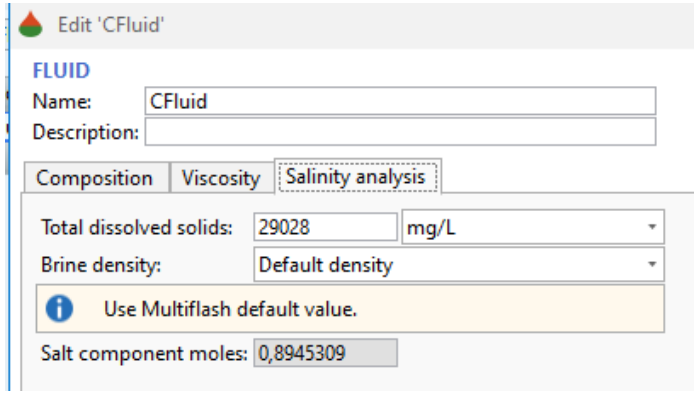
Кейс Вода

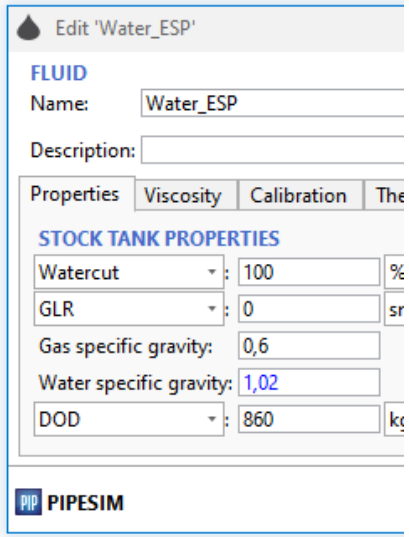
PVT вода

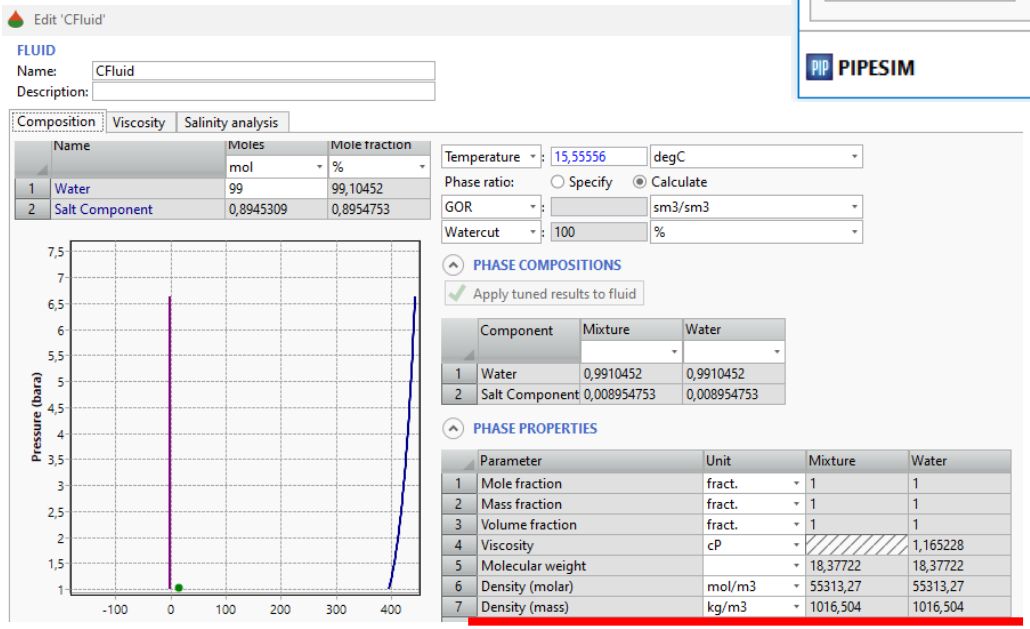
T = 80 C

water sp gr = 1016/998 = 1.018

Stock tank cond ?

