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Case Study Oil Flowing Material Balance

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Summary

This Case Study demonstrates the application of the **Oil Flowing Material Balance (FMB)** engineering technique using the **E&P Portal**.

The Study is based on the oil well from a field in West Siberia, Russia.

It is shown how to:

- Input the data to the **E&P Portal**;
- Apply the **Oil FMB** to estimate the well's STOIIP and JD;
- Save and export the analysis results.

All the input data is attached to the Case Study for the reference.



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Introduction

E&P Portal is a service to identify production enhancement opportunities and maximize production and recovery. The average production increase for the last 3 E&P companies applied the **E&P Portal** was 38%.

Oil FMB is the advanced engineering technique published in 2005 by Louis Mattar and David Anderson. Original paper PDF: <u>Dynamic Material Balance (Oil or Gas-In-Place Without Shut-Ins)</u>.

The details on math and physics of the **Oil FMB** method are published on the wiki page:

https://wiki.pengtools.com/index.php?title=Oil Flowing Material Balance

Oil FMB is available at the **E&P Portal** as one of its engineering workflows. The access to the **Oil FMB** tool at the **E&P Portal** is free for the personal use, once sign up at <u>ep.pengtools.com</u>.



Well Data

Well "8" was drilled down to 9240 ft.

Well design: **13 3/8** in conductor down to **101** ft; **9 5/8** in surface casing down to **2699** ft; 7 in production casing down to **9240** ft.

The well "8" was perforated and hydraulically fractured in "B2" reservoir of the "Superior" field on 01.05.2017¹.

The "B2" reservoir was perforated as follows: top **MD 8850** ft, bot **MD 8897** ft, by "Mega-73 BG" gun with shot density of **6 SPF**.

Well completion string is 2 7/8 in down to 8102 ft with the ESP on 7905 ft.

From the log analysis report the well **kh** is 17.8 md*ft.

The post frac report suggests the well **JD** is 0.6.

The initial reservoir pressure at the well was measured to be 2689 psia.

The well was put on production with the ESP on 26.06.2017.

The field team routinely gathers the well measures and flow test data (dynamic fluid levels, annular pressures, oil, water, gas flowrates etc.). The ESP intake gauge data is also available through the SCADA system.

The well data is attached as "well 8 daily data.csv".

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¹ Note that the well, reservoir, field names as well as well production data and dates were changed for the purpose of this study



Reservoir Data

The "B2" reservoir data is given below:

STOIIP		128 MMstb
Connate water saturation	Sw	35 %
Rock compressibility	cr	4.36E-6 psia ⁻¹
Initial reservoir pressure	Pi	3262 psia
Initial reservoir temperature	Ti	212 F
Oil density		37 API
Bubble point pressure	Pb	2486 psia
Solution gas ratio	Rs	1011 scf/bbl
Gas specific gravity	SGgas	1.2
Water specific gravity	SGwater	1

Table 1 . "B2" reservoir data.



Data Input to the E&P Portal

Signing up

First open <u>ep.pengtools.com</u> in your browser and signup or login to the **E&P Portal**.



Figure 2 . E&P Portal landing page

After signing up /logging in you'll see the main **E&P Portal** page:



Figure 3 . Main page of the E&P Portal



Check the units in the page footer to be "Field".



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Adding the "Superior" field

In the left menu open the "Fields" page of the "Subsurface" module:

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Surface Facilities +	Home /	Fields							
Sales Reports + Subsurface - » Field	Field	ls							
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» BHP & Pres				Fie	eld		License	Area	Operat
» kh & JD					c =:				

Figure 6. Fields page of subsurface module of the E&P Portal

Click "Create Field", fill the form as follows and click "Create":

				ep.	pengto	ols.com	
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Sales Reports Subsurface » Field	Cre	ate	Field	b			
» Well » Deviation Surveys » Perforations	Field Sup	perior					
» Well Logs Interpretation » BHP & Pres	s Licen	ect LA				*	
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Well Enhancement List	US	try				×	
Reservoir Management Mature Water Flood	- Cre	ate					
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Figure 7. Creating the "Superior" field in the E&P Portal

Union where the successfully added the "Superior" field to the **E&P Portal**:

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and Artificial Lift Drilling + Well Enhancement List	1			FMB Salt Mich	_test Lake tigan				Big C Big G	il Co 85 Co				F&P Portal		1
Engineering Tools + Reservoir Management +	1			OilF Tarlau	MB IaMea				RFD OIL /	II CO		Russia Romania Italy	N	Ikhail Tuzovskiy Dragos serban jovanni spitaleri		
Mature Water Flood + Analysis	1			Test	Field				Big C	il Co		Azerbaijan	9	Anton Zimin		1
Production Forecast Calculator +																
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Figure 8. "Superior" field in the E&P Portal



Adding the "B2" reservoir

In the left menu open the "Reservoirs" page of the "Reservoir Management" module:



Figure 9. Reservoirs page of Reservoir Management module of the E&P Portal

Click "Create Reservoir", fill the form as follows and click "Create":

	cpipeigroom		
Dashboard Well Production +	Reservoirs Performance Plots PVT Objects Completions Upload	Reservoirs Upload PVT	
Field Production + Surface Facilities +	Home / Reservoirs / Create Reservoir		
Sales Reports + Subsurface +	Create Reservoir		
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and Artificial Lift	Reservoir	H reference TVD, π	n_net, π
Drilling + Well Enhancement List +	Field	OWC TVD. ft	porosity. %
Engineering Tools +	Superior × *		
Mature Water Flood +	Object	GOC TVD, ft	k, md
Production Forecast	Select object		
© Calculator + © Admin +	Primary Fluid Type	GWC TVD, ft	Swi, %
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Figure 10. Creating the "B2" reservoir in the E&P Portal

Union with the successfully added the "B2" reservoir to the **E&P Portal**:

E&P Portal. Case Study Oil Flowing Material Balance



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Total:		530,319	9 250,838	47.3	284,497	394.2	6.55	1.66	388.0	3.00	0	8.01	0	0			-	41	26	24	5	

Figure 11. "B2" reservoir in the E&P Portal

Note that a number of the reservoir's parameters are automatically calculated based on the production data loaded to the system.



Creating the "B2" reservoir PVT model

In the top of the page click on the "PVT Tool" page:

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Dashboard Well Production +	F	Reservoirs	s Perfor	mance I	Plots PVT	Obje	ects	Complet	tions	Upload R	eservoirs	s Uploa	Engin PVT PQp	Tool Tool	7	
Field Production + Surface Facilities + Sales Reports +	Ho	me / Re	servoir Man	agemen	it								sPip Pha	e seD		
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 » Reservoir Production » Performance Plots 		🔻	🔻	🔻)				MMSCT	MMSCT	%	MMSCT	bbl	10° 001	%	10° DDI
Mature Water Flood + Analysis	1	US	Btc Michigan		14 A1			Oil Gas	330,000	219,908	66.6	110,092		0.33		
Production Forecast Calculator +	1	US	Michigan Superior		A2 B1			Gas	<mark>78</mark> ,838	1,334 1,149	1.69	77,504	44. <mark>5</mark>	2.00e-3 0. <mark>9</mark> 6	2.15	43.5
¢ Admin +	1	US US Pomonio	Superior FMB_test		B2 Can1_reservoir			Gas	<mark>3</mark> 7,292	3,867 <mark>2</mark> 4,532	65.8	<mark>1</mark> 2,761	128.0	5.19	4.05	122.8

Figure 12. Opening the PVT Tool in the E&P Portal

Fill the form with the given data as follows and click "Calculate":



The "B2" reservoir PVT model is ready by now. Check the parameters plots on the "Oil", "Gas" and "Water" tabs. Model results are available in the Output section and the results table on each page.

Ulick "Save to cloud" to save the model.



The summary of the model parameters is given below:

Pi, psia	3262	Z	0.72
Ti, F	212	Gas Density, lbm/ft3	21.7
SGoil	0.84 (37 API)	Bg, scf/scf	0.004218
SGgas	1.2	μgas, cP	0.043
SGwater	1	Cgas, psia-1	0.00011363713688852
Rsb, scf/bbl	1011	Water Density, lbm/ft3	60.180592
Pb, psia	2486	Bw, bbl/bbl	1.037
Oil density, lbm/scf	41.7	µwater, cP	0.29
Bo, bbl/stb	1.651	Cw, psia-1	3.1981709184194E-6
μoil, cP	0.37		
Coil, psia-1	3.66E-6		

Table 2. "B2" reservoir PVT model results



Adding the "B2" reservoir PVT model

In the top menu open the "PVT" page of the "Reservoir Management" module:

