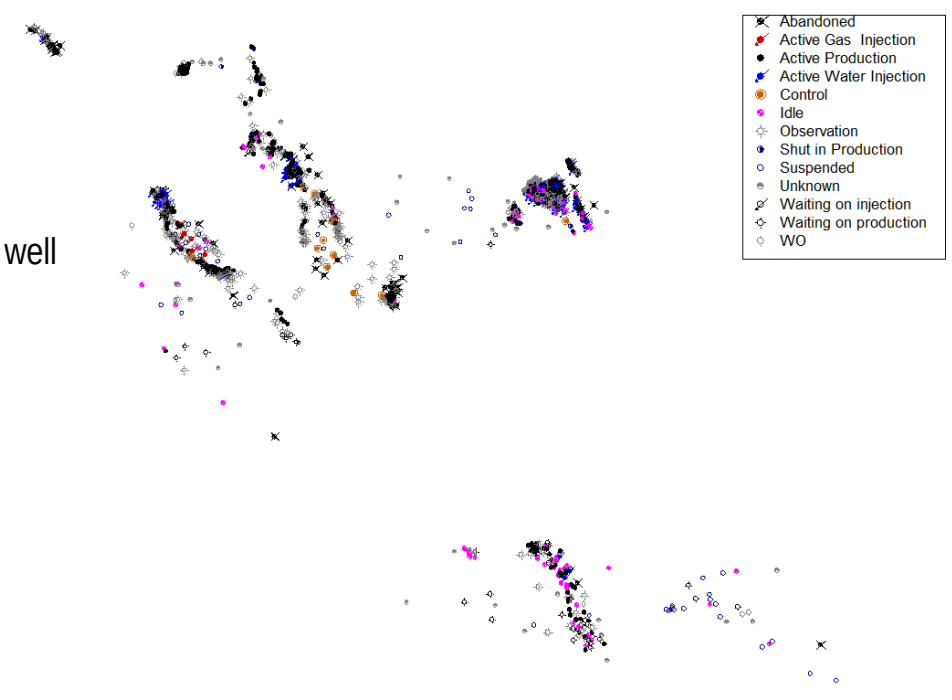
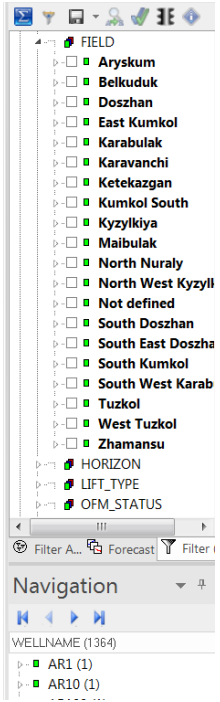
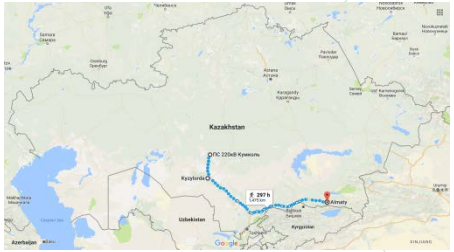
Company overview - PetroKazakhstan Kumkol Resources JSC

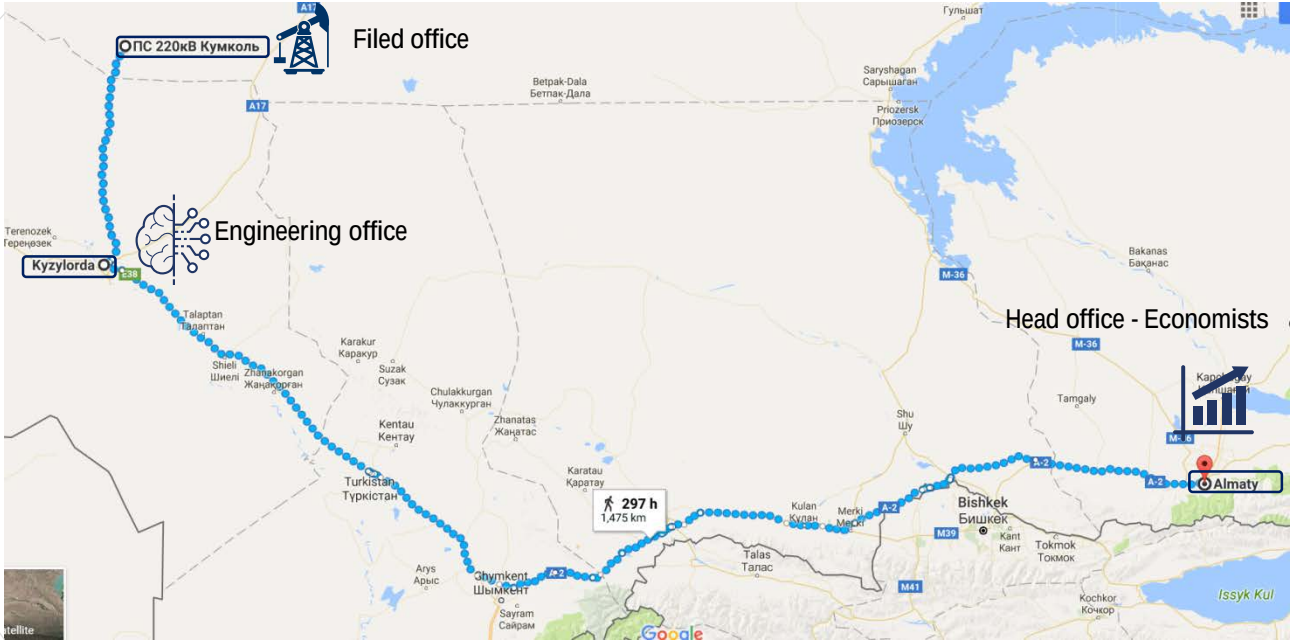
- 20 fields
- > 30 years of production history
- ~ 1400 wells
- > 15 parameters collected from each well on daily basis
- ~ 6 million parameters annually
- Huge number of excel files
- 3 locations
  - Kumkol – Field site
  - Kyzylorda – Engineering office
  - Almaty - Economists