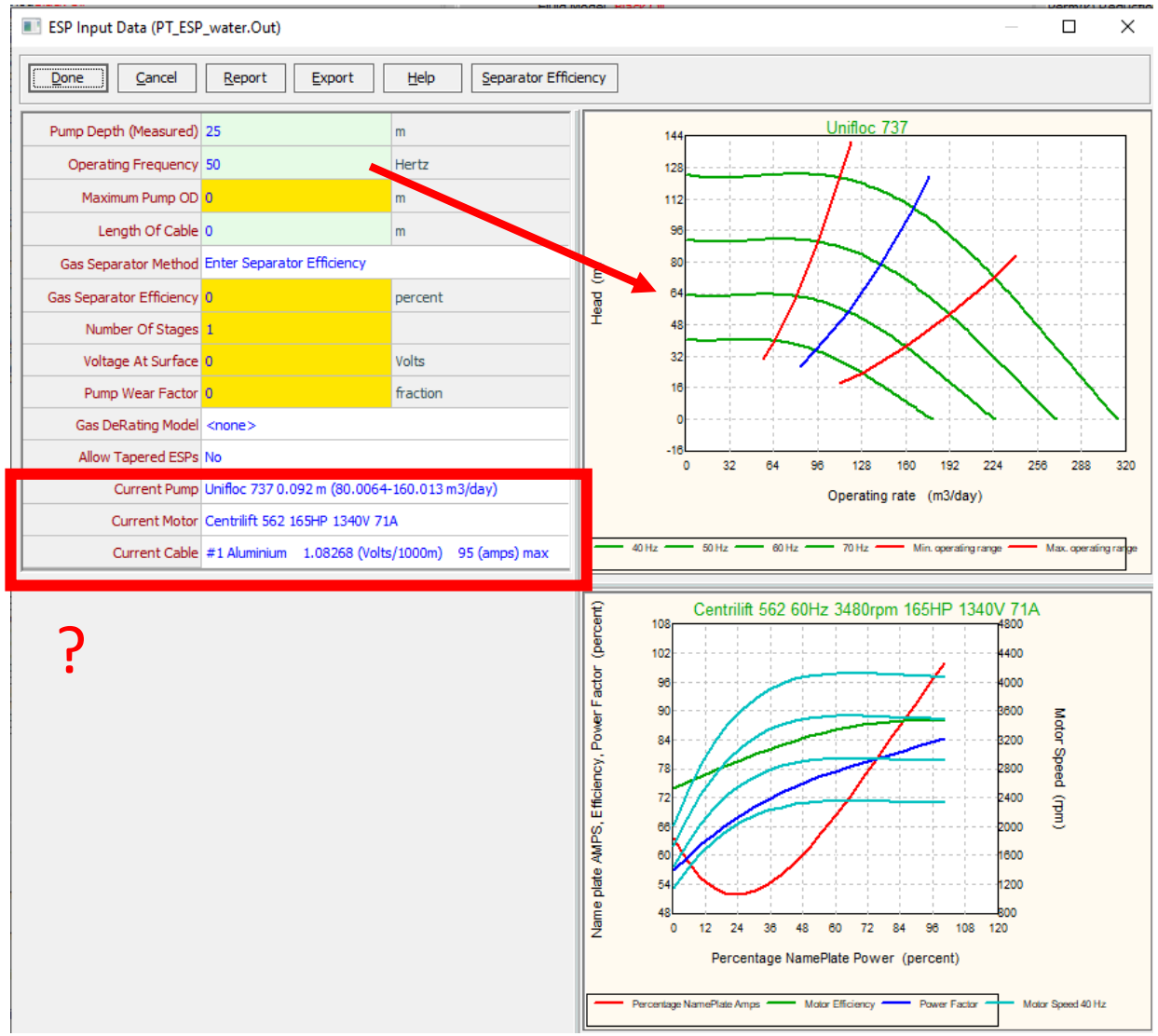




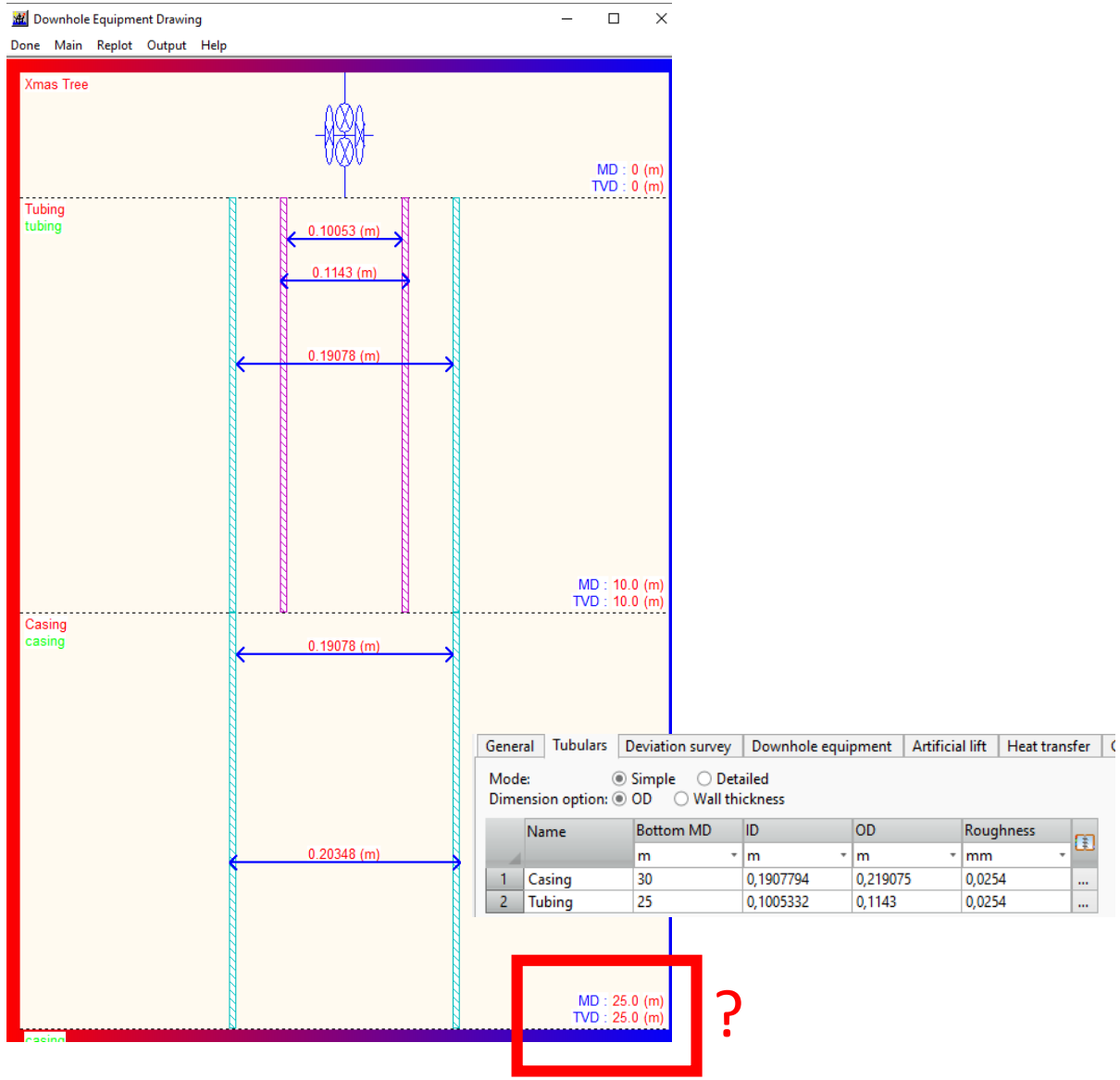


T = 80 C

ESP INPUT 1/3

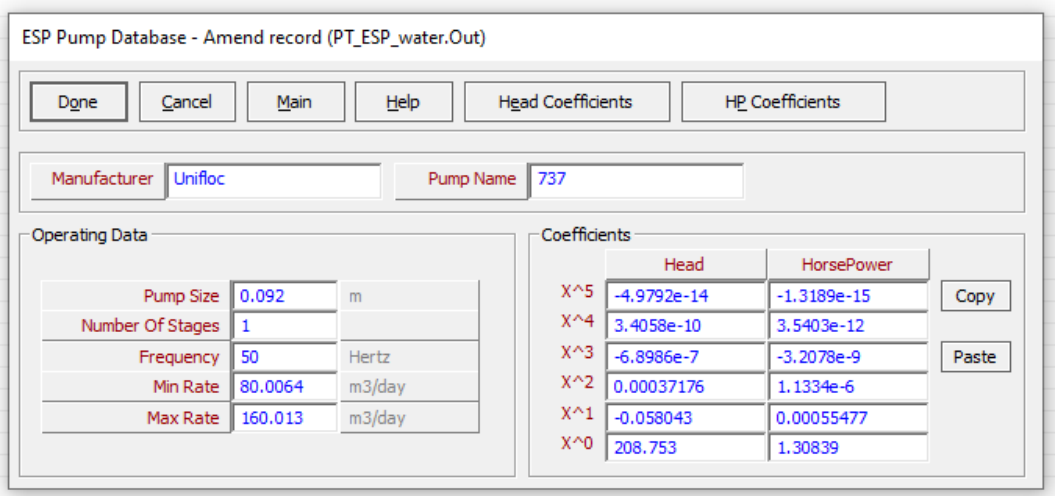


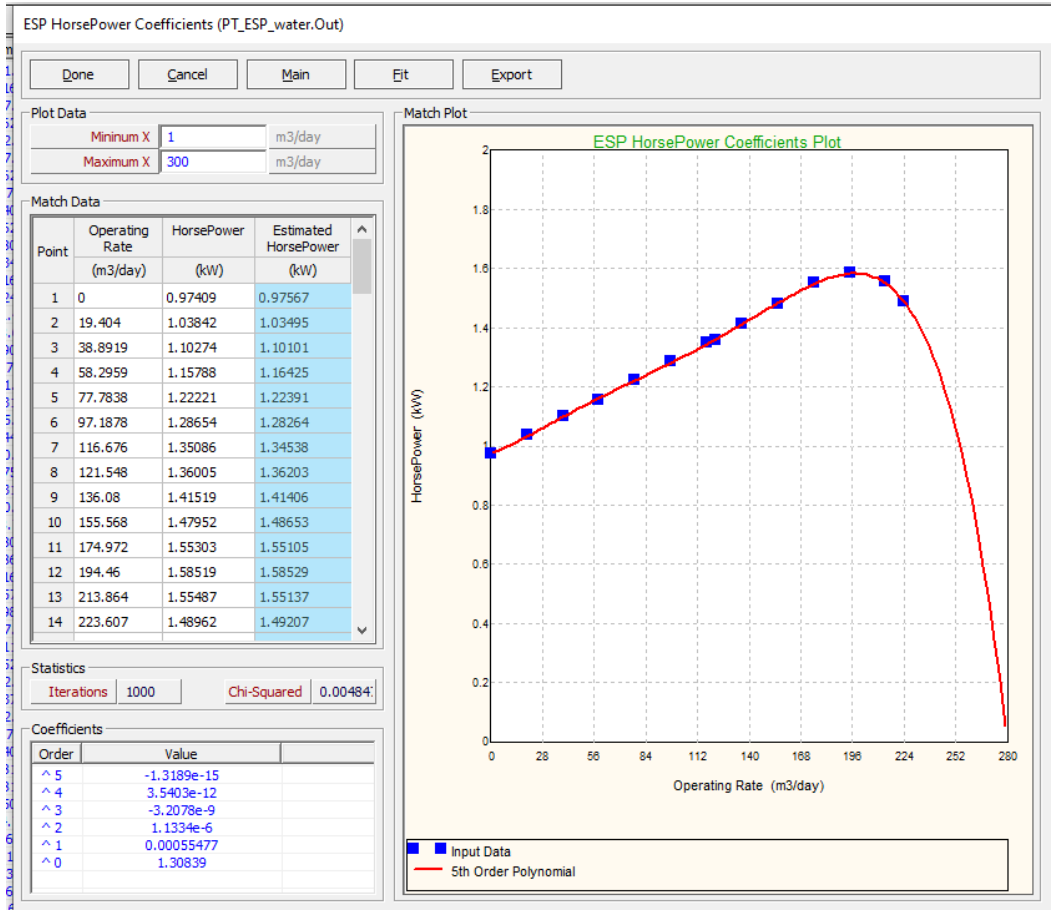
?