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Well Enhancement List + Engineering Tools + Reservoir Management - * Reservoir B1 3262 212 0.84 1.20 1 1011 2486 52.4 1.63 0.35 3.65e-6 0.72 21.7 4.22e-3 0.043 * Russia OliFMB test 262 212 0.84 1.20 1 1011 2486 41.7 1.65 0.37 3.66e-6 0.72 21.7 4.22e-3 0.043 * Russia OliFMB test 2 4500 140 0.88 0.65 1 280.9 1552 1.13 * Russia OliFMB test 3 4500 140 0.88 0.65 1 146.7 1000 50.7 1.07 4.40 3.11e-6 3.51e-3 * Russia OliFMB test 3 4500 140 0.88 0.65 1 986.3 4500 44.3 1.41 0.82 3.28e-5 0.93 14.1 3.51e-3 0.025 * Russia OliFMB test 4 4500 140 0.88 0.65 1 986.3 4500 44.3 1.41 0.82 3.28e-5 0.93 14.1 3.51e-3 0.025 * Russia OliFMB test 5 4500 140 0.88 0.65 1 741.5 4000 45.2 1.35 0.87 1.87e-6 0.93 14.1 3.51e-3 0.025 * Russia OliFMB test 5 4500 140 0.88 0.65 1 741.5 4000 45.2 1.35 0.87 1.87e-6 0.93 14.1 3.51e-3 0.025 * Russia OliFMB test 5 4500 140 0.88 0.65 1 741.5 4000 45.2 1.35 0.87 1.87e-6 0.93 14.1 3.51e-3 0.025 * Russia OliFMB test 5 4500 140 0.88 0.65 1 741.5 4000 45.2 1.35 0.87 1.87e-6 0.93 14.1 3.51e-3 0.025 * Russia OliFMB test 5 4500 140 0.88 0.65 1 741.5 4000 45.2 1.35 0.87 1.87e-6 0.93 14.1 3.51e-3 0.025 * Russia OliFMB test 5 4500 140 0.88 0.65 1 741.5 4000 45.2 1.35 0.87 1.87e-6 0.93 14.1 3.51e-3 0.025 * Russia OliFMB test 5 4500 140 0.88 0.65 1 741.5 4000 45.2 1.35 0.87 1.87e-6 0.93 14.1 3.51e-3 0.025 * Russia OliFMB test 5 4500 140 0.88 0.65 1 741.5 4000 45.2 1.35 0.87 1.87e-6 0.93 14.1 3.51e-3 0.025 * Russia OliFMB test 5 4500 140 0.88 0.65 1 741.5	Drilling 4	Coun	try Field	Reservoir	Pi	Ti	SGoil	SGgas	SGwater	Rsb	Pb	Oil Density	Во	μ _{oil}	Coil	Ζ	Gas Density	Bg	µ _{gas}	C
Engineering Tools Image: Constraint of the second seco	Well Enhancement List				psia	F				scf/bb	l psia	lbm/scf	bbl/bb	CP	psia ⁻¹		lbm/ft ³	scf/scf	сP	ps
Bits 14 1778 138.4 0.84 0.92 1 269.7 1323 1.13 5 Reservoir Management US Michigan A1 4697 199 0.78 0.58 1.04 7 Reservoir Management US Michigan A2 2473 123 0.78 0.58 1.04 7 Reservoir Management US Michigan A2 2473 123 0.78 0.56 1 Reservoir Production US Superior B1 3262 212 0.84 1.20 1 1011 2866 52.4 1.65 0.373 .66e-6 0.72 21.7 4.22e-3 0.043 Performance Plots Mature Water Flood I m_test m_test reservoir 3821 140 0.85 0.65 1 280.9 1552 1.13 1 Mature Water Flood I Russia OIIFMB test 1 4500 140 0.88 0.65 1 146.7 1000 50.7 1 4.403.11e-6 3.51e-3 Production Foreca	Engineering Toole		▼ ▼	1	r															
Reservoir Michigan A1 4697 199 0.78 0.58 1.04 Reservoirs Wichigan A2 24731230 0.78 0.58 1 Reservoirs Wichigan A2 24731230 0.78 0.58 1 Reservoirs Wichigan A2 24731230 0.78 0.58 1 Performance Plots Wiss Superior B2 3262 212 0.84 1.20 1 1011 2866 52.4 1.63 0.353.65e-6 0.72 21.7 4.22e-3 0.043 Performance Plots US Superior B2 3262 12 0.84 1.20 1 1011 2866 52.4 1.63 0.353.65e-6 0.72 21.7 4.22e-3 0.043 US Us Iditttttttttttttttttttttttttttttttttt			Btc	14	1778	138.4	0.84	0.92	1	269.7	1323	6	1.13	5						
Reservoirs Vois Micrigan A2 2473 123.0 0.76 1 * Reservoirs Vois Superior B1 3262 212 0.84 1.20 1 1011 2866 52.4 1.63 0.353.65e-60.72 21.7 4.22e-30.043 * Reservoir Production VUS Superior B2 3262 212 0.84 1.20 1 1011 2866 52.4 1.63 0.353.65e-60.72 21.7 4.22e-30.043 * Performance Plots VUS Superior B2 3262 212 0.84 1.20 1 1011 2866 51.4 1.65 0.373.66e-60.72 21.7 4.22e-30.043 * Performance Plots VUS FMB_test Call_reservoir 3821 140 0.85 0.65 1 146.7 1000 50.7 1 4.40 3.11e-6 3.51e-3 Mature Water Flood Analysis Fussia OIIFMB test 3 4500 140 0.88 0.65 1 146.7 1000 50.7 1.07 4.40.3.11e	Reservoir Management		Michigan	A1	4697	199	0.78	0.58	1.04											
* Reservoir Production * OGS Superior B1 S262 212 0.84 1.20 1 1011 2486 0.53 5.44 1.05 0.373.56e-6.0.72 21.7 4.22e-0.0.44 * Performance Plots US FMB_test Can1_reservoir 4409.224.6 0.58 1 1 111 2486 41.7 1.65 0.373.56e-6.0.72 21.7 4.22e-0.0.44 * Performance Plots ** m_test m_reservoir 3821 140 0.85 1 280.9 1552 1.13 1 1 1 1 4.40.3.11e-6 3.51e-3 Analysis OIIFMB test1 2 4500 140 0.88 0.65 1 146.7 1000 50.7 1.07 4.40.3.11e-6 3.51e-3 Production Forecast * Russia OIIFMB test3 4500 140 0.88 0.65 1 146.7 1000 50.7 1.07 4.40.3.11e-6 3.51e-3 Production Forecast * Russia OIIFMB test3 4500 140 0.88 0.65 1 <td< td=""><td>» Reservoirs</td><td></td><td>Superior</td><td>AZ B1</td><td>2473</td><td>212</td><td>0.78</td><td>1.20</td><td>1</td><td>1011</td><td>2866</td><td>52.4</td><td>1.63</td><td>0.35</td><td>3 650-6</td><td>0.73</td><td>217</td><td>1 220-3</td><td>0.043</td><td>1 1</td></td<>	» Reservoirs		Superior	AZ B1	2473	212	0.78	1.20	1	1011	2866	52.4	1.63	0.35	3 650-6	0.73	217	1 220-3	0.043	1 1
Performance Plots US FMB_test Can1_reservoir 4409 224.6 0.58 1 1 1 1 Mature Water Flood Analysis + Mature Water State + 1	» Reservoir Production		Superior	B2	3262	212	0.84	1.20	1	1011	2486	417	1.65	0.37	3.66e-6	0.72	21.7	4 22e-3	0.043	11
Pertonnance Pols m_test m_test_reservoir 3821 140 0.85 0.65 1 280.9 1552 1.13 Mature Water Flood + Analysis * Russia OIIFMB test 1 4500 140 0.88 0.65 1 146.7 1000 50.7 1 4.403.11e-6 3.51e-3 Production Forecast P Russia OIIFMB test 3 4500 140 0.88 0.65 1 986.3 4500 44.0 3.51e-3 Production Forecast * Russia OIIFMB test 4 4500 140 0.88 0.65 1 986.3 4500 44.0 3.51e-3 3.51e-3 * Russia OIIFMB test 3 4500 140 0.88 0.65 1 986.3 4500 44.0 3.51e-3 * Russia OIIFMB test 4 4500 140 0.88 0.65 1 828.5 4000 46.0 1.35 0.871.87e-6.0.93 14.1 3.51e	. Porformance Ploto		FMB test	Can1 reservoi	r 4409	224.6	0.04	0.58	1	1011	2400	41.7	1.00	0.01	0.000 0	1		4.220 0	0.040	
Mature Water Flood Analysis + Russia OliFMB test 1 4500 140 0.88 0.65 1 146.7 1000 50.7 1 4.403.11e-6 3.51e-3 Analysis Russia OliFMB test 2 4500 140 0.88 0.65 1 146.7 1000 50.7 1 4.403.11e-6 3.51e-3 Production Forecast Russia OliFMB test 3 4500 140 0.88 0.65 1 146.7 1000 50.7 1.07 4.403.11e-6 3.51e-3 Production Forecast Russia OliFMB test 3 4500 140 0.88 0.65 1 986.3 4500 44.0 1.35 0.871.187e-6 3.51e-3 Quality Russia OliFMB test 4 4500 140 0.88 0.65 1 28.45 4000 46.2 1.35 0.874.87e-6.033 14.1 3.51e-3.0025 Quality Russia OliFMB test 5 4500	» Performance Plots	/	m test	m test reservo	ir 3821	140	0.85	0.65	1	280.9	1552		1.13							
Analysis Production Forecast Production Forecast Production Forecast OIIFMB test 2 4500 140 0.88 0.65 1 146.7 1000 50.7 1.07 4.403.11e-6 3.51e-3 Production Forecast Production Forecast Vir Sussia OIIFMB test 3 4500 140 0.88 0.65 1 986.3 4500 4.43 1.41 0.823.28e-50.93 14.1 3.51e-30.022 Q Calculator + Russia OIIFMB test 4 4500 140 0.88 0.65 1 741.5 4000 46.0 1.35 0.871.87e-60.93 14.1 3.52e-30.022 Q Calculator + Russia OIIFMB test 5 4500 140 0.88 0.55 1 741.5 4000 45.2 1.35 0.874.954e-60.93 14.1 3.51e-30.022	Mature Water Flood	Russ	ia OilFMB	test 1	4500	140	0.88	0.65	1	146.7	1000	50.7	1	4.40	3.11e-6			3.51e-3		
Production Forecast × Russia OIIFMB test 3 4500 10 986.3 4500 44.3 1.41 0.82 0.85 1 986.3 4500 4.3 0.41 0.82 0.65 1 986.3 4500 4.3 0.41 0.82 0.65 1 986.3 4000 4.3 0.41 0.82 0.43 0.87 0.83 0.65 1 828.5 4000 4.3 0.87 0.83 0.82 0.40 0.83 0.65 1 74.15 3.54 0.63 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83 0.83	Analysis	📝 Russ	ia OilFMB	test 2	4500	140	0.88	0.65	1	146.7	1000	50.7	1.07	4.40	3.11e-6			3.51e-3		
Calculator Russia OilFMB test 4 4500 140 0.88 0.65 1 828.5 4000 46.0 1.35 0.871.87e-60.93 14.1 3.52e-3 0.02t © Calculator + Prussia OilFMB test 5 4500 140 0.88 0.65 1 741.5 4000 45.2 1.35 0.949.54e-60.93 14.1 3.51e-3 0.025	Production Forecast	📝 Russ	ia OilFMB	test 3	4500	140	0.88	0.65	1	986.3	4500	44.3	1.41	0.82	3.28e-5	0.93	3 14.1	3.51e-3	0.025	1.3
Calculator + P Russia OilFMB test 5 4500 140 0.88 0.65 1 741.5 4000 45.2 1.35 0.949.54e-6.0.93 14.1 3.51e-30.025		🖉 🖍 Russ	ia OilFMB	test 4	4500	140	0.88	0.65	1	828.5	4000	46.0	1.35	0.87	1.87e-6	0.93	3 14.1	3.52e-3	0.026	1.3
	Calculator	🕐 Russ	ia OilFMB	test 5	4500	140	0.88	0.65	1	741.5	4000	45.2	1.35	0.94	9.54e-6	0.93	3 14.1	3.51e-3	0.025	1.3