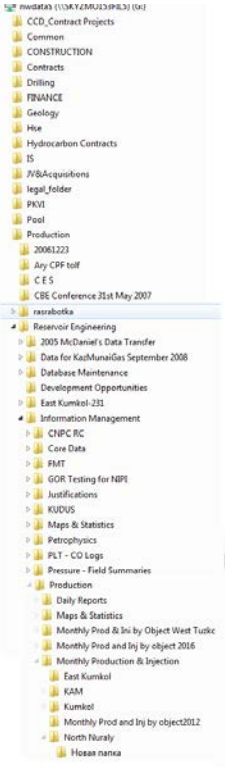


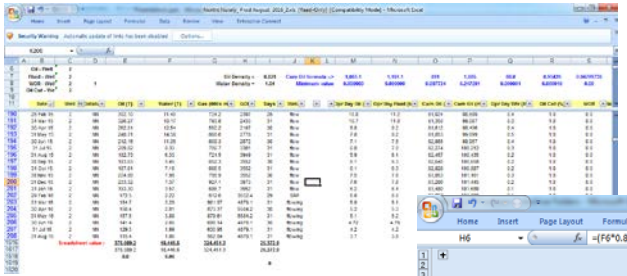
Challenge overview: Data flow from field office to head office



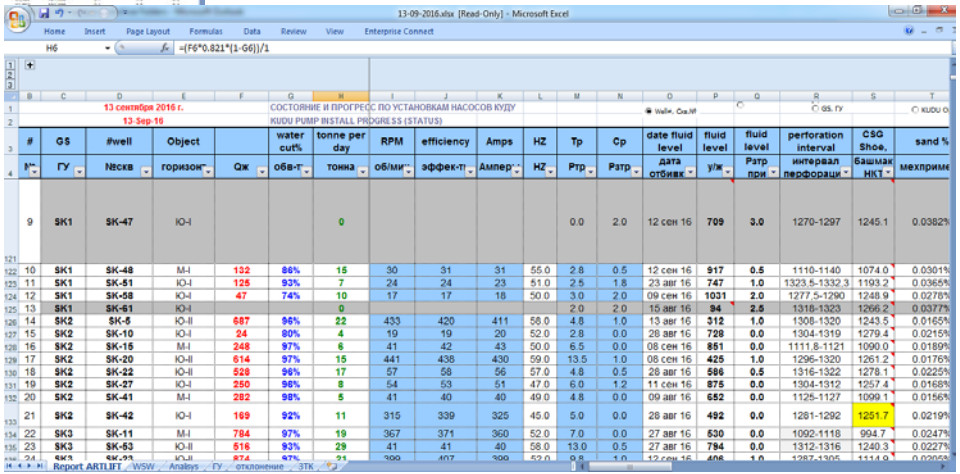


Challenge overview: Data analysis - how it was before





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



#	GS	#well	Object		water cut%	tonne per day	RPM	efficiency	Amps	HZ	Tp	Cp	date fluid level	fluid level	fluid level	perforation interval	CSG Shoe,	sand %
№	ГУ	№скв	горизонт	Qж	обв-т	тонна	об/мин	эффек-т	Ампер	HZ	Ртр	Рзатр	дата отбивк	уж	Рзатр при	интервал перфораци	башмак НКТ	мехприме
9	SK1	SK-47	IO-I			0					0.0	2.0	12 сен 16	709	3.0	1270-1297	1245.1	0.0382%
10	SK1	SK-48	M-I	132	86%	15	30	31	31	55.0	2.8	0.5	12 сен 16	917	0.5	1110-1140	1074.0	0.0301%
11	SK1	SK-51	IO-I	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%
12	SK1	SK-58	IO-I	47	74%	10	17	17	18	50.0	3.0	2.0	09 сен 16	1031	2.0	1277.5-1290	1248.9	0.0276%
13	SK1	SK-61	IO-I			0					2.0	2.0	15 авг 16	94	2.5	1318-1323	1266.2	0.0377%
14	SK2	SK-6	IO-II	687	96%	22	433	420	411	58.0	4.8	1.0	13 авг 16	312	1.0	1308-1320	1243.5	0.0165%
15	SK2	SK-10	IO-I	24	80%	4	19	19	20	52.0	2.8	0.0	28 авг 16	728	0.0	1304-1319	1279.4	0.0215%
16	SK2	SK-15	M-I	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%
17	SK2	SK-20	IO-II	614	97%	15	441	438	430	59.0	13.5	1.0	08 сен 16	425	1.0	1296-1320	1261.2	0.0176%
18	SK2	SK-22	IO-II	528	96%	17	57	58	56	57.0	4.8	0.5	28 авг 16	586	0.5	1316-1322	1278.1	0.0225%
19	SK2	SK-27	IO-I	250	96%	8	54	53	51	47.0	6.0	1.2	11 сен 16	875	0.0	1304-1312	1257.4	0.0168%
20	SK2	SK-41	M-I	282	98%	5	41	40	40	49.0	4.8	0.0	09 авг 16	652	0.0	1125-1127	1099.1	0.0156%
21	SK2	SK-42	IO-I	169	92%	11	315	339	325	45.0	5.0	0.0	28 авг 16	492	0.0	1281-1292	1251.7	0.0219%
22	SK3	SK-11	M-I	784	97%	19	367	371	360	52.0	7.0	0.0	27 авг 16	630	0.0	1092-1118	994.7	0.0247%
23	SK3	SK-53	IO-II	516	93%	29	41	41	40	58.0	13.0	0.5	27 авг 16	784	0.0	1312-1316	1240.3	0.0227%
24	SK3	SK-23	IO-II	874	97%	21	399	407	399	52.0	9.8	1.0	12 сен 16	406	1.0	1287-1305	1114.9	0.0205%