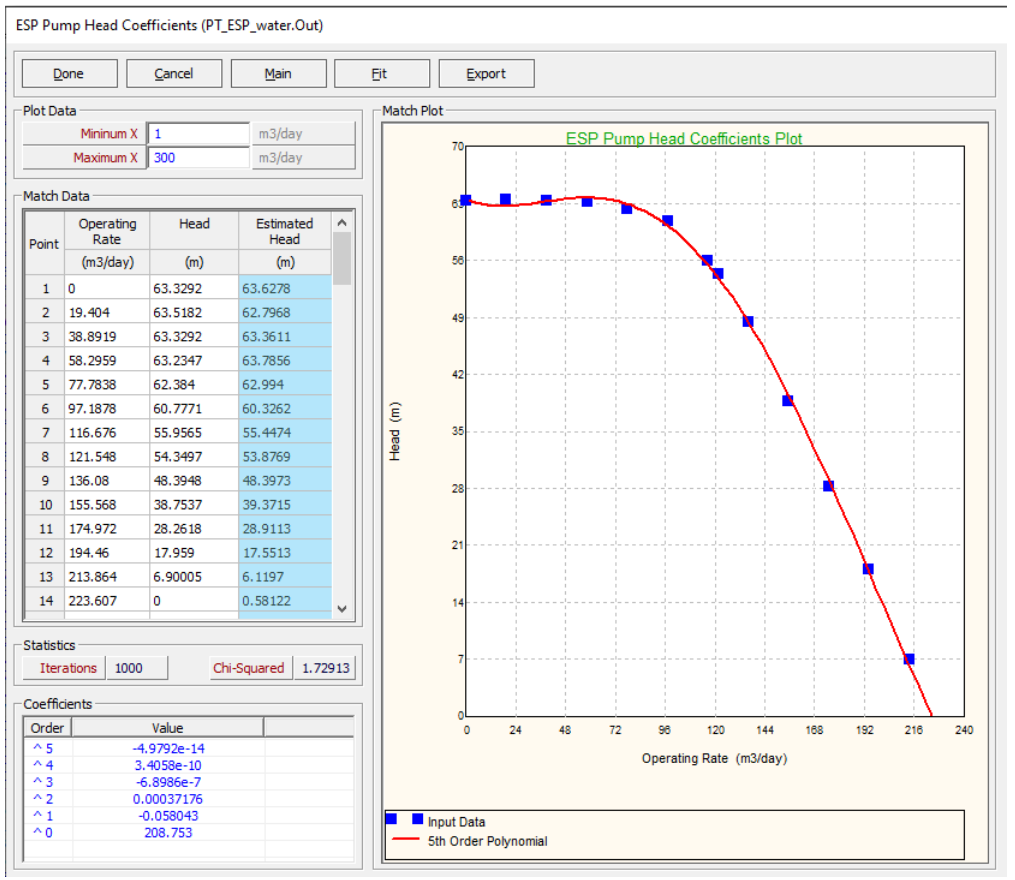


?

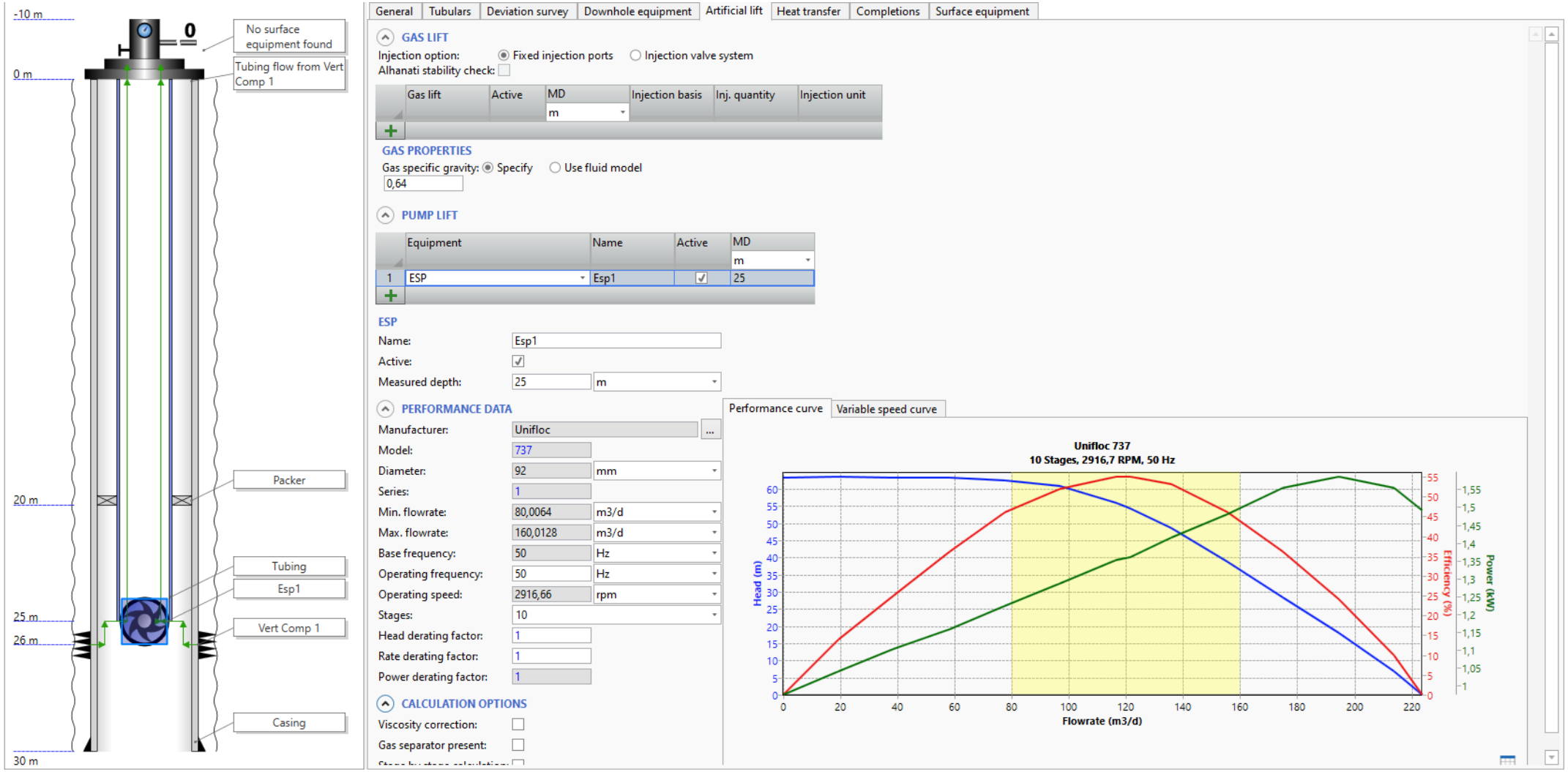
ESP INPUT 2/3


ESP Pump Database - Amend record (PT_ESP_water.Out)
Done
Cancel
Main
Help
Head Coefficients
HP Coefficients
Manufacturer
Unifloc
Pump Name
737
Operating Data
Pump Size
0.092
m
Number Of Stages
1
Frequency
50
Hertz
Min Rate
80.0064
m3/day
Max Rate
160.013
m3/day
Coefficients
Head
HorsePower
X^5
-4.9792e-14
-1.3189e-15
X^4
3.4058e-10
3.5403e-12
X^3
-6.8986e-7
-3.2078e-9
X^2
0.00037176
1.1334e-6
X^1
-0.058043
0.00055477
X^0
208.753
1.30839
Copy
Paste