Figure 13. Reservoirs PVT page of Reservoir Management module of the E&P Portal

Click "Add PVT", fill the form as follows and click "Create":

	ep.pengtools.com	🔁 About - 🚔 pengtools.com - 🌣 Settings 1 MishaT - බ	Support - 🏴 Language -
O Dashboard Well Production + Field Production +	Reservoirs Performance Plots PVT Objects Completions Upload	Reservoirs Upload PVT	
Surface Facilities +	Home / PVT / Add PVT		
Sales Reports + Subsurface + Dispatcher Office	Add PVT		
Downhole Equipment +	Field	μ _{olb} cP	Cw, psia ⁻¹
Drilling +	Superior × *	0.37	3.1981709184194E-6
Well Enhancement List +	Reservoir	Coil, psia ⁻¹	
Engineering Tools + Reservoir Management +	82 *	3.66E-6	
Mature Water Flood +	P _i , psia	z	
Analysis Production Forecast	3262	0.72	
© Calculator +	T _b F	Gas Density, Ibm/ft ³	
Admin +	212	21.7	
	SGoil	Pa cotlast	
	0.84	0.004218	
	SGgas		
	1.2	μ _{gas} , cP	
	SGwater	0.045	
	1	Cgas, psia ⁻¹	
	Rsb. scf/bbl	0.00011363713688852	
	1011	Water Density, Ibm/ft ³	
	Ph. osia	60.180592	
	2486	Bw, bbl/bbl	
		1.037	
	Oil Density, ibm/scf	µ _{water} , cP	
		0.29	
	Bo, bbl/bbl		
	1.651		
Q	Create		

Figure 14. Creating the PVT model in the E&P Portal

Note that PVT parameters are copied from the PVT model created on the previous step.

Union with the successfully added the "B2" reservoir PVT model to the **E&P Portal**:



E&P Portal. Case Study Oil Flowing Material Balance

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O Dashboard Well Production +	Reservoirs	Performance Plots	PVT	Objects	Comple	ations	Uploa	d Reservoir	s U	Ipload PVT											
Field Production + Surface Facilities + Sales Reports +	PVT																				
Subsurface + Dispatcher Office	Add PVT																				
Downhole Equipment + and Artificial Lift	Showing 1-12	of 12 items.																	Expo	t table data: 🔠 🕶	<u>a</u> -
Drilling + Well Enhancement List +	Country Fi	eld Reservoir	Pi Ti psia F	SGoil SG	as SGwate	scf/bb	Pb C psia	bil Density Ibm/scf	Bo bbl/bbl	µ _{oll} Coil cP psia ⁻¹	Z Gas Den Ibm/ft	sity Bg 3 sct/sct	P psia	s Water Densit ¹ Ibm/ft ³	bbl/bbl	Pwater cP	Cw psia ⁻¹	Username	Created At	Updated At	
Engineering Tools +		Btc 14	1778 138.4	0.84 0.9	2 1	269.7	1323		1.13	5					1	1		Mikhail Turowskiu	2018-02-05 16:51:35	2018-02-05 16:5	1:35 / 📋
Mature Water Flood + Analysis	US Mic	higan A2 perior B1	2473 123.0 3262 212	0.78 0.5	i6 1 0 1	1011	2866	52.4	1.63	0.353.65e-6	.72 21.7	4.228-3	0.043 1.14e	4 60.2	1.04	0.29	3.20e-6	Mikhail Tuzovskiy Mikhail Tuzovskiy	2017-10-04 10:53:43 2017-09-06 08:51:48	2017-10-04 10:5 2018-04-11 07:0	3:43
Production Forecast	US FME	3_test Can1_reservoir test m_test_reservoir	3262 212 4409 224.6 3821 140	0.84 1.2	0 1 8 1 5 1	280.9	1552	41.7	1.65	0.373.66e-60	1	4.228-3	0.043 1.14e	-4 60.2	1.04	0.29	3.20e-6	Mikhail Tuzovskiy	2017-08-14 12:20:15 2017-12-11 09:30:47 2018-02-05 06:15:07	2018-04-11 07:0 2017-12-11 09:3 2018-02-05 06:1	4:19 0:47 5:07
¢ Admin +	 Russia Oil Russia Oil Russia Oil 	FMB test 1 FMB test 2 FMB test 3	4500 140 4500 140	0.88 0.6	5 1 5 1	146.7 146.7 986.3	1000 1000	50.7 50.7	1 1.07	4.403.11e-6 4.403.11e-6	93 14 1	3.51e-3 3.51e-3	0.025.1.38e	62.2 62.2	1.00	0.47	2.77e-6 2.77e-6	E&P Portal E&P Portal	2018-03-22 07:17:43 2018-03-29 04:13:30 2018-03-29 08:11:23	2018-04-04 03:50 2018-04-02 10:5 2018-04-02 11:0	3:42 / 1 4:03 / 1
	 Russia Oli Russia Oli Russia Oli 	FMB test 4 FMB test 5	4500 140 4500 140	0.88 0.6	15 1 15 1	828.5 741.5	4000	46.0 45.2	1.35	0.87 1.87e-60 0.94 9.54e-60	.93 14.1 .93 14.1	3.51e-3 3.51e-3	0.025 1.35e 0.025 1.35e 0.025 1.38e	-4 61.7 -4 62.2	1.00	0.47	2.78e-6 2.77e-6	Mikhail Tuzovskiy	2018-04-03 09:32:01 2018-04-10 05:54:54	2018-04-02 11:0 2018-04-03 09:3 2018-04-10 05:5	2:01

Figure 15. Reservoirs PVT page of Reservoir Management module of the E&P Portal



Adding the well "8"

In the left menu open the "Well" page of the "Subsurface" module:

				ep.p	engto	ols.	com		
Dashboard Well Production +	Field	Well	Pad	Shop	Operator	Lice	ense Area	Upload Wel	Is
Field Production + Surface Facilities + Soles Persets	Home /	Wells							
Subsurface • Field	Well	S							
» Well » Deviation Surveys	Create We	ell 🚯	Wiki it						
» Perforations » Well Logs Interpretations « RHR & Reco	Showing 1	-100 of 2	07 items.	Ded	Chan	Field	Oneveter	Licence Arr	
» вни & Pres » kh & JD		Well	Ψž	Pad	snop *	-	v	License Are	• C

Figure 16. Well page of Subsurface module of the E&P Portal

Click "Create Well", fill the form as follows and click "Create":

					ep.	pengto	ols.c	om	
O Dashboard		Field	Well	Pad	Shop	Operator	Licens	e Area	Upload Wells
Field Production	+								
Surface Facilities	+	Home /	Wells /	Create W	/ell				
Sales Reports	+								
Subsurface	+	Croa	to \						
Dispatcher Office		Crea	lev						
Downhole Equipment and Artificial Lift	: +	Well							
Drilling	+	8							
Well Enhancement Lis	st +	Field							
Engineering Tools	+	Queorie	-						
Reservoir Manageme	nt +	Superio	ſ				×	×	
Mature Water Flood	+	Pad							
Analysis		Α						-	
Production Forecast									
Calculator	+	Deviation	Туре						
✿ Admin	+							•	
		Create							

Figure 17. Creating the well "8" in the E&P Portal

UNOW YOU have successfully added well "8" to the **E&P Portal**:





				ep.j	pengto	ools.co	om		() Abo	out• 🖴	pengtool	s.com +	Settings	1 Misha	α - (🖓 Support 🗸	🏴 Languag	e -		
Deshboard Well Production Field Production	Field	d Well	Pad	Shop	Operator	License	Area L	Ipload Wells												
Surface Facilities +	Home	/ Wells																		
Subsurface -	We	lls																		
Well Deviation Surveys	Create	Well	Wiki It																	
Perforations Well Logs Interpretations	Showin	g 1-2 of 2	tems.																Export table data:	. <u>₹</u> ~
* BHP & Pres	-	Wel	11	Pad	Shop	Field	Operator	License Area	Country	Well Type	Status	Status Typ	e Deviation Ty	pe Opera	tion Type	Usern	ame	Created At	Updated At	
• Kn & JD Dispatcher Office	/	1	8	A	- * 8	Superior	Big Oil Co		US	Injector	Change	Change		Peric	dic ESP	E&P P	ortal :	2017-08-30 08:24:52+00	2017-08-30 08:24:5	2+00 🖌 💼
Downhole Equipment + and Artificial Lift	10	ŧ	1	A		Superior	Big Oil Co		US	Producer	Charge	Change		Peric	odic ESP	E&P P	ortal	2017-08-30 08:24:52+00	2017-08-30 08:24:5	1+00 💉 🏥
DHilling + Well Enhancement List + Engineering Tools + Reservoir Management + Mature Water Flood + Analysis Production Forecast O Calculator + O Admin +																				

Figure 18. Well "8" in the E&P Portal



Adding the well "8" perforations

In the left menu open the "Perforations" page of the "Subsurface" module:



Figure 19. Perforations page of Subsurface module of the E&P Portal

Click "Create Perforation", fill the form as follows and click "Create":

	ep.pengtools.com	0 About - ≜ pengtools.com - ♦ Settings 1 MishaT - 🖓	Support → 🔎 Language →
O Dashboard Well Production +	Data RuninHole Method Upload		
Field Production + Surface Facilities + Sales Reports +	Home / Perforations / Create Perforation		
Subsurface + Dispatcher Office	Create Perforation		
Downhole Equipment +	Field	Hole Density, SPF	Saturation Test
Drilling +	Superior 🗶 *	6	¥
Well Enhancement List +	Reservoir	RunInHole Method	Notes
Reservoir Management +	B2 × *	- *	
Mature Water Flood + Analysis	Well	Explosive Type	
Production Forecast	8 *		
Q Calculator + ↓ Admin +	Perforation Date	Company Name	A
	2017-05-01	-	
	Top MD, ft	Allocation Factor	
	8850	1	
	Bottom MD, ft	Isolation Date	
	8897		
	Perforator Type		
_	Mega-73 BG		
	Create		

Figure 20. Creating the well "8" perforations in the E&P Portal

Wow you have successfully added well "8" perforations to the E&P Portal:

Figure 21. Well "8" perforations in the E&P Portal



Adding the well "8" kh and JD

In the left menu open the "kh & JD" page of the "Subsurface" module:

		ep.peng tools.	com
O Dashboard			
Well Production +	Data Upload		
Field Production +			
Surface Facilities +	Home / kh & JD		
Sales Reports +			
Subsurface -	kh & ID		
» Field			
» Well	Create kh & JD		
» Deviation Surveys			
» Perforations	Showing 1-100 of 250 items		
» Well Logs Interpretations			
» BHP & Pres	Country Field	Well Reservoir	S
» kh & JD	-		ï
Figur	e 22. kh & JD page o	f Subsurface module	of the