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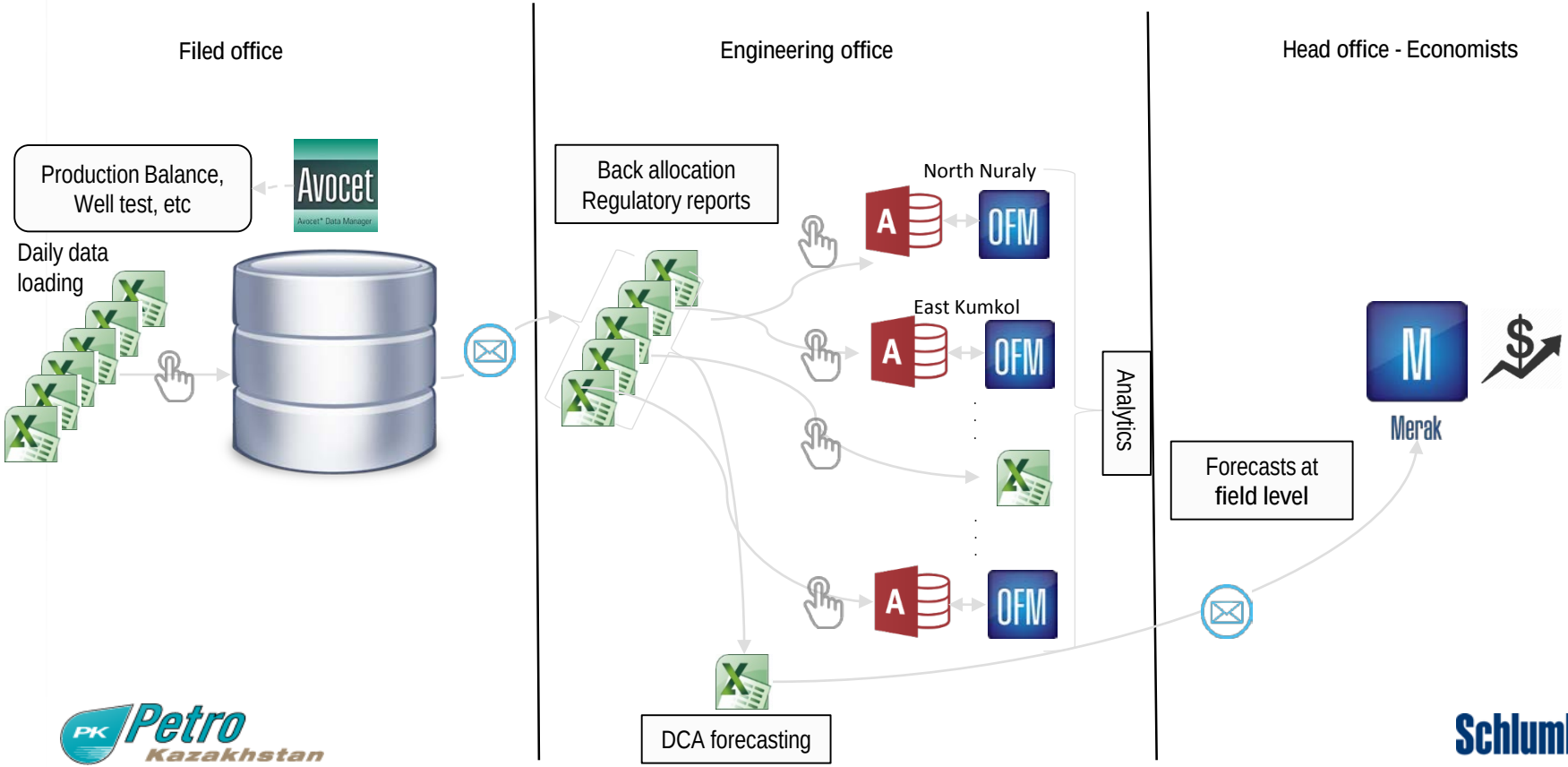
Challenge overview: Architecture - before



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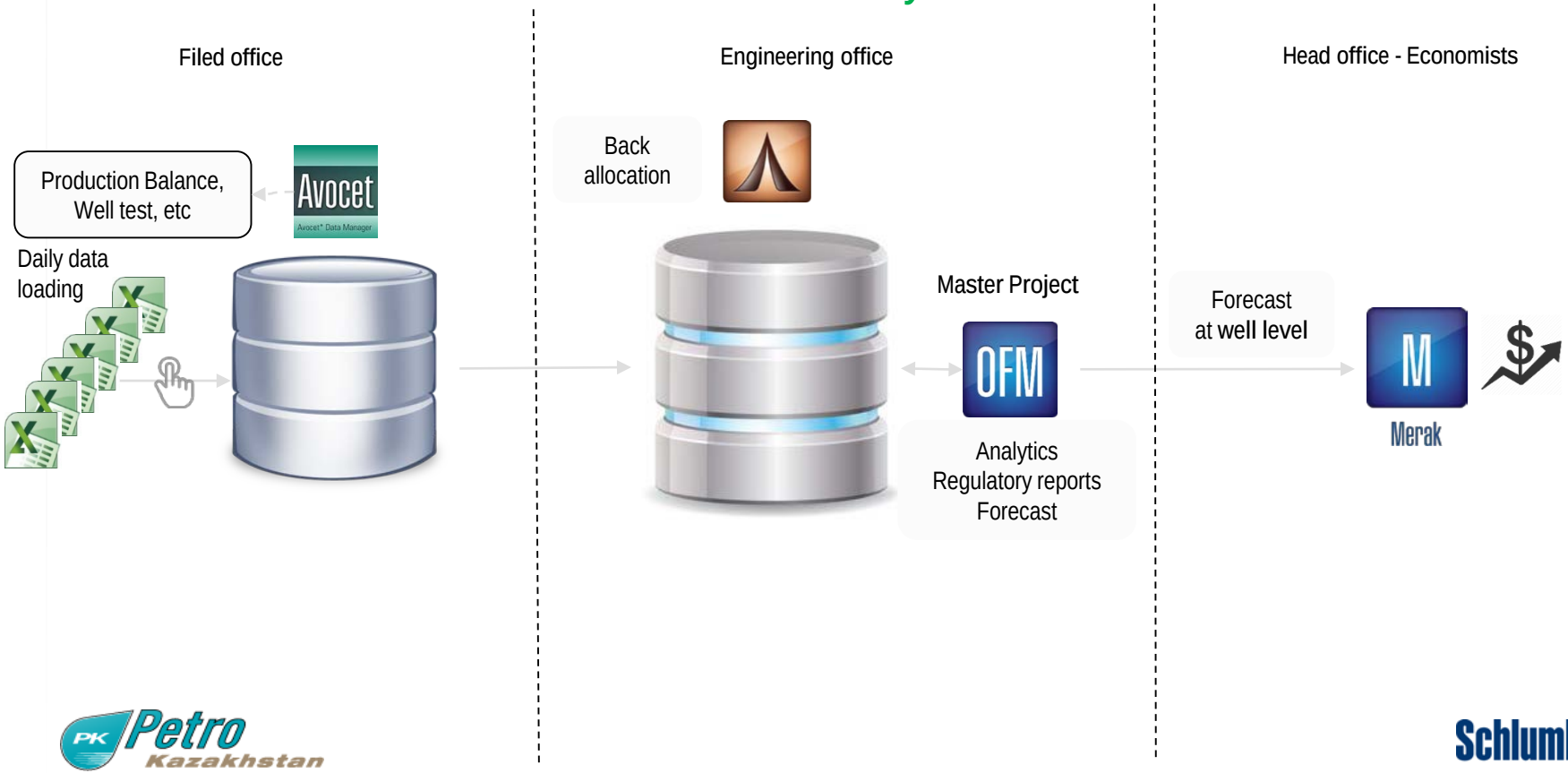
Solution overview: Architecture - today