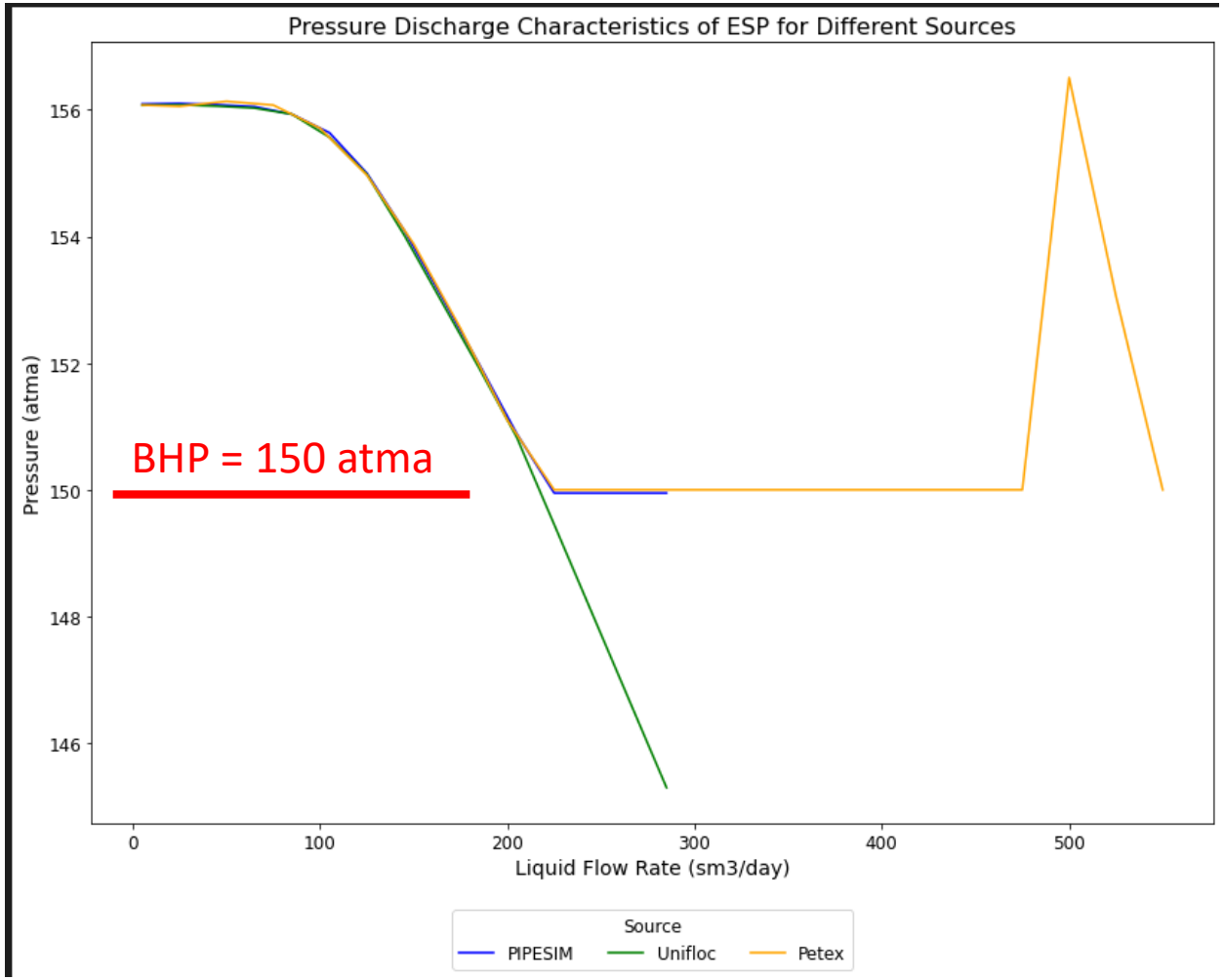

ESP HorsePower Coefficients (PT_ESP_water.Out)
Done
Cancel
Main
Fit
Export
Plot Data
Mininum X
1
m3/day
Maximum X
300
m3/day
Match Data
Point
Operating Rate (m3/day)
HorsePower (kW)
Estimated HorsePower (kW)
1 0 0.97409 0.97567
2 19.404 1.03842 1.03495
3 38.8919 1.10274 1.10101
4 58.2959 1.15788 1.16425
5 77.7838 1.22221 1.22391
6 97.1878 1.28654 1.28264
7 116.676 1.35086 1.34538
8 121.548 1.36005 1.36203
9 136.08 1.41519 1.41406
10 155.568 1.47952 1.48653
11 174.972 1.55303 1.55105
12 194.46 1.58519 1.58529
13 213.864 1.55487 1.55137
14 223.607 1.48962 1.49207
Statistics
Iterations
1000
Chi-Squared
0.00484
Coefficients
Order
Value
^5 -1.3189e-15
^4 3.5403e-12
^3 -3.2078e-9
^2 1.1334e-6
^1 0.00055477
^0 1.30839
Match Plot
ESP HorsePower Coefficients Plot
HorsePower (kW)
Operating Rate (m3/day)
Input Data
5th Order Polynomial