Click "Create Perforation", fill the form as follows and click "Create":

	ep.pengtoois.com	About • = pengtools.com •	V Settings I Misnai • 47 Support • P Language •
O Dashboard Well Production +	Data Upload		
Field Production + Surface Facilities + Sales Reports +	Home / kh & JD / Create kh & JD		
Subsurface + Dispatcher Office	Create kh & JD		
Downhole Equipment + and Artificial Lift	Save DateTime		at
Drilling + Well Enhancement List +	2017-06-13 01:00:00		U.0
Engineering Tools + Reservoir Management +	Superior	××	17.8
Mature Water Flood + Analysis	Well		Note
Production Forecast	8	× *	
Ø Admin +	Reservoir B2		
	Create		

Figure 23. Creating the well "8" kh and JD in the E&P Portal

🥪 IN		/ yc	bu h	ave	e suco	cessfully a	dded we	ell "8" k	ch & J	D to th	ne E&P	Portal:		
		-		ep.	pengtool	s.com	0 About - 🚔	pengtools.com +	Settings	💄 MishaT 👻	କ Support 🗸 🔎	Language 🗸		
ion +	Dat	a Upk	bad											
tion + ities +	Home	/ kh & Jl	D											
	ch	<u>р.</u> IГ	•											
		XJL												
rveys	Create	kh & JD												
roretations	Showir	g 1-26 of	26 items.										Export table data:	
														·
	Co	untry	Field	Well	Reservoir	Save DateTime 1	JD		kh md*ft	Note	Username	Created At	Updated At	
ffice	Co	untry	Field Superier *	Well	Reservoir v	Save DateTime 1	JD		kh md*ft	Note	Username	Created At	Updated At	
ffice	Co	untry v	Field Superior *	Well	Reservoir 	Save DateTime 14 2021-08-05 00:00:00	JD 0.13		kh md*ft 1.79	Note Well Test	Username	Created At 2017-09-14 09:52:50	Updated At 2017-09-14 09:52:50	
ffice ulpment +	Co	untry VS US	Field Superior * Superior Superior	Well * 21 25	Reservoir B1 B2	Save DateTime 14 2021-08-05 00:00:00 2018-08-09 01:00:00	0.13 0.13		kh md*ft 1.79 8.98	Note Well Test Well Test	Username	Created At 2017-09-14 09:52:50 2017-09-14 09:52:50	Updated At 2017-09-14 09:52:50 2017-09-14 09:52:50	
ffice juipment + Lift	Co	untry VS US US	Field Superior Superior Superior Superior	Well 21 25 29	Reservoir * B1 B2 B2 B2 B2 B2 B2 B2	Save DateTime 1 2021-08-05 00:00:00 2018-08-09 01:00:00 2018-07-16 01:00:00	0.13 0.13 0.13		kh md*ft 1.79 8.98 22.6	Note Weil Test Weil Test	Username	Created At 2017-09-14 09:52:50 2017-09-14 09:52:50 2017-09-14 09:52:50	Updated At 2017-09-14 09:52:50 2017-09-14 09:52:50 2017-09-14 09:52:50	
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Iffice uipment + Lift + ement List + Tools + Inagement + r Flood +		US US US US US US US US US US US US US	Field Superior Superi	Well 21 25 29 21 20 18 9 17 17 15 19 16	Reservoir	Seve DateTime II 2021-08-05 00:00:00 2018-06-09 01:00:00 2018-06-09 01:00:00 2018-06-05 01:00:00 2018-06-05 01:00:00 2018-03-20 1:00:00 2018-03-20 1:00:00 2018-03-20 1:00:00 2018-03-12 01:00:00 2018-03-12 01:00:00	JD 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13		kh md*ft 1.79 8.98 22.6 11.9 51.9 11.1 16.2 5.24 5.24 5.24 5.24 5.23 7.95 34.1 7.95 34.1	Note Veil Test V	Username	Created At	Updated At 2017-09-14 09552:60 2017-09-14 09552:60 2017-09-14 09552:60 2017-09-14 09552:60 2017-09-14 09552:60 2017-09-14 09552:60 2017-09-14 09552:60 2017-09-14 09552:60 2017-09-14 09552:60 2017-09-14 09552:60	
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rffice julpment + Lift + trenent List + Tools + inagement + r Flood + orecast		untry US US US US US US US US US US US US US	Field Superior Superior Superior Superior Superior Superior Superior Superior Superior Superior Superior Superior Superior	Well 21 25 29 21 20 18 9 17 17 15 19 16 15 19 16 15 19 10 10 10 10 10 10 10 10 10 10 10 10 10	Reservoir * B1 B2 B2 B2 B1 B2 B2 B2 B1 B2 B2 B2 B1 B2 B1 B2	Save DataTime Li 2021-08-05 00:00:00 2016-08-05 00:000 2016-08-05 00:000 2016-08-05 00:000 2016-08-05 00:000 2016-08-15 00:000 2016-08-12 00:000 2016-08-12 00:000 2016-08-12 00:000 2016-08-12 00:000 2016-08-12 00:000 2016-08-12 00:000 2016-08-12 00:000 2016-08-12 00:000 2016-08-12 00:000	JD 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13		kh md*ft 1.79 8.98 22.6 11.9 51.9 11.1 16.2 5.24 5.83 7.95 34.1 22.8 6.78 23.2	Note Well Test Well Test	Username Mikhail Tuzovskiy	Created At	Updated At 2017-09-14 09:52:50 2017-09-14 09:52:50	
mce uipment + Lift + roots + inagement + r Flood + orscast +		untry US	Field Superior Superior Superior Superior Superior Superior Superior Superior Superior Superior Superior Superior Superior Superior	Well	Reservoir * B1 B2 B2 B2 B3 B3 B4 B4	Bave DataTime Li 2021-08-05 00:000 2016-08-00 00:00 2016-08-00 00:00 2016-09-10 01:00 2016-09-10 01:00 2016-09-10 01:00 2016-09-10 01:00 2016-09-10 01:00 2016-09-10 01:00 2017-10-09 01:00 2017-09-09 01:00 2016-09-09 2016-09 2017-09 2016-09 2017-09 2016-09 2017-09 2016-09 2017-09 2016-09 2017-09 2016-09 2017-09 2016-09 2016-09 2017-09 2016-09 2016-09 2017-09 2016-09 200-09 2	JD 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13		kh md*ft 1.79 8.99 22.6 11.9 51.9 11.1 16.2 5.24 5.83 7.95 34.1 22.8 6.78 23.2 24.2	Note Weil Test W	Username Mikhail Tuzovsky Mikhail Tuzovsky	Created At	Updated At 2017-09-14 09:52:50 2017-09-14 09:52:50 2017-09-10 09:12:02 2017-09-10 10:12:22	
rffice uipment + Lift + ement List + Tools + anagement + r Flood + orscast + +	Co	untry US	Field Superior	Well 21 25 29 21 20 18 9 17 15 19 16 15 10 11 8 8 8 9 17 15 19 16 15 10 10 10 10 10 10 10	Reservoir * 81 82 82 82	Bave DataTime II 2011-08-00 00:000 2016-07-10 00:000 2016-07-10 00:000 2016-07-10 00:000 2016-08-10 00:000 2016-08-10 00:000 2016-08-10 00:000 2016-08-10 00:000 2016-08-10 00:000 2016-08-10 00:000 2017-08-08 00:000 2017-08-20 00:0000 2017-08-20 00:0000	JD 0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13		kh md*ft 1.79 8.98 225 11.9 51.9 11.1 16.2 5.24 5.83 7.95 34.1 22.8 6.78 23.2 24.3 17.8	Note Well Test W	Username Mikhail Tuzovskiy Mikhail Tuzovskiy	Created At 2017 -03-14 (2):82-80 2017 -03-14 (2):82-80 2017 -03-14 (0):82-80 2017 -03-1	Updated At 2017-09-14 0952:50 2017-09-14 0952:50 2017-09-14 2017-09-14 2017-09-14 2017-09	

Figure 24. Well "8" kh & JD in the E&P Portal



Upload the well "8" daily production data

In the left menu open the "Daily Data" page of the "Well Production" module:

	ep.pengtools.com
Dashboard	Dist. Table Company Wells Unload
Well Production	- Piot Table Compare Weils Opload
» Daily Data	
» Monthly Data	Upload
Field Production	+ File
Surface Facilities	+ Choose File no file selected
Sales Reports	+
Subsurface	
Dispatcher Office	Merge
	Figure 25. Wells daily data upload page of the E&P Port

Fill the form as follows and click "Upload":

				ep. <mark>p</mark>	engtoo	ls.com	3 A	bout -
ashboard								
Production	+	Plot	Table Co	mpare Wells	Upload			
I Production	Ð,		2					
ace Facilities	÷	Upload						
s Reports	Ŀ	File						
surface	+	Choose File	, 😰 well 8 daily	/ data.csv				
atcher Office		Update Ty	pe					
nhole Equipment Artificial Lift	+	Merce						
ng	+	morge						~
Enhancement List	+	File Heade	ər					
ineering Tools	+	File with	header					×
ervoir Management ure Water Flood	+	File Colum	nns Map					
lysis		#01 col	Field				÷	
duction Forecast		#02 ccl	Mall					
alculator	+	#02 COI	VVeli				• •	
ldmin	+	#03 col	Date				\$	
		#04 col	D Choke Tub				\$	/64in
		#05 col	Fluid Level Ar	ท			\$	ft
		#06 col	Gas Productio	on Volume			\$	MMscf
		#07 col	Liquid Produc	tion Volume			¢	bbl
		#08 col	Oil Production	n Volume			\$	bbl
		#09 col	P Ann				\$	psia
		#10 col	P Line				\$	psia
		#11 col	P Tub				\$	psia
		#12 col	PIP				\$	psia
		#13 col	Pres				\$	psia
		#14 col	Solids Amour	nt			\$	ppm
		#15 col	Uptime				\$	h
		#16 col	Water produc	tion Volume			\$	bbl
		#17 col					\$	

Figure 26. Well "8" daily data upload to the E&P Portal

Wait for the message showing the data upload status:

E&P Portal. Case Study Oil Flowing Material Balance



		ep. <mark>p</mark>	engtools.com	🕄 About 🗸	🚔 pengtools.com 👻
Dashboard	Plot Table	Compare Wells	Upload		
Well Production +					
Field Production +					
Surface Facilities +	2165 rows were r	ead from file			×
Sales Reports +	Time elapsed 10	(16.75 Mb) sec			
Subsurface +					
Dispatcher Office					
Downhole Equipment + and Artificial Lift					
Drilling +					
Well Enhancement List +					
Engineering Tools +					
Reservoir Management +					
Mature Water Flood + Analysis					
Production Forecast					
Calculator +	Upload				Wiki info
¢Admin +	File				
	Choose File 🕵 well	8 daily data.csv			Briaf

Figure 27. Well "8" daily data upload status message

Union with the successfully uploaded the well "8" daily data to the **E&P Portal**:

Let's visually inspect the data uploaded. In the top menu click the "Plot". Fill the filter as follows and click "Search":



Figure 28. Well "8" daily data visualization



Adding the well "8" casing design

In the left menu open the "Well Design" page of the "Drilling" module:

					ep.p	engto	ools.co	m	
Dashboard Well Production +		Well De	sign U	pload W	ell Design	Surfac	e Equipment	Pipe Catalog	
Field Production + Surface Facilities + Soles Benerits	Ho	me / V	Vell Desigr	1					
Sales Reports + Subsurface + Dispatcher Office	W	ell	Des	ign					
Downhole Equipment + and Artificial Lift	Ad	d Equip	ment						
Drilling -	Sho	owing 1-	-37 of 37 it	ems.					
» Drilling Reports » History	#	Well	Field	Pad	Pad	Drilling Start	Drilling Finish ↓	Equipment	OD ↓²
» Well Design » Depth vs Time	1		🔻	▼ ▲	Δ			Production Casin	ín
» Crews		10	Superior	^	^			Production Casin	g0.75

Figure 29. Well Design page of the Drilling module of the E&P Portal

Adding the Conductor: Click "Add Equipment", fill the form as follows and click "Create":

			ep. <mark>peng</mark> t	ools	.com	0 About -	🖻 pengtools.com 👻	© Settings	🛔 MishaT -	ର Support -	🏴 Language -	
O Dashboard Well Production + Field Production +	Well Design	Upload Well Design	Surface Equipment Pip	e Catal	29							
Surface Facilities + Sales Reports +	Home / Well D	esign Equipments / C	reate Well Design Equipment									
Subsurface + Dispatcher Office	Create	Well Des	ign Equipm	ent	:							
Downhole Equipment and + Artificial Lift	Field							OD, in				
Drilling +	Superior						××	13.375				
Well Enhancement List + Engineering Tools	well							Pipe Weight	t, Ibm/ft			
Reservoir Management +	10											
Mature Water Flood Analysis +	Equipment							Wall Thickn	ess, in			
O Calculator +	Conductor						0	0.48				
¢ Admin +	Date							Steel Time				
	2017-05-01							ateer type				
	Depth MD Start, f	τ			Depth MD End, ft							
	0				101			Mud Weight	, ppg			
				_								
								Mud Type				
								Top of Cem	ent MD, ft			End of Cement MD, ft
								0				101
								Float Colar	MD, ft			
								Casing Sho	e MD. ft			
								101				
								Etran Calla	- 110 0			
								orage cone	1 110, 11			
								orunty weig	m, ppg			
								Slurry Class	•			
	\frown											
(Create											

Figure 30. Creating Well "8" conductor in the E&P Portal

Adding the Surface casing: Click "Add Equipment", fill the form as follows and click "Create":

E&P Portal. Case Study Oil Flowing Material Balance



		ep.pengtool	s.com	0 About -	🖻 pengtools.com 👻	Settings	💄 MishaT -	G Support •	🏴 Language 👻	
Dashboard Well Production + Eadd Resolution 4	Well Design Upload Well Design	Surface Equipment Pipe Cat	alog							
Surface Facilities +	Home / Well Design Equipments / Creat	e Well Design Equipment								
Sales Reports + Subsurface +	Create Well Desi	an Equipmen	+							
Dispatcher Office	Create wen Desig		it.							
Artificial Lift	Superior					00, in				
Well Enhancement List +	Well				× -					
Engineering Tools +	8				*	Pipe Weight, I	ibm/ft			
Reservoir Management + Mature Water Flood Analysis +	Equipment									
Production Forecast	Surface Casing				0	Wall Thicknes	is, in			
© Calculator + © Admin +	Date					0.47				
	2017-05-01					Steel Type				
	Depth MD Start, ft		Depth MD End, ft							
	0		2699			Mud Weight, p	ppg			
						Mud Type				
						Top of Cemer	t MD, ft			End of Cement MD, ft
						Ū				5094
						Float Colar M	D, ft			
						Casing Shoe	MD, ft			
						Stage Collar I	MD, ft]
						Siurry Weight,	, ppg			
						Siurry Class				
4										
(Create									

Figure 31. Creating Well "8" surface casing in the E&P Portal

Adding the Production casing: Click "Add Equipment", fill the form as follows and click "Create":

			ep. <mark>peng</mark>	ools.cor	n	0 About -	🖻 pengtools.com 🕞	Settings	💄 MishaT -	କ Support -	🍽 Language 🗸		
Dashboard Well Production + Field Production + Surface Facilities +	Well Design	Upload Well Design	Surface Equipment P	e Catalog									
Sales Reports +	Tione - Tione	angiri Equipriminari 7-0	nano man beargin capapinana										
Dispatcher Office	Create	Well Des	sign Equipm	ent									
Downhole Equipment and + Artificial Lift	Field							OD, in					
Drilling +	Superior						× *	7					
Well Enhancement List + Engineering Tools +	well						-	Pipe Weight, I	lbm/ft				
Reservoir Management +	0												
Mature Water Flood Analysis +	Equipment							Wall Thicknes	ıs, in				
© Calculator +	Production Casin	9					0	0.41					
¢ Admin +	Date							Steel Type					
	2017-05-01												
	Depth MD Start, f	t		Depth	MD End, ft			Mud Weight, p	PPS				
	0			9240)								
								Mud Type					
								Top of Cemen	t MD, ft			End of Cement MD, ft	
								0				9240	
								Float Colar M	D, ft				
								Casing Shoe I	MD. ft				
								Stage Collar I	MD, ft				
								9240					
								Slurry Weight,	. PPg				
								Slurry Class					
(Create												
	Circuito												

Figure 32. Creating Well "8" production casing in the E&P Portal

UNOW you have successfully added well "8" casing design to the **E&P Portal**:

E&P Portal. Case Study Oil Flowing Material Balance







Adding the well "8" downhole equipment

In the left menu open the "Downhole Equipment" page of the "Downhole Equipment and Artificial Lift" module:

			ep.p	engtools.com	
	O Dashboard	Deverteda Favianeert	Uniond	Davidada Environment Tanan	Dine Ontolen
	Well Production +	Downnoie Equipment	Upload	Downnoie Equipment Types	Pipe Catalog
	Field Production +				
	Surface Facilities +	Home / Well Downhole E	quipment		
	Sales Reports +				
	Subsurface +	Well Down	alod	Equipment	
_	Dispatcher Office		IUIE	Lyupment	
	Downhole Equipment - and Artificial Lift	Create Well Downhole Equi	pment		
1	» Downhole Equipment » ESP	Showing 1-100 of 222 items	8.		

Figure 34. Well Downhole Equipment page of the Downhole Equipment and Artificial Lift module of the E&P Portal

Click "Create Well Downhole Equipment", fill the form as follows and click "Create":

	•	
O Dashboard Well Production +	Downhole Equipment Upload Downhole Equipment Types Pipe Catalog	
Field Production + Surface Facilities + Sales Reports +	Home / Well Downhole Equipment / Create Well Downhole Equipment	
Subsurface + Dispatcher Office	Create Well Downhole Equipment	
Downhole Equipment + and Artificial Lift Drilling +	Field Superior x *	Mount Date 2017-06-24
Well Enhancement List + Engineering Tools +	Pad X V	Unmount Date
Meservoir management + Mature Water Flood + Analysis	Well	Notes
Production Forecast Calculator + Admin +	0 × *	
	2 7/8 x *	

Figure 35. Creating the well "8" downhole equipment in the E&P Portal

Next click on the "well name" to define the completion string elements:

	ep	.pengtools.co	m	• About -	🚔 pengtools.com 👻	¢ s	ettings 👤 Mish	uaT- γ	ନ Support 👻	🏴 Language 👻			
O Dashboard Downhole Equip	nent Upload	d Downhole Equipment	Types Pipe Catalog										
Field Production + Surface Facilities + Home / Well Dow Sales Reports +	hole Equipment												
Subsurface + Well Dor	vnhole	e Equipme	nt										
Downhole Equipment - Create Well Downh and Artificial Lift	le Equipment												
ESP Showing 1-1 of 1 ite Orilling Well Field	Pad (Completion Run	Mount Date 1	Unmo	ount Date TBG	Htub	Days in Service	Notes	Username	Created At	Export table data: Updated A	t	2-
Engineering Tools Reservoir Management + Supering	× ×	1	2017-06-24	A		8102	297		Mikhail Tuzov	skiy 2017-09-12 09:12:01	2018-04-17 03:	22:11	/8
Engineering Tools + x6 × Superier Reservoir Management +	• • A	1	2017-06-24	A	Lctive 2 7/8	8102	297		Mikhail Tuzov	skiy 2017-09-12 09:12:01	2018-04-17 03:	22:11	10

Figure 36. Well "8" downhole equipment in the E&P Portal

Click "Add Well Downhole Equipment Element:



E&P Portal. Case Study Oil Flowing Material Balance

			ep.p	engtools.com		🕄 About -	🚔 pengtoo
O Dashboard							
Well Production	+	Downhole Equipment	Upload	Downhole Equipment Type	s Pipe Catalog		
Field Production	+						
Surface Facilities	•	Home / Well Downhole	Equipment / \	Well Downhole Equipment S	tructure		
Sales Reports	+						
Subsurface	+	Back to Downhole Equipr	nent List				
Dispatcher Office							
Downhole Equipment and Artificial Lift	: •	Showing 1-1 of 1 item.					
Drilling	+	Well 1	Field	Pad	Completion F	Run Moun	rt Date ↓ ^z
Well Enhancement Li	st +						
Engineering Tools	•	8	Superi	or A	1	201	7-06-24
Reservoir Manageme	int +						
Mature Water Flood Analysis	•	Downhole Ed	auipme	ent Structure			
Production Forecast			1				
Calculator	-	Add Well Downhole Equip	ment Element	Upload Well Downhole	Equipment Elements		
4 Admin	+						