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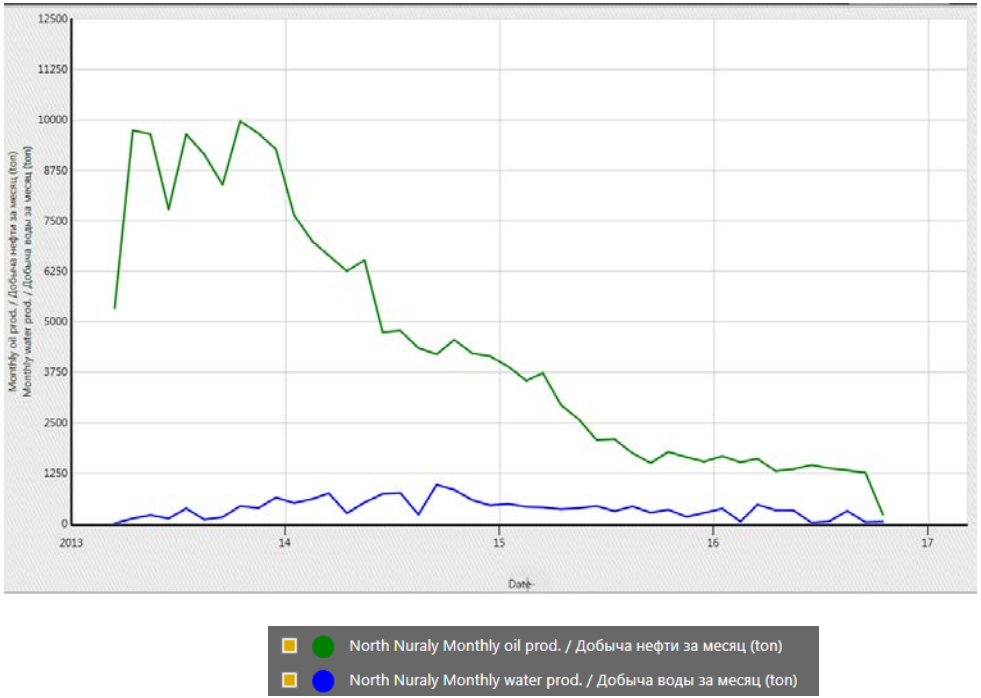
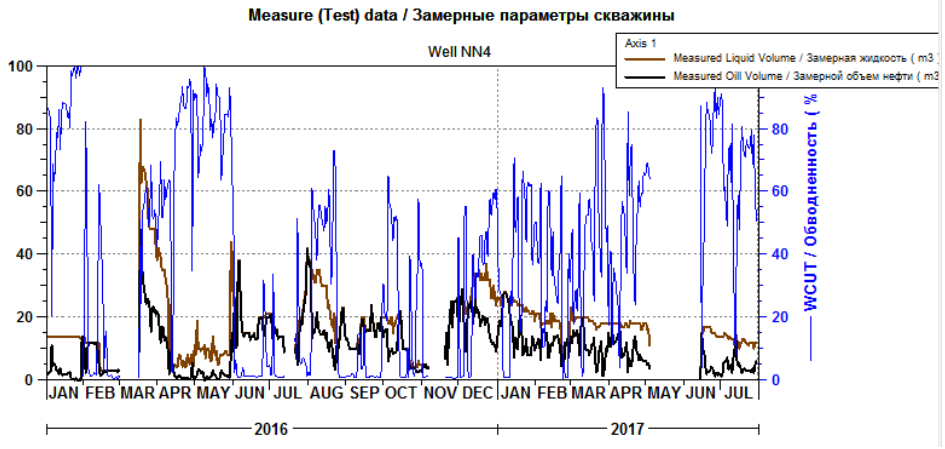
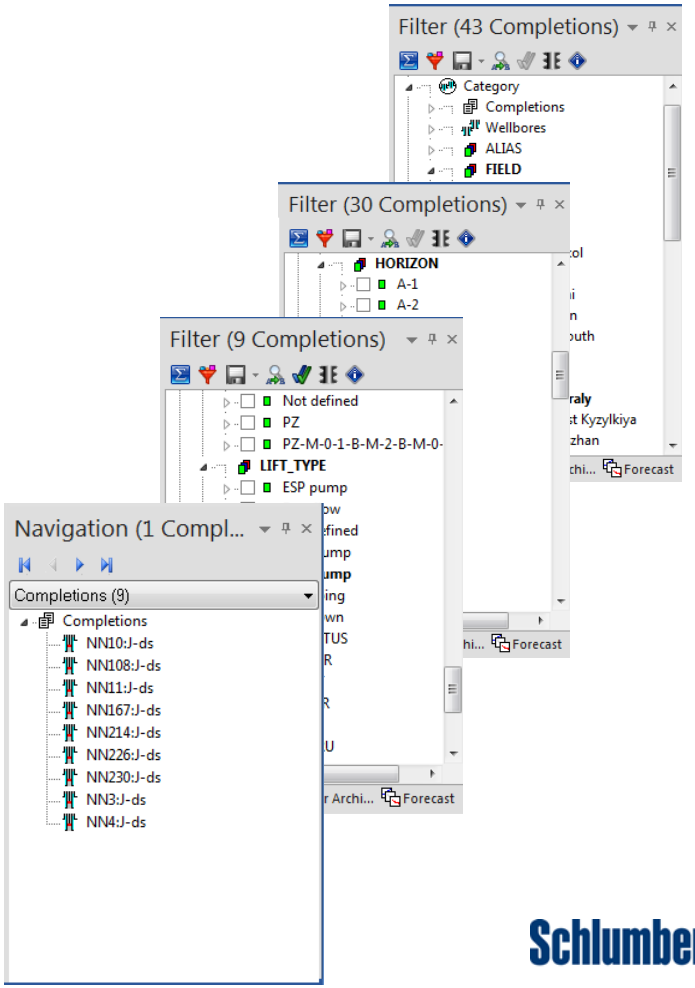
Solutions details