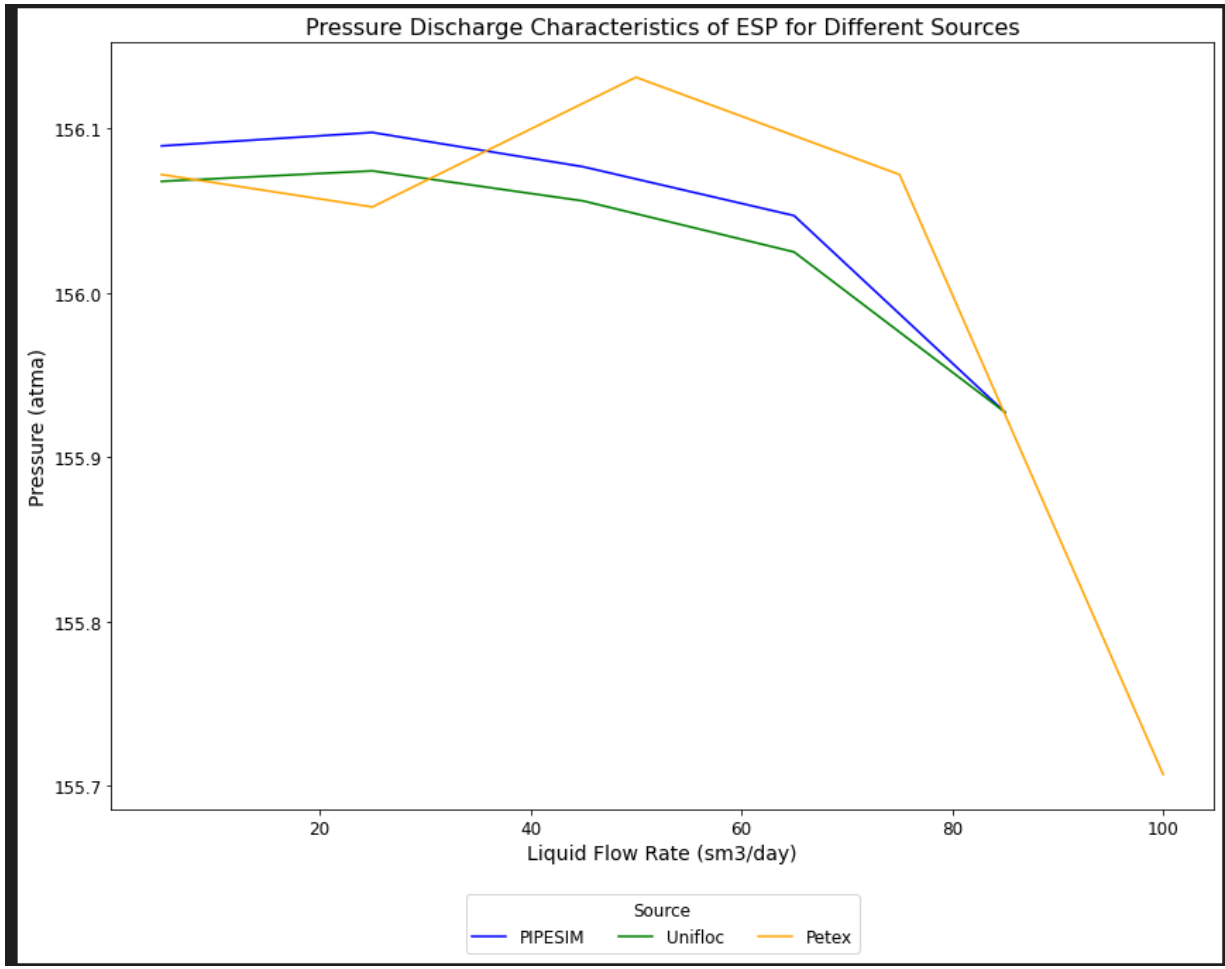

ESP Pump Head Coefficients (PT_ESP_water.Out)
Done
Cancel
Main
Fit
Export
Plot Data
Mininum X
1
m3/day
Maximum X
300
m3/day
Match Data
Point
Operating Rate (m3/day)
Head (m)
Estimated Head (m)
1 0 63.3292 63.6278
2 19.404 63.5182 62.7968
3 38.8919 63.3292 63.3611
4 58.2959 63.2347 63.7856
5 77.7838 62.384 62.994
6 97.1878 60.7771 60.3262
7 116.676 55.9565 55.4474
8 121.548 54.3497 53.8769
9 136.08 48.3948 48.3973
10 155.568 38.7537 39.3715
11 174.972 28.2618 28.9113
12 194.46 17.959 17.5513
13 213.864 6.90005 6.1197
14 223.607 0 0.58122
Statistics
Iterations
1000
Chi-Squared
1.72913
Coefficients
Order
Value
^5 -4.9792e-14
^4 3.4058e-10
^3 -6.8986e-7
^2 0.00037176
^1 -0.058043
^0 208.753
Match Plot
ESP Pump Head Coefficients Plot
Head (m)
Operating Rate (m3/day)
Input Data
5th Order Polynomial

ESP INPUT 3/3


-10 m
0 m
20 m
25 m
26 m
30 m
No surface equipment found
Tubing flow from Vert Comp 1
Packer
Tubing
Esp1
Vert Comp 1
Casing
General
Tubulars
Deviation survey
Downhole equipment
Artificial lift
Heat transfer
Completions
Surface equipment
GAS LIFT
Injection option:
Fixed injection ports
Injection valve system
Alhanati stability check:
Gas lift
Active
MD
Injection basis
Inj. quantity
Injection unit
GAS PROPERTIES
Gas specific gravity:
Specify
Use fluid model
0,64
PUMP LIFT
Equipment
Name
Active
MD
ESP
Esp1
25
ESP
Name:
Esp1
Active:
Measured depth:
25
PERFORMANCE DATA
Manufacturer:
Unifloc
Model:
737
Diameter:
92
mm
Series:
1
Min. flowrate:
80,0064
m3/d
Max. flowrate:
160,0128
m3/d
Base frequency:
50
Hz
Operating frequency:
50
Hz
Operating speed:
2916,66
rpm
Stages:
10
Head derating factor:
1
Rate derating factor:
1
Power derating factor:
1
CALCULATION OPTIONS
Viscosity correction:
Gas separator present:
Performance curve
Variable speed curve
Unifloc 737
10 Stages, 2916,7 RPM, 50 Hz
Head (m)
Efficiency (%)
Power (kW)
Flowrate (m3/d)
PIPESIM
Close

Pdis


Pressure Discharge Characteristics of ESP for Different Sources
Pressure (atma)
156
154
152
150
148
146
BHP = 150 atma
0
100
200
300
400
500
Liquid Flow Rate (sm3/day)
Source
PIPESIM
Unifloc
Petex


Pressure Discharge Characteristics of ESP for Different Sources
Pressure (atma)
156.1
156.0
155.9
155.8
155.7
20
40
60
80
100
Liquid Flow Rate (sm3/day)
Source
PIPESIM
Unifloc
Petex

Liq Density

Point	Label	Bottom Measured Depth	True Vertical Depth	Pressure	Temperature	Gradient	Holdup	Regime	Heat Transfer Coefficient
		(m)	(m)	(BARa)	(deg C)	(bar/m)			(W/m2/K)
1		25.0	25.0	151.99	80.00				
2		25.0	25.0	155.76	80.00	0.056551	0		
3		25.0	25.0	151.99	80.00	0.056551		ESP	
4		17.5	17.5	151.26	80.00	0.097558	1.000		28.3949
5		10.0	10.0	150.52	80.00	0.097556	1.000		28.3949
6		5.0	5.0	150.03	80.00	0.098109	1.000		28.3949
7		0	0	149.54	80.00	0.098108	1.000		28.3949
8		0	0	149.54	80.00	0.098108		WellHead	28.3949

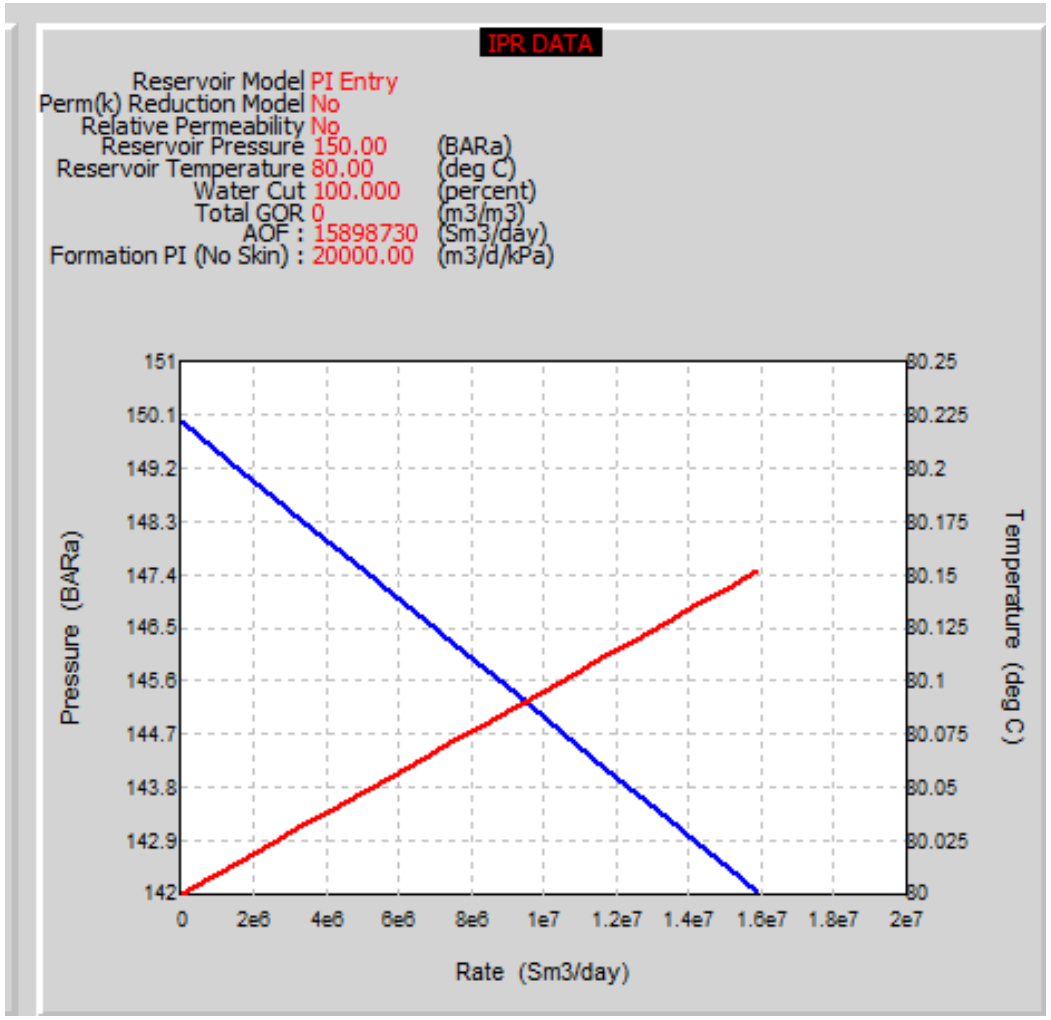
Point	Erosion Type	Corrosion Rate	Maximum Grain Diameter	Oil Density	Gas Density	Water Density	Liquid Density	Mixture Density	Oil Viscosity	Water Viscosity	Gas Viscosity	Liquid Viscosity	Ga Int T
		(mm/year)	(mm)	(Kg/m3)	(Kg/m3)	(Kg/m3)	(Kg/m3)	(Kg/m3)	(centipoise)	(centipoise)	(centipoise)	(centipoise)	(
1				725.980	125.297	995.811	995.811		0.72344	0.40757	0.017574	0.40757	32.9
2				726.553	128.476	995.889	995.888		0.72592	0.40757	0.017767	0.40757	32.2
3				725.980	125.297	995.811	995.811		0.72344	0.40757	0.017574	0.40757	32.9
4			1.5155	725.866	124.678	995.797	995.796	995.796	0.72296	0.40757	0.017537	0.40761	33.1
5			1.5155	725.751	124.059	995.782	995.781	995.781	0.72248	0.40757	0.017499	0.40761	33.2
6			10.6551	725.673	123.643	995.772	995.738	995.738	0.72216	0.40757	0.017475	0.40761	33.2
7			10.6551	725.594	123.226	995.762	995.728	995.728	0.72184	0.40757	0.01745	0.40761	33.3
8			10.6551	725.594	123.226	995.762	995.728	995.728	0.72184	0.40757	0.01745	0.40761	33.3