Figure 37. Adding well "8" Completion string elements in the E&P Portal

Add the first part of the completion string: Fill the from as follows and click "Create":

		ep.pengtool	s.com	O About -	pengtools.com -	O Settings 1 A	AlshaT -	ଦ Support -	- P L	anguage -		
ĺ	Downhole Equipment	Upload Downhole Equi	pment Types Pipe Catak	20								
ł	iome / Well Downhole E	quipment / Well Downhole E	iquipment Structure / Add I	Vell Downhole Equipme	nt Element							
A	dd Well D	ownhole E	quipment E	lement								
8	rowing 1-1 of 1 item.										Export tab	ie data: 🔳 - 🗦
	Well 1	Field	Pad	Completion Run	Mount Date 1	Unmount Date	Htub	Days in Service	Notes	Username	Created At	Updated At
	8	Superior	A	1	2017-08-24	2017-07-16	8108	22		Michail Tuzovskiy	2017-09-12 09:12:01	2017-09-12 09:
	Downhole Equipmen	t Element										
	DE Type					Steel Type						
	Tubing				× *							
	Depth MD, ft					Description						
	0											
	7905											
	ID, in											
	2.44											
	00, in											

Figure 38. Adding well "8" tubing top in the E&P Portal

Add the ESP: Fill the from as follows and click "Create":

		ep.pengtools.	com	Ø About -	pengtools.com -	O Settings	1 MishaT -	ର Support -	🏴 Language -			
O Dushboard Well Production +	Downhole Equipment	Upload Downhole Equipm	ert Types Pipe Cata	iog								
Field Production + Surface Facilities + Sales Reports +	Home / Well Downhole Equi	ipment / Well Downhole Equ	ipment Structure / Add	Well Downhole Equipme	nt Bement							
Bubsurface + Dispatcher Office	Add Well Do	wnhole Eq	uipment E	Element								
Downhole Equipment + and Antificial Lift	Showing 1-1 of 1 item.									Export tab	le dets: 💷 -	2٠
Drilling + Well Enhancement List +	Well 11	Field	Ped	Completion Run	Mount Date II	Unmount D	nte Htub ft	Days in Service	Notes Username	Created At	Updated /	At
Engineering Tools + Reservoir Management + Mature Water Econd +	8	Superior	A	1	2017-08-24	2017-07-1	6 8108	22	Midnail Tuzovskiy	2017-09-12 09:12:01	2017-09-12 09	12:01
Analysis Production Forecast	Downhole Equipment E	Bement										
Calculator + Admin +	DE Type					Steel Type						
	ESP				× *							
	Depth MD, ft					Description						_
	7905					199/280/2450						
	Length, ft											
	104											
	ID, in											_
	2.00											
	00, in											
	3.21											

Figure 39. Adding well "8" ESP in the E&P Portal

Add the last part of the completion string: Fill the from as follows and click "Create":



		ep.pengtools.	com	O About -		O Settings	1 MishaT -	ନ Support -		Language -		
O Deshiboand Well Production +	Downhole Equipment	Upload Downhole Equipm	ent Types Pipe Catal	og								
Skeface Pacilities + Seles Reports +	Home / Well Downhole E	quipment / Well Downhole Equi	pment Structure / Add1	Well Downhole Equipme	nt Element							
Butisurlace a Dispatcher Office	Add Well D	ownhole Eq	uipment E	lement								
Downhole Equiproent + and Artificial Lift	Showing 1-1 of 1 item.										Export tabl	e data: ≣ - Z -
Dritting + Well Enhancement List +	Well 1	Field	Pad	Completion Run	Mount Date 12	Unmount D	ute Htub π	Days in Service	Notes	Username	Created At	Updated At
Engineering Tools + Reservoir Management +	8	Superior	A	1	2017-06-24	Active	8102	297		Mikhail Tuzovskiy	2017-09-12 09:12:01	2018-04-17 03:22:11
Mature Water Flood + Analysis												
Production Forecast	Downhole Equipment	t Element										
Q Admin +	DE Type					Steel Type						
	Tubing				× *							
	Depth MD, ft					Description						
	8089											
	Length, ft											
	32.8											
	ID, in											
	2.44											
	0D, in											
	2.87											

Figure 40. Adding well "8" tubing bottom in the E&P Portal

University of the successfully added well "8" downhole equipment to the E&P Portal:

		ep.pengtoo	ols.com	6 A	bout-	pengto	ols.com +	Settings	💄 MishaT 🗸	Ģ Support →	🏴 Langua	ige -			
O Dashboard Well Production +	Downhole Equipment	t Upload Downhole E	quipment Types Pipe	Catalog											
Field Production + Surface Facilities + Sales Reports +	Home / Well Downhole	e Equipment / Well Downhol	le Equipment Structure												
Subsurface + Dispatcher Office	Back to Downhole Equip	pment List													
Downhole Equipment + and Artificial Lift	Showing 1-1 of 1 item.	Pield	Ped	Overal dias Days					78.0	Made David In	nation Materia		Export table d	ata: 🔳 🕶	<u>A</u> .
Drilling + Well Enhancement List +	Well 12	Field	Pad	Completion Hun	Mount D	ate 1i	Unmour	it Date	TBG	ft	Service Notes	Username	Created At	Opdat	ed At
Engineering Tools + Beservoir Management +	8	Superior	A	1	2017-0	8-24	Act	ve	2 7/8	8102 29	7	Mikhail Tuzovskiy	2017-09-12 09:12:01	2018-04-17	7 03:22:11
Mature Water Flood + Analysis Production Forecast		quipment Str	ructure:	t Flamants											
¢ Admin +	Showing 1-3 of 3 items.												Export table d	ata: 🔳 🗕 🗕	<u>a</u> .
	N DE	E Type De	epth MD 12 Lengt	h Down to MI	D ID in	OD in	Steel Type	Description	on	Username	C	reated At	Updated	At	
	/ 1 Ti	ubing	0 7905	7905	2.44	2.87			MB	chail Tuzovskiy	2017-0	9-12 10:35:15	2018-04-17 0	3:09:17	18

Figure 41. Well "8" downhole equipment elements in the E&P Portal

ep.p	engtools.com	About -	🛱 pengtools.com 🚽	¢ Set	ttings 👤 Misha	α- G	Support - 🕨	Language -			
O Dashboard Downhole Equipment Upload	Downhole Equipment Types Pipe Catalog										
Field Production + Surface Facilities + Home / Well Downhole Equipment Sales Reports +											
Subsurface * Well Downhole	Equipment										
Downhole Equipment - Create Weil Downhole Equipment * Downhole Equipment											
* ESP Showing 1-1 of 1 item.									Export table data:	.	<u>A</u> -
Drilling + Well Field Pad Cor	npletion Run Mount Date	Unmour	nt Date TBG	Htub ft	Days in Service	Notes	Username	Created At	Updated At		
Engineering Tools +			*								
Reservoir Management +	1 2017-06-24	Act	ive 2 7/8	8102	297		Mikhail Tuzovski	y 2017-09-12 09:12:01	2018-04-17 03:2	2:11	10
Mature Water Flood + Analysis											
Production Forecast											

Figure 42. Well "8" downhole equipment in the E&P Portal



Calculating the well "8" flowing bottomhole pressure

In the left menu open the "BHP Calculation" page of the "Calculator" module.

Fill the filter as follows² and click "Search".

ep.pengtools.com	🚯 About 🗸 🚔 pengtools.com 👻 🌣 Settings	💄 MishaT 🔹 🎧 Support 👻 🏴 Language 👻	
O Destaced Well Production Reservoir Calculator BHP Calculator Well Production Reservoir Calculator BHP Calculator	n BHP & Pres - Export to Daily Data WHP & WO Calculation	ion Refresh Materialized Views in DB	
Surface Facilities + Home / BHP Calculation			
Base Reports			
Downhole Equipment + and Artificial Lift Please select well to recalculate BHP Drilling + Compriser to Shop Part 8			
Well Enhancement List + Engineering Tools +			
Reservoir Management + Mature Water Flood +			
Analysis Production Forecast			
October of the second sec			
Total Production Reservoir Calculator			
BHP & Pres - Export to Daiy Data			
* WHP & WO Calculation			
» Refresh Materialized Views in DB			
O Admin +			

Figure 43. BHP Calculator page in the E&P Portal

Inspect the BHP calculation results in the results table:

•																												
1	Home / Bł	P Calculation																										
	BHP	Calcul	atio	n																								
a pana na v	Please select	well to recalcu	late BHP																									
141 (*	Superior $_{\mbox{\tiny H}}$	× St	op		Pad		8 ×	• = Se	ect Date F	tange	iii :	×				i x			Se	urch R	leset							
+ ent + Acatysia + I	Click to look	history data for -300 of 2,211 it	selected ams.	vell																							Export table	e dat
lator servoir	# Field	Well DM Date	Primary Fluid Type	Well Operation Type	Gas Production Vol	Liquid Production Vol	Oil Production Vol	Water Production Vol	Ptub Pa	ann PIP	Ttub	Tann 1	Reservoir lemperature	Fluid Level Ann MD	Fluid Level Ann TVD	Tubing Depth MD	Tubing Depth TVD	Perforation top MD	Perforation top TVD	IDcasing	Tubing	Tubing	E Pipe	E	Pressure Type	Measure Type	Pressure Calculation Method	Cal
					MMscf	bbl	bbl	bbl	psia p	sia psia	F	F	F	ft	R	R	ft	ft	R	in	in	in	in	in				
t to Daily tion / Views in	202 Superior 203 Superior 204 Superior 205 Superior 206 Superior 207 Superior	8 2017-11-1 8 2017-11-1 8 2017-11-2 8 2017-11-2 8 2017-11-2 8 2017-11-2 8 2017-11-2		ESP ESP ESP ESP ESP ESP		215.1 215.1 218.9 218.9 177.4	186.7 186.7 190.0 190.0 154.0		426.2 38 455.6 39 440.9 35 440.9 35 440.9 41 485.0 41	83.6 823.0 83.8 837.7 86.8 837.7 86.8 837.7 10.0 881.8			212 212 212 212 212 212 212 212	5545 4826 5292 5912 4400 5774	4940 4351 4716 5253 3978 5109	8102 8102 8102 8102 8102 8102 8102	7205 7205 7205 7205 7205 7205	8850 8850 8850 8850 8850 8850 8850	7949 7949 7949 7949 7949 7949 7949	6.18 6.18 6.18 6.18 6.18 6.18	2.44 2.44 2.44 2.44 2.44	2.87 2.87 2.87 2.87 2.87 2.87 2.87	not used not used not used not used not used	i not used i not used i not used i not used i not used i not used	Flowing Flowing Flowing Flowing Flowing	Calculated Calculated Calculated Calculated Calculated Calculated	PIP + rhog r PIP + rhog r	
	208 Superior 209 Superior 210 Superior 211 Superior 212 Superior	8 2017-11-2 8 2017-11-2 8 2017-11-2 8 2017-11-2 8 2017-11-2 8 2017-11-2	4 (*oi*) 5 (*oi*) 5 (*oi*) 7 (*oi*) 8 (*oi*)	ESP ESP ESP ESP ESP		177.4 177.4 177.4 177.4 177.4	161.0 161.0 161.0 161.0 161.0		470.3 40 455.6 40 455.6 40 440.9 35 440.9 35	08.5 881.8 05.6 837.7 01.2 852.4 15.3 852.4 10.9 837.7			212 212 212 212 212 212 212	5709 5787 4767 5292 5666	5081 5138 4294 4716 5024	8102 8102 8102 8102 8102 8102	7205 7205 7205 7205 7205 7205	8850 8850 8850 8850 8850 8850	7949 7949 7949 7949 7949 7949	6.18 6.18 6.18 6.18 6.18 6.18	2.44 2.44 2.44 2.44 2.44	2.87 2.87 2.87 2.87 2.87 2.87	not used not used not used not used not used	not used not used not used not used not used not used	Flowing Flowing Flowing Flowing Flowing	Calculated Calculated Calculated Calculated Calculated	PIP + tho g t PIP + tho g t PIP + tho g t PIP + tho g t PIP + tho g t	
-	213 Superior 214 Superior 215 Superior 216 Superior 217 Superior 218 Superior	8 2017-11-2 8 2017-11-3 8 2017-12-0 8 2017-12-0 8 2017-12-0 8 2017-12-0		ESP ESP ESP ESP ESP		181.1 179.9 184.9 184.9 184.9 184.9	164.5 163.3 167.9 167.9 167.9 167.9		440.9 38 440.9 38 426.2 35 426.2 35 426.2 35 411.5 37	88.0 852.4 88.0 852.4 85.3 852.4 85.3 852.4 80.9 852.4 19.1 837.7		_	212 212 212 212 212 212 212	5715 5715 5495 6109 5728	5081 5081 5081 4885 5401 5081	8102 8102 8102 8102 8102 8102	7205 7205 7205 7205 7205 7205	8850 8850 8850 8850 8850 8850	7949 7949 7949 7949 7949 7949 7949	6.18 6.18 6.18 6.18 6.18 6.18	2.44 2.44 2.44 2.44 2.44	2.87 2.87 2.87 2.87 2.87 2.87	not used not used not used not used not used	not used not used not used not used not used not used	Flowing Flowing Flowing Flowing Flowing Flowing	Calculated Calculated Calculated Calculated Calculated Calculated	PIP + mog t PIP + mog t	
	219 Superior 220 Superior 221 Superior 222 Superior 223 Superior 224 Superior	8 2017-12-0 8 2017-12-0 8 2017-12-0 8 2017-12-0 8 2017-12-0 8 2017-12-0 8 2017-12-1	5 "ol" 5 "ol" 7 "ol" 8 "ol" 9 "ol"	ESP ESP ESP ESP ESP		181.1 206.3 201.3 206.3 200.0 191.2	164.5 187.3 182.8 187.3 181.6 173.6		455.6 37 411.5 37 440.9 30 411.5 36 411.5 36 411.5 36	73.3 823.0 77.7 837.7 01.3 837.7 04.5 837.7 04.5 837.7 04.5 837.7 04.5 823.0			212 212 212 212 212 212 212 212	5594 5331 4583 4577 4954 4452	4967 4744 4121 4121 4437 4035	8102 8102 8102 8102 8102 8102 8102	7205 7205 7205 7205 7205 7205	8850 8850 8850 8850 8850 8850 8850	7949 7949 7949 7949 7949 7949 7949	6.18 6.18 6.18 6.18 6.18 6.18 6.18	2.44 2.44 2.44 2.44 2.44 2.44	2.87 2.87 2.87 2.87 2.87 2.87 2.87	not used not used not used not used not used	i not used i not used i not used i not used i not used i not used i not used	Flowing Flowing Flowing Flowing Flowing	Calculated Calculated Calculated Calculated Calculated Calculated	PIP + rho g r PIP + rho g r	
	225 Superior 226 Superior 227 Superior 228 Superior 229 Superior 230 Superior	8 2017-12-1 8 2017-12-1 8 2017-12-1 8 2017-12-1 8 2017-12-1 8 2017-12-1 8 2017-12-1	1 "ol" 2 'ol" 3 'ol" 4 'ol" 5 'ol"	ESP ESP ESP ESP ESP ESP		217.6 217.6 215.1 215.1 186.2 186.2	197.6 197.6 195.3 195.3 169.1		382.1 34 396.8 35 573.1 37 396.8 34 396.8 36 426.2 37	46.8 823.0 58.6 808.3 71.8 837.7 46.8 793.6 57.4 837.7 73.3 823.0			212 212 212 212 212 212 212 212	4350 5387 4957 5341 4505 4557	3949 4801 4437 4772 4064 4121	8102 8102 8102 8102 8102 8102 8102	7205 7205 7205 7205 7205 7205 7205	8850 8850 8850 8850 8850 8850	7949 7949 7949 7949 7949 7949 7949	6.18 6.18 6.18 6.18 6.18 6.18 6.18	2.44 2.44 2.44 2.44 2.44 2.44	2.87 2.87 2.87 2.87 2.87 2.87 2.87	not used not used not used not used not used	not used not used not used not used not used not used not used	Flowing Flowing Flowing Flowing Flowing	Calculated Calculated Calculated Calculated Calculated Calculated	PIP + rho g r PIP + rho g r	
	231 Superior 232 Superior 233 Superior 234 Superior	8 2017-12-1 8 2017-12-1 8 2017-12-1 8 2017-12-2 8 2017-12-2 8 2017-12-2	7 'ol' 8 'ol' 9 'ol' 0 'ol'	ESP ESP ESP ESP		186.2 187.4 127.7 127.7 127.7	169.1 170.2 115.9 115.9 159.9		382.1 35 404.1 36 514.4 35 440.9 36 440.9 36	57.1 823.0 55.9 823.0 55.6 911.2 57.4 837.7 57.4 852.4			212 212 212 212 212 212	4495 4600 4268 4350 4170	4064 4150 3863 3949 3776	8102 8102 8102 8102 8102	7205 7205 7205 7205 7205 7205	8850 8850 8850 8850 8850	7949 7949 7949 7949 7949 7949	6.18 6.18 6.18 6.18 6.18	2.44 2.44 2.44 2.44 2.44	2.87 2.87 2.87 2.87 2.87	not used not used not used not used not used	i not used i not used i not used i not used i not used i not used	Flowing Flowing Flowing Flowing Flowing	Calculated Calculated Calculated Calculated Calculated	PIP + rho g r PIP + rho g r PIP + rho g r PIP + rho g r PIP + rho g r	

Export the calculated BHP to the daily measures.

In the left menu open the "BHP & Pres - Export to Daily Data" page of the "Calculator" module. Fill the filter as follows and click "Calculate".

² Then dates filters left empty the calculator processes all the well history





Figure 45. Export Calculated BHP to Daily Measures in the E&P Portal

Inspect the export results:



Figure 46. Calculated BHP export to Daily Measures results in the E&P Portal



In the left menu open the Daily Data Plot to visualize the calculated BHP values:

Figure 47. Well "8" Daily Data Plot with the Calculated BHP

Now you have successfully calculated the well "8" flowing bottomhole pressure in the E&P Portal





Applying the **Oil FMB**

Opening the Oil FMB tool

In the left menu open the "Oil FMB" page of the "Engineering Tools" module.

Fill the filter as follows and click "Submit".

		ep.pengto	ols.con	n	3 About -	🚔 pengtools.com 👻	🌣 Settings	👤 MishaT 🗸	ନ Support 🗸
Dashboard Well Production + Field Production +	Gas Oil								
Surface Facilities + Sales Reports +	Home / Flowing M	aterial Balance - Oil							
Subsurface + Dispatcher Office	Flowing	Material Bala	ance	- Oil				\frown	
Downhole Equipment + and Artificial Lift	Country	Superior x x	Object		B2(Superior) 8 ×	× 🖩 ×		Subm	it Reset
Drilling +		Woll oursulative							
Well Enhancement List +	x Axis	vveii cumulative		🕄 Wiki it					
» Bubble Map	Show Table								
» Type Curves. DCA	Pi 😯		psia						
Flowing Material -	Т, 😯		F						
Balance	STOIIP ()		ы						
» Oil FMB	JD 😯								
Reservoir Management +	Data Usage 😧 🛛	•	%						

Figure 48. Oil Flowing Material Balance in the E&P Portal

Inspect the **Oil FMB** Results. Note that STOIIP and JD correspond to the input data.

Also note that oil FMB model (red and gray curves) doesn't match the well's data points.

This means that well "8" is draining only a part of the reservoir "B2" reserves and the post frac report **JD** of **0.6** is over estimated.



• Now well "8" oil FMB model is ready to be matched with the well data to find the actual well's STOIIP and JD.