Automatic data update.



Data analysis in OFM





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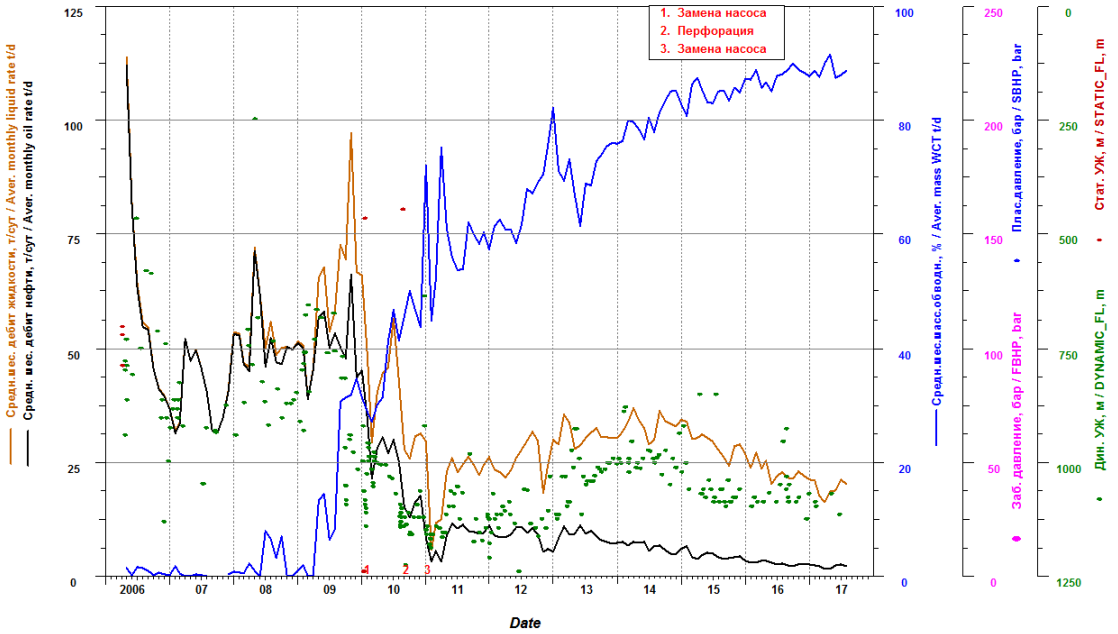
Data analysis in OFM - Plots



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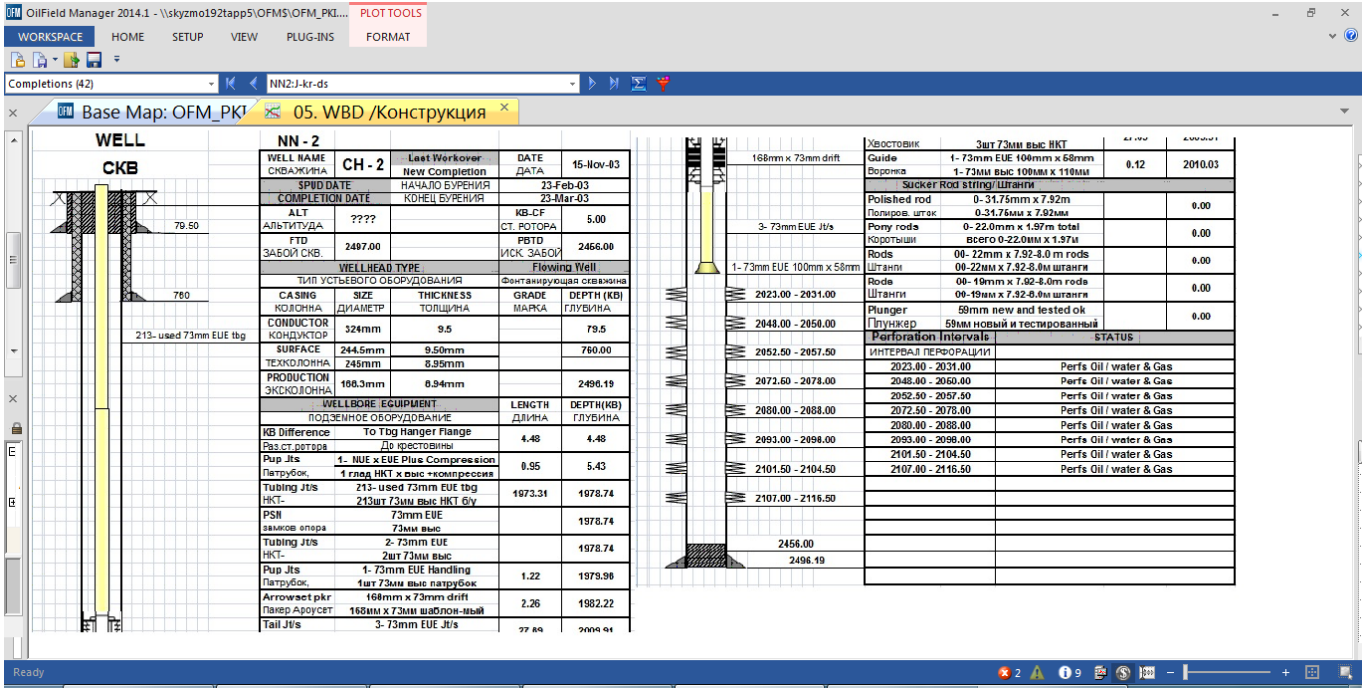
Data analysis in OFM - Tables