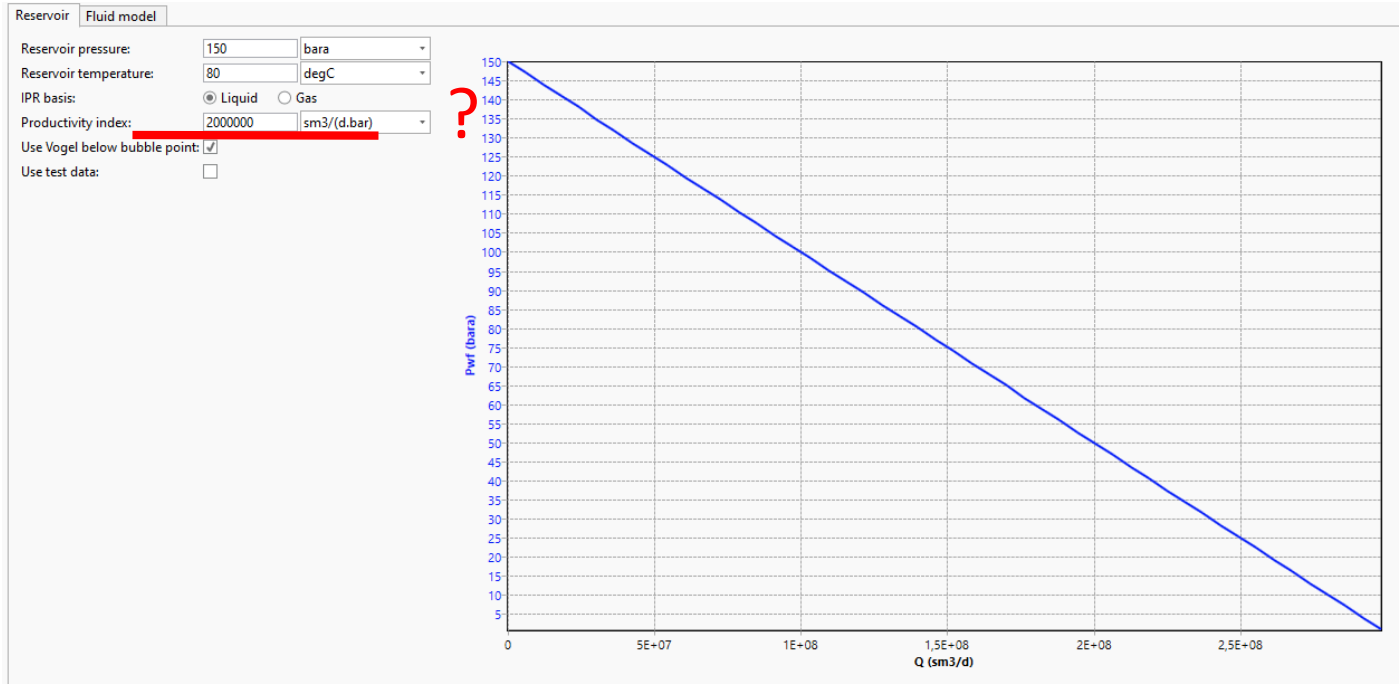
?

Select columns... | Expand all | Type to filter

	Case	Equipment	Type	Total distance	Elevation	Pressure	Temperature	Fluid mean...	Liquid holdup	EVR	G-L Pattern	O-W Pattern	Flowing liqu...	Flowing oil...
				m	m	bara	degC	m/s	%				kg/m3	kg/m3
1	Outlet Pressure=155.7055 Bara			0	-25,49987	151,988	80				Undefined	Undefined	999,9756	822,1653
2	Outlet Pressure=155.7055 Bara	Vert Comp 1	Completion	0	-25,49987	151,988	80				Undefined	Undefined	999,9756	822,1653
3	Outlet Pressure=155.7055 Bara	Casing	Tubing	0	-25,49987	151,988	80	0,00206499	100	0,000535287...	Liquid	Undefined	999,9753	822,1653
4	Outlet Pressure=155.7055 Bara		Tubing	0,499872	-25	151,939	80	0,002064994	100	0,000535288...	Liquid	Undefined	999,9736	822,1652
5	Outlet Pressure=155.7055 Bara	Esp1	ESP	0,499872	-25	158,1577	83,58747				Undefined	Undefined	998,0024	820,2933
6	Outlet Pressure=155.7055 Bara	Tubing	Tubing	0,499872	-25	158,1577	83,58747	0,00744258	100	0,001928466...	Liquid	Undefined	999,1433	821,2312
7	Outlet Pressure=155.7055 Bara		Tubing	15,49999	-9,999878	156,6864	80	0,007434726	100	0,001927448...	Liquid	Undefined	1000,199	822,1674
8	Outlet Pressure=155.7055 Bara		Tubing	25,49987	0	155,7055	80	0,007435071	100	0,001927492...	Liquid	Undefined	1000,152	822,167

IPR Data


IPR DATA
Reservoir Model PI Entry
Perm(k) Reduction Model No
Relative Permeability No
Reservoir Pressure 150.00 (BARa)
Reservoir Temperature 80.00 (deg C)
Water Cut 100.000 (percent)
Total GOR 0 (m3/m3)
AOF : 15898730 (Sm3/day)
Formation PI (No Skin) : 20000.00 (m3/d/kPa)
Pressure (BARa)
Temperature (deg C)
Rate (Sm3/day)
151
150.1
149.2
148.3
147.4
146.5
145.6
144.7
143.8
142.9
142
80.25
80.225
80.2
80.175
80.15
80.125
80.1
80.075
80.05
80.025
80
0
2e6
4e6
6e6
8e6
1e7
1.2e7
1.4e7
1.6e7
1.8e7
2e7