Matching the well "8" Oil FMB model





Figure 50. Well "8" Oil FMB changing the STOIIP to 10M

Inspect the Oil FMB plot with STOIIP = 10M bbl: Flowing Material Balance



Figure 51. Well "8" Oil FMB STOIIP = 10M

At this step change the "Data Usage" to 100% in the model inputs to increase the details of the plot:

		ep. <mark>peng</mark>	tools.com	L
O Dashboard Well Production	Gas Oil			
Field Production Surface Facilities Sales Reports	+ + Home / Flowin	ng Material Balance - Oil		
Subsurface Dispatcher Office	Flowing	g Material E	Balance	- Oil
Downhole Equipment and Artificial Lift	* Country	Superior x	× Object	
Drilling	•	(
Well Enhancement List	+ x Axis	Well cumulative	¢)	Wiki it
» Bubble Map	Pi 🕄	2689	psia	
Flowing Material Balance	т, О	212	F	
» Gas FMB » Oll FMB	JD 😧	0.6	DDI	
Reservoir Managemen	t + Data Usage	•••	> %	
Mature Water Flood Analysis	́ Св	eset Changes R Save Mo	del	
Production Forecast				
☆ Calculator ☆ Admin	 Flowing Mate + 	rial Balance		



Figure 52. Changing the Data Usage of the Oil FMB plot in the E&P Portal

Inspect the Oil FMB plot with STOIIP = 10M bbl and increased data usage: Flowing Material Balance



Figure 53. Well "8" Oil FMB STOIIP = 10M and data usage = 100%

STOIIP should be reduced further. Drag and drop the red line end point to the 3M. Flowing Material Balance



Figure 54. Well "8" Oil FMB STOIIP = 3M



STOIIP should be reduced further. Drag and drop the red line end point to the 2M. Flowing Material Balance

Figure 55. Well "8" Oil FMB STOIIP = 2M

Next JD should be reduced. Drag and drop the gray line end point to match the gray points:



ep.pengtools.com

Flowing Material Balance



Figure 56. Well "8" Oil FMB changing the JD to 0.5





Figure 57. Well "8" Oil FMB matched model

Now well "8" oil FMB model is matched and the results are:
 STOIIP = 2 min bbl
 JD = 0.5



Saving and exporting the analysis results Saving the well "8" Oil FMB model

Click "Save Model:



Figure 58. Saving the well "8" Oil FMB matched model

The dialog confirms that the model was saved:

Flowing M	aterial Balan	ce - Oil								
Country	Superior x Obje		B2(Superigr) +	8× ×	×	Submit Reset				
x Axis										
B D										
1.0		F								
STOIP										
JD 😡										
Data Usage 😡		• %								
S Reset	Changes R Save Model									
Flowing Material Bala	nce			Model succesful	y saved.					
						Close				
										 → P (82/8) ▲ JDnorm (82/8) ▲ JD (82/8) → F8PH (82/8)
1.73	*									
1.5 24 1.5		the set of								
10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1									el & Water	
		A A A A A A A A A A A A A A A A A A A	* _x					ection, MMscf		
0.73 74	THE AVERAGE AND AVERAGE AVE									

Figure 59. Saving Oil FMB model dialog

Wow well "8" oil FMB model is saved to the E&P Portal database.



E&P Portal. Case Study Oil Flowing Material Balance



Figure 60. Saved well "8" Oil FMB model in the table



Exporting the well "8" Oil FMB model

Check the "Show Table" select box in the model inputs and click "Submit".

		ep. <mark>pen</mark>	gtools.cor	n	6 About-	🚔 pengtools.com 👻	Settings	💄 MishaT ᠇	କ Support 🗸	🏴 Language 🛨		
Dashboard Well Production -	Gas Oil											
Monthly Data Field Production +	Home / Flowing M	faterial Balance - Oil										
Surface Facilities + Sales Reports +	Flowing	Material	Balance	- Oil								
Subsurface + Dispatcher Office Downhole Equipment +	Country	Superior _X	× Object		B2(Superigr) * 8	× × × 🖬 ×		✓ Subr	mit Reset			
and Artificial Lift Drilling +	x Axis Show Table	Well cumulative	0)	0 Wiki it								
Well Enhancement List + Engineering Tools - = Bubble Map	Pi 😡	2689 212	psia F									
Type Curves. DCA Flowing Material		2000000.0	bbl									
Balance = Gas FMB = Oll FMB	Data Usage 📀		• %									
Reservoir Management + Mature Water Flood + Analysis Production Forecast	C Rese	t Changes K Save M	Aodel									
	2									8	800 — P (82/8)	≡
	1.72										A JD (82/8) — FBPH (82/8)	

Figure 61. Selecting the Oil FMB table for output

Scroll below the main Plot to see the calculation results table:



Figure 62. Oil FMB results table in the E&P Portal

Click to the export button on the top right corner of the table and select the output format you want the data in:



					Export	table da	ita:	• 2•
Ppo(Pi) psia	Ppo(P) psia	Ppo(BHP) psia	∆Ppo psia	J bpd/psia	N _{p, norm} bbl	JD _{norm}	JD	
2528 2528	2226 2225	909.8 895.9	1618 1632	0.10 0.11	373189 370977	0.46 0.52	0.57 0.64	Text
2528 2528	2224 2223	909.8 909.8	1618 1618	0.12	375136 376124	0.53	0.65	Excel 95 +
2528 2528	2222 2222	951.6 951.6	1576 1576	0.098	387939 388796	0.44 0.47	0.55	Excel 2007+
2528 2528	2221 2220	951.6 909.8	1576 1618	0.10	389652 380413	0.47	0.58	

Figure 63. Exporting the Oil FMB results table from the E&P Portal

Open the downloaded file "epDataExport.xlsx":

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1 Country T Field Wel T Reservoir T Date T go, bbl T No, bbl T Qr, MMscl T Go, MMscl T	Gi, MMsef v Gp-Gi, MMsef v Wp, bbi v Wi, bbi v STOIIP, 10%	16 bbl v Boi, bbl/bbl v Bocak, bbl/bbl v µol, cP v µolkak, cP	v kh, md*h v JOd v JOshial v P. psia v v FBHP, psia v PaolPi, psia	v Ppoi v Ppo(BHP), psia v APpo, psia v J, bod/psia
2 US Superior 8 82 2022-10-22 61.2 221376 0.15 395	0 395 18937 0	2 1.66 1.43 0.35	0.44 17.8 0.6 0.5 2689 1351 603.2	2528 1143 451.9 2076
3 US Superior 8 82 2022-10-23 61.2 221438 0.15 395.1	0; 395.1; 18941; 0;	2: 1.66 1.43 0.35	0.44 17.8 0.6 0.5 2689 1351 603.2	2528 1143 451.9 2076
4 US Superior 8 82 2022-10-24 57.6 221495 0.14 395.3	0 395.3 18943 0	2 1.66 1.43 0.35	0.44 17.8 0.6 0.5 2689 1351 603.7	2528 1143 452.4 2075
5 U5 Superior 8 82 2022-10-25 57.4 221553 0.14 995.4	0 995.4 18945 0	2 1.66 1.43 0.35	0.44 17.8 0.6 0.5 2689 1351 600.7	2528 1142 449.8 2078
6 US Superior 8 82 2022-10-26 57.4: 221610 0.14 395.5	0: 395.5: 18947: 0:	2 1.66; 1.43; 0.35	0.44: 17.8: 0.6: 0.5: 2689: 1351: 599.3:	2528: 1142: 448.6: 2079
7 US Superior 8 82 2022-10-27 57.6 221668 0.14 395.7	0 395.7 38950 0	2 1.66 1.43 0.35	0.46 17.8 0.6 0.5 2689 1350 597.8	2528 1142 447.3 2380
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10 15 Superior 8 92 2023-10-30 61.7 221853 0.13 296.7	0 296.1 18968 0	2 144 143 035	0.44 17.8 0.6 0.5 2689 1350 600.6	2528 1142 445.8 2578
11 US Superior 8.02 2022-05.33 61.7 223935 0.13 296.7	0: 336.2 18974 0	2 1.66 1.43 0.35	0.44 17.8 0.6 0.5 2689 1350 600.6	2528 1141 448.8 2078
12 US Superior 8 82 2022-15-01 60.5 222976 0.13 396.7	0: 396.3. 18977: 0:	2: 1.66: 1.43: 0.35	0.44: 17.8: 0.6: 0.5: 2689: 1349: 602.8	2528: 1141: 451.6: 2076:
13 US Superior 8:82 2022-11-02 60.5 222036 0.13 996.5	0 396.5 18980 0	2: 1.66: 1.43: 0.35:	0.44: 17.8: 0.6: 0.5: 2689: 1349: 596.9	2528 1141 446.5 2081
14 US Superior 8:82 2022-11-03 60.5 222097 0.13 396.5	0 396.6 18983 0	2 1.66 1.43 0.35	0.44 17.8 0.6 0.5 2689 1349 595.4	2528: 1141: 445.3: 2082
15 US Superior 8 82 2022-11-04 60.5 222157 0.13 396.7	0 396.7 18986 0	2 1.66 1.43 0.35	0.44 17.8 0.6 0.5 2689 1349 596.9	2528 1141 446.5 2081
16 US Superior 8 82 2022-11-05 59.5 222217 0.13 396.8	0 396.8 18991 0	2 1.66 1.43 0.35	0.44 17.8 0.6 0.5 2689 1349 603.1	2528: 1141: 451.8: 2076
17 US Superior 8 82 2022-11-06 59.5 222276 0.13 397	0: 397 18997 0	2 1.66 1.43 0.35	0.44: 17.8: 0.6: 0.5: 2689 1349: 601.6:	2528: 1140: 450.6: 2077
18 US Superior 8 82 2022-11-07 59.5 222336 0.13 397.1	0: 397.1: 19002: 0:	2 1.66 1.43 0.35	0.44 17.8 0.6 0.5 2689 1348 600.1	2528: 1140: 449.3: 2078:
19 US Superior 8:02 2022-11-08 59.5 222395 0.13 397.2	0: 397.2 19007 0	2: 1.66: 1.43: 0.35:	0.44: 17.8: 0.6: 0.5: 2689 1348: 600.1:	2528: 1140: 449.3: 2078
20 US Superior 8 82 2022-11-09 59.5; 222455 0.13; 397.4	0; 397.4; 19012; 0;	2: 1.66; 1.43; 0.35;	0.44; 17.8; 0.6; 0.5; 2689; 1348; 603.1;	2528; 1140; 451.8; 2076;
21 US Superior 8 82 2022-11-10 59.5 222514 0.13 397.5	0; 397.5; 19018; 0;	2: 1.66: 1.43: 0.35:	0.44: 17.8: 0.6: 0.5: 2889; 1348: 603.1	2528: 1140; 451.8; 2076;
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Figure 64. Exporting the Oil FMB results in Excel spreadsheet



Conclusions

This Case Study demonstrated application of the Oil Flowing Material Balance to estimate well "8" STOIIP and JD using the **E&P Portal**.

A step by step guide was presented to assist users along the way of using the **E&P Portal** and **Oil FMB** tool.

The following steps were covered:

- Input the data to the **E&P Portal**;
- Apply the **Oil FMB** to estimate the well's STOIIP and JD;
- Save and export the analysis results.

As usual, data preparation and upload step took the most time an effort, while the analysis part once data is processed was relatively easy and quick.

Imagine the power of the **E&P Portal** then data continually flows to the system for the hundreds and thousands of wells and ready for the analysis like the **Oil FMB** and others in the live mode!

With the help of the **E&P Portal** you can quickly analyze the big number of wells saving the engineering time while increasing the well's and field's production and company's revenues.