Monthly Production Report / Месячный Отчет по Добыче

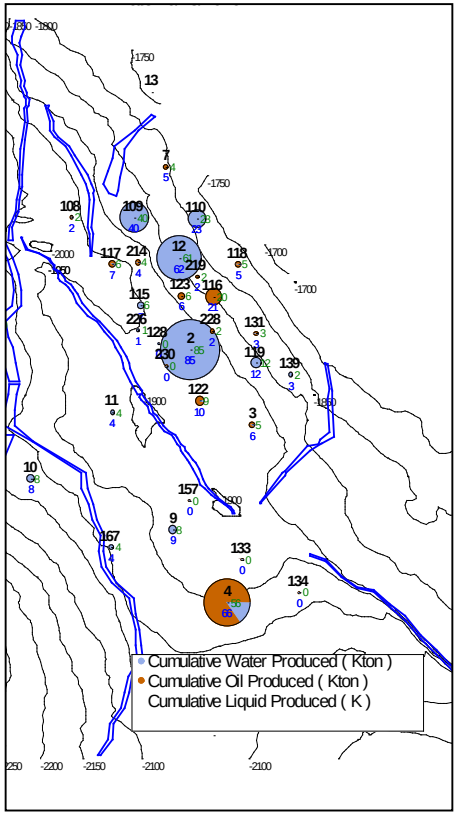
Well NN11

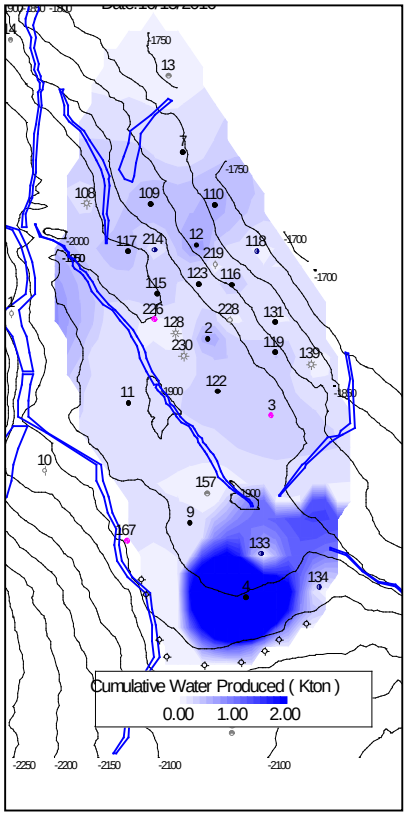
	Well Name / Имя скважины	Horizon / Зона(Горизонт)	Field / Месторождение	Date / Дата	Lift Type/ Способ эксплуатации	Monthly working hours/ Кол. отработ. часов за месяц	Monthly working days / Кол. отработ. суток за месяц	Monthly oil production / Добыча нефти за месяц	Monthly water production / Добыча воды за месяц	Monthly fluid production / Добыча жидкости за	Monthly gas production / Добыча газа за месяц	Average monthly WCT (by mass) / Среднемесячная обводненность (по	Average monthly oil rate / Среднемесячный дебит нефти	Average monthly water rate / Среднемесячный дебит воды	Average monthly fluid rate / Среднемесяч	Monthly gas 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	662	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	660	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	155.26	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