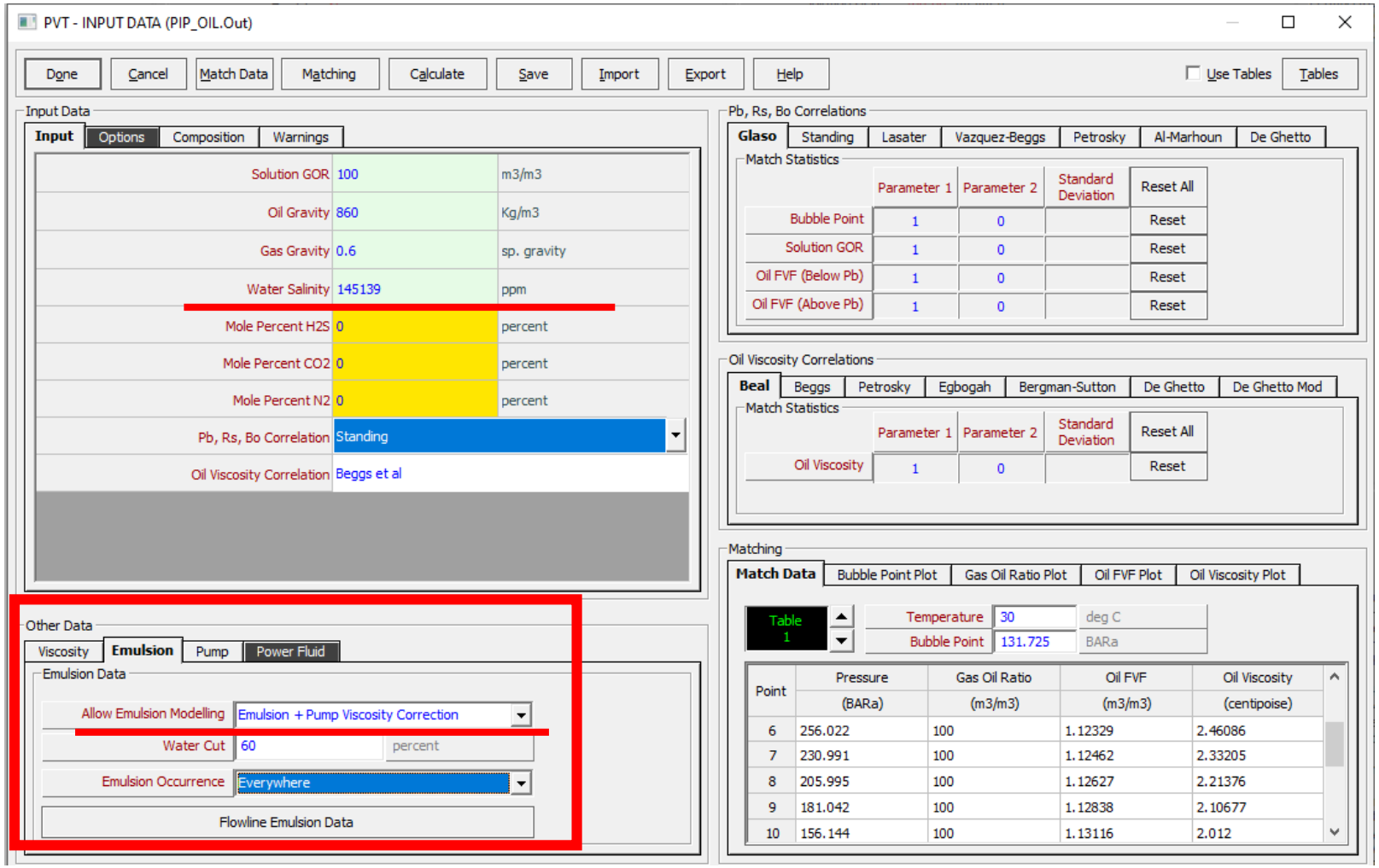

Reservoir
Fluid model
Reservoir pressure: 150 bara
Reservoir temperature: 80 degC
IPR basis: Liquid Gas
Productivity index: 2000000 sm3/(d.bar)
Use Vogel below bubble point:
Use test data:
?
Pwf (bara)
Q (sm3/d)
0
5E+07
1E+08
1,5E+08
2E+08
2,5E+08

Кейс Нефть

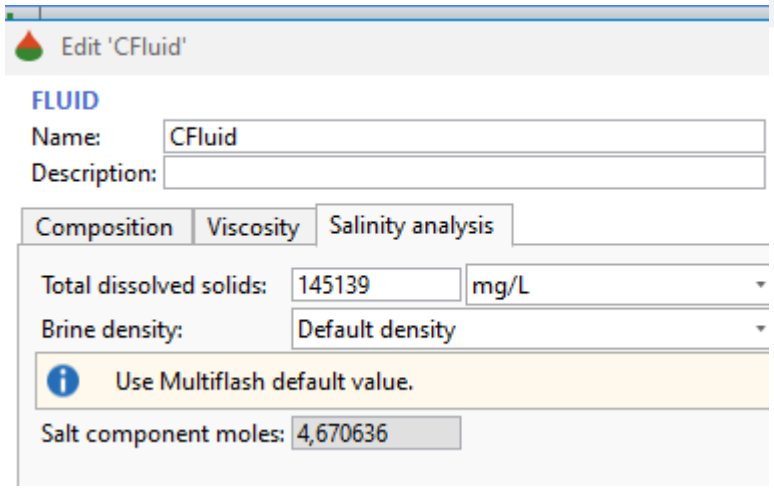
PVT Input 1/3

- в PIP вязкость эмульсия учитывается в HACOCE?

- If a pump is enabled in the main Options screen, a viscosity correction for emulsions can be enabled. The user has the option to select where the emulsion viscosity corrections will be considered (e.g. everywhere or just in the pump etc.).