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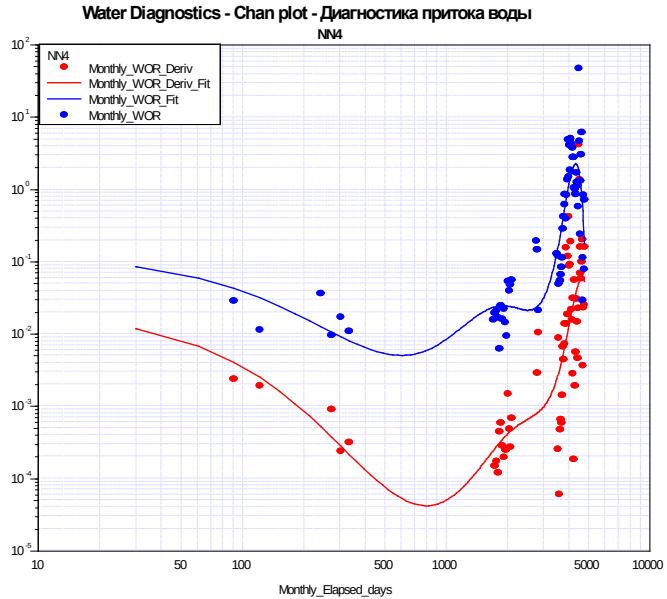
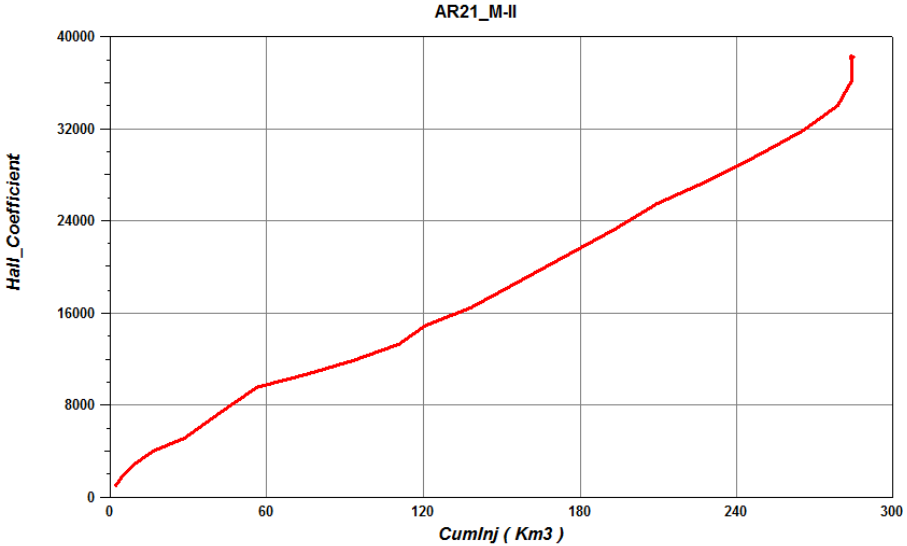
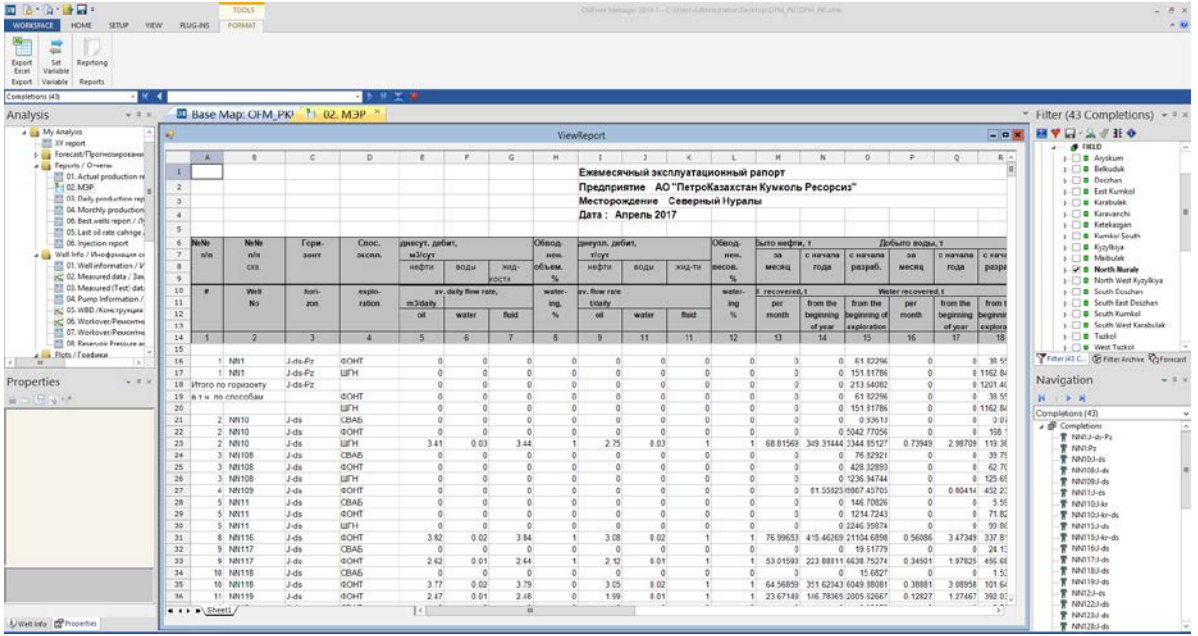
Data analysis in OFM – Chan/Hall plots





Regulatory monthly reports – 20 fields

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



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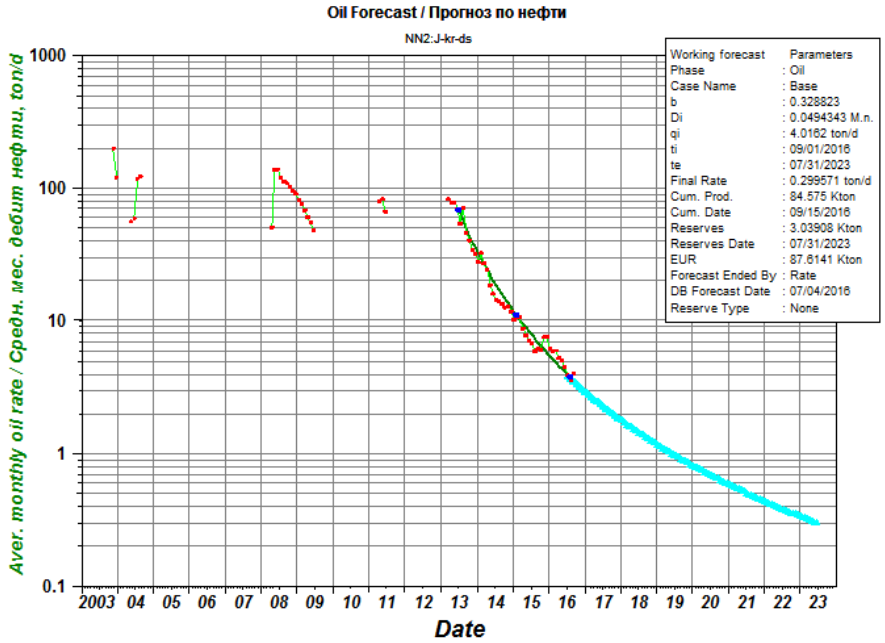
Data analysis in OFM

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



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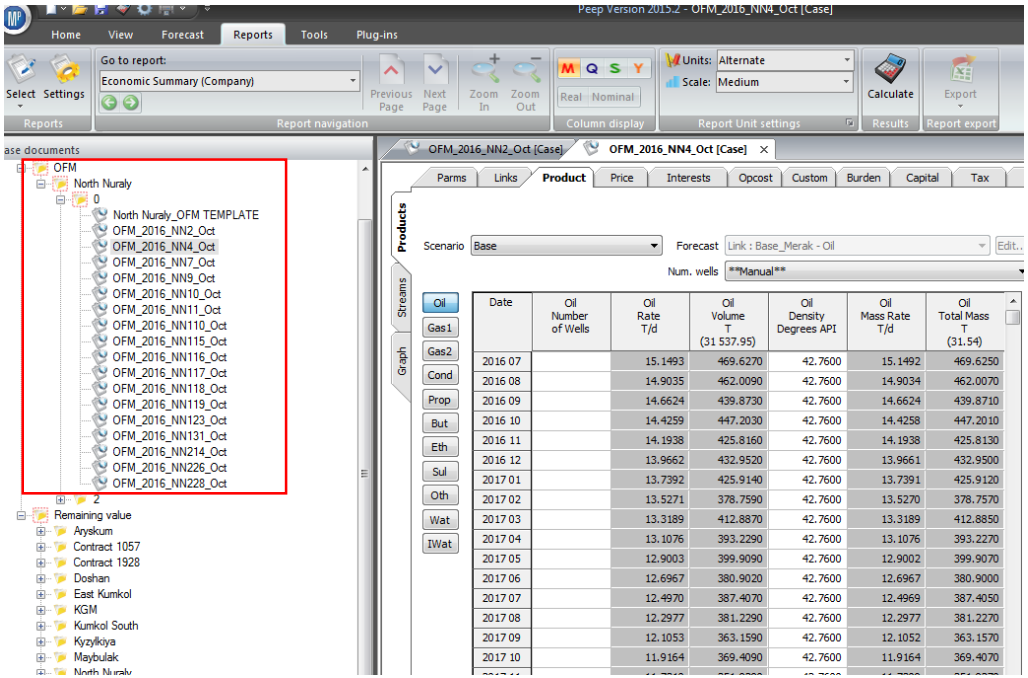
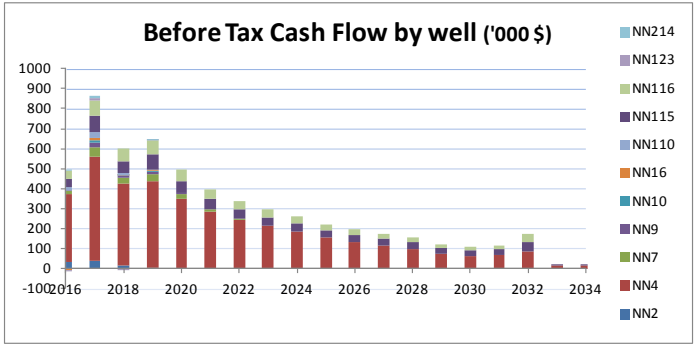
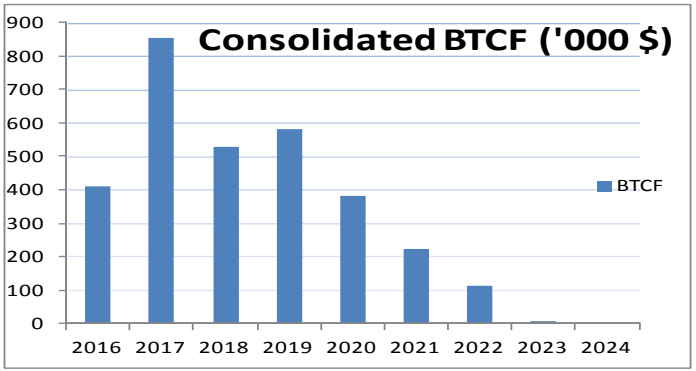
Economical analysis Merak Peep







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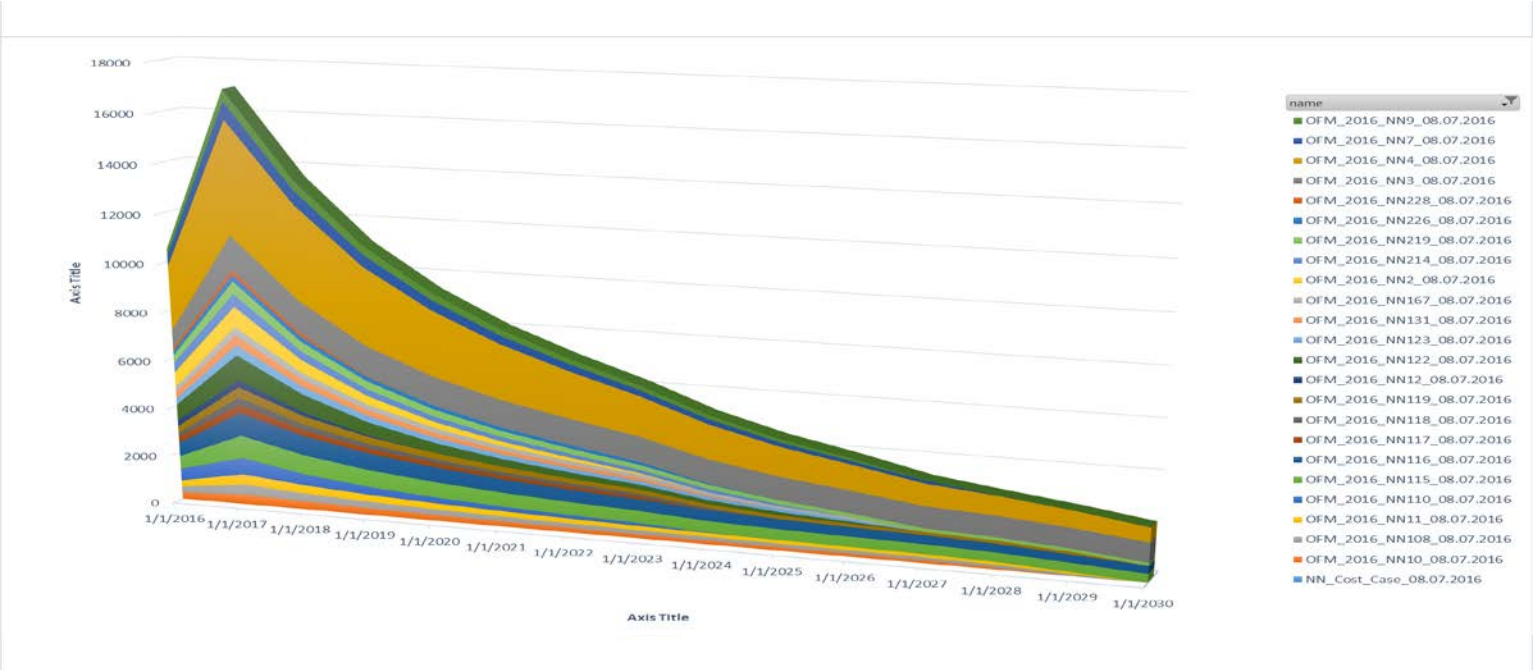
Economical analysis Merak

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

Acknowledgment

PetroKazakhstan Kumkol Resources JSC
Schlumberger


THANK
YOU!