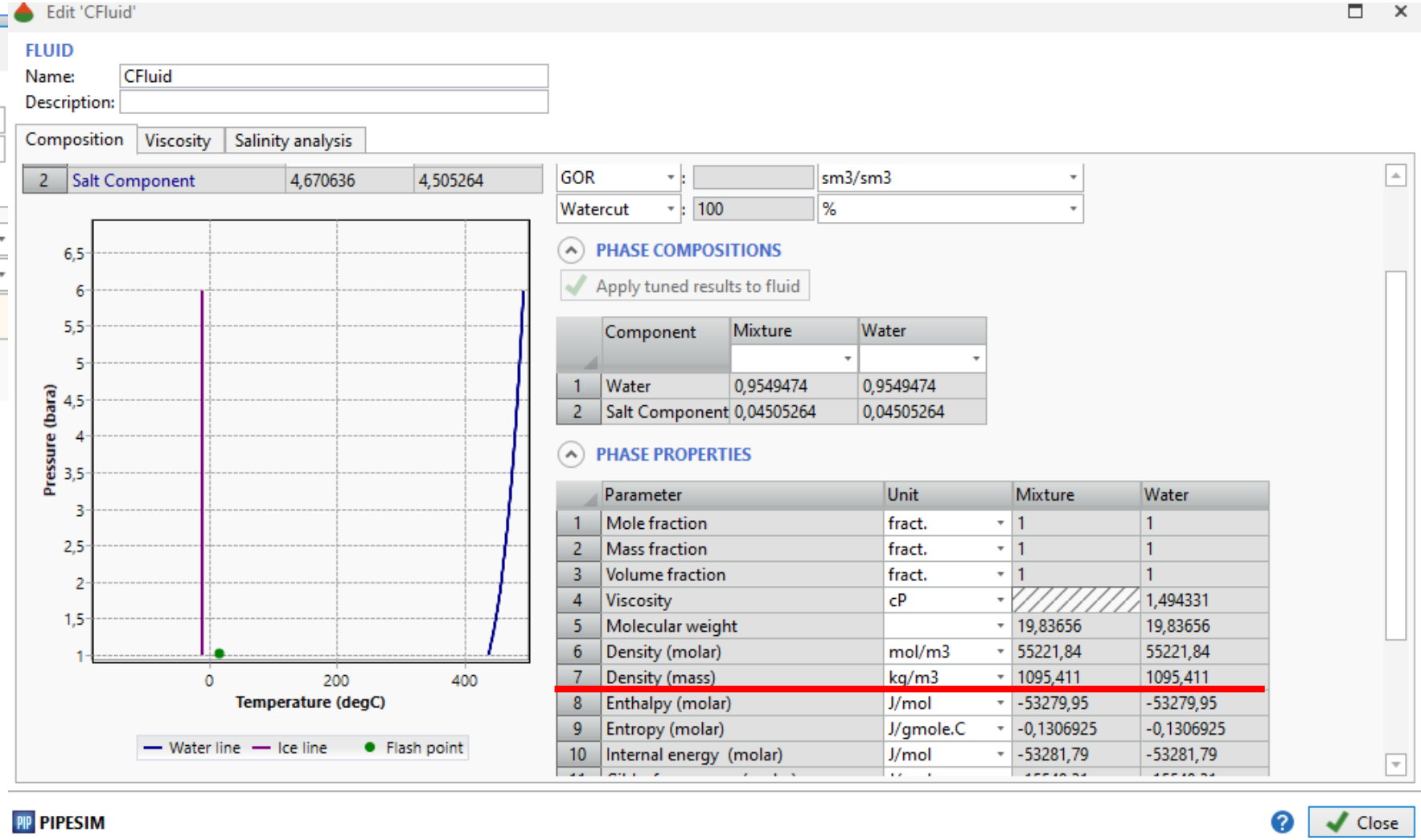
PVT Input 2/3



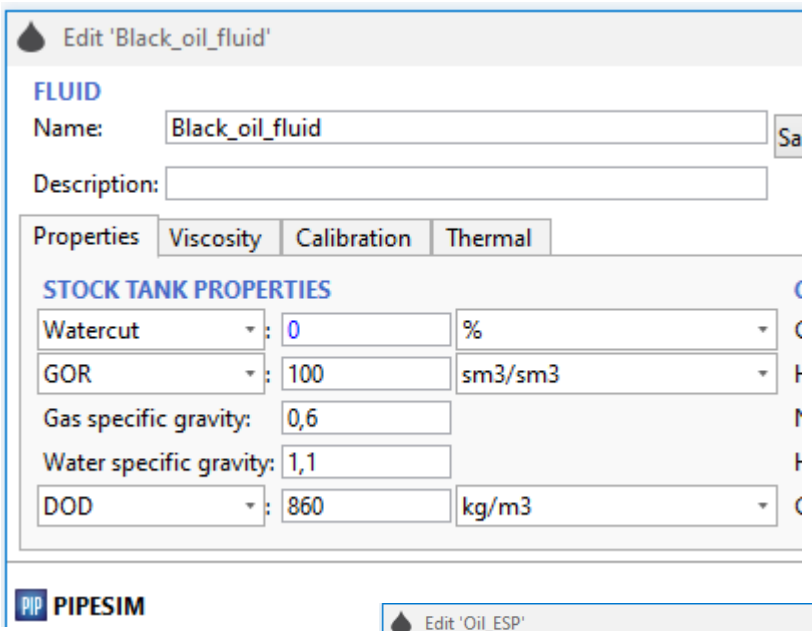
~ water sp gr = 1.1

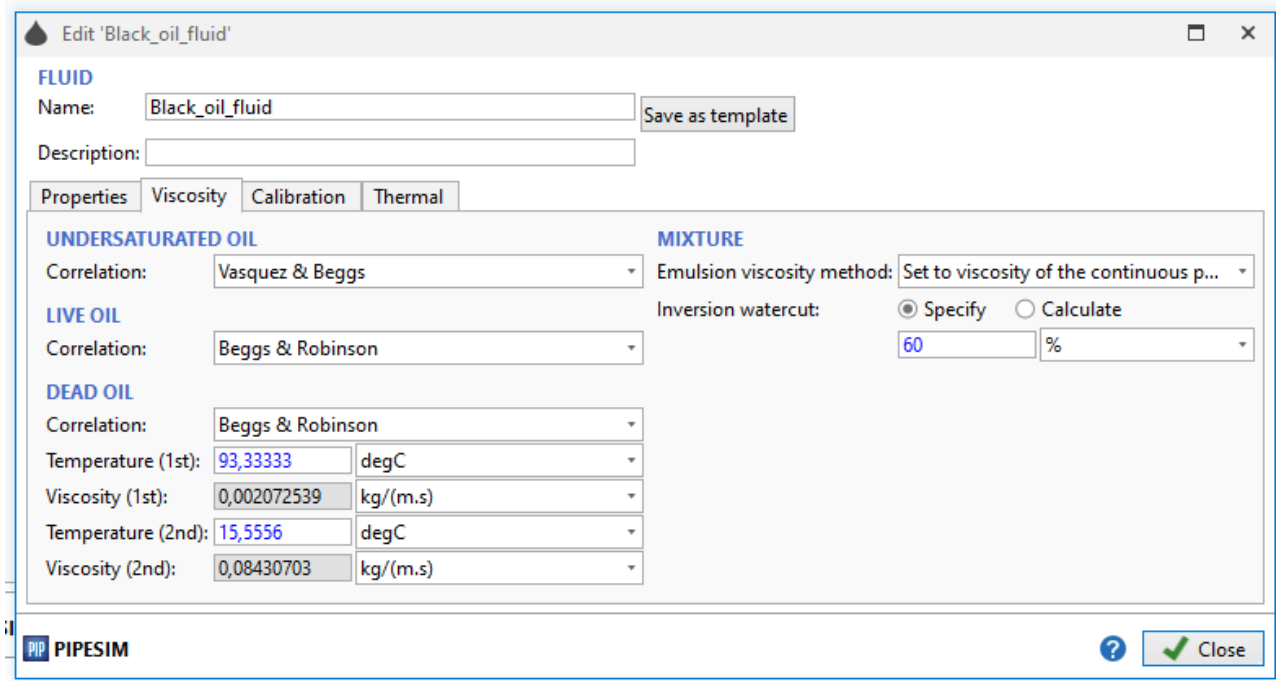
PETEX: Water salinity

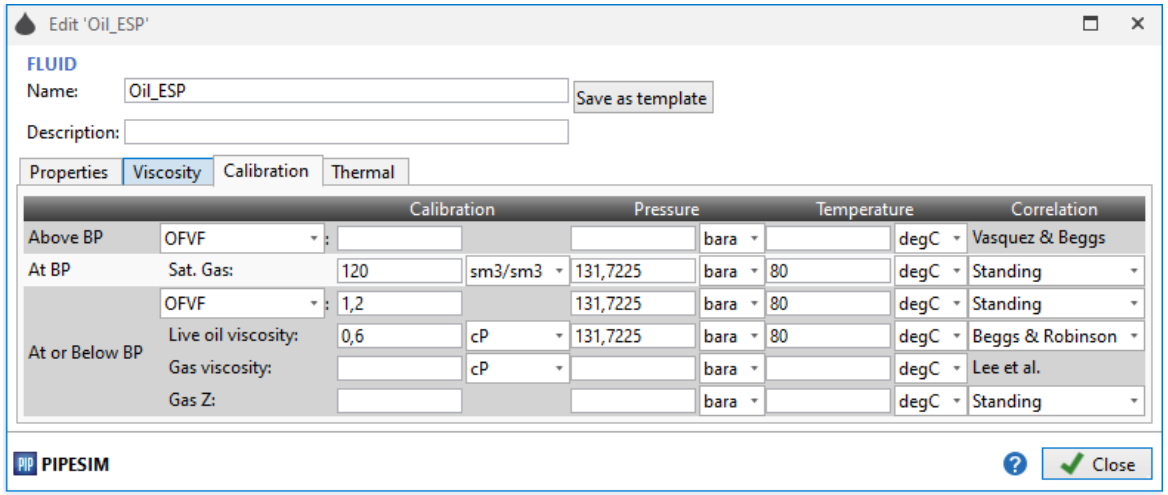
Salinity of water, expressed as NaCl equivalent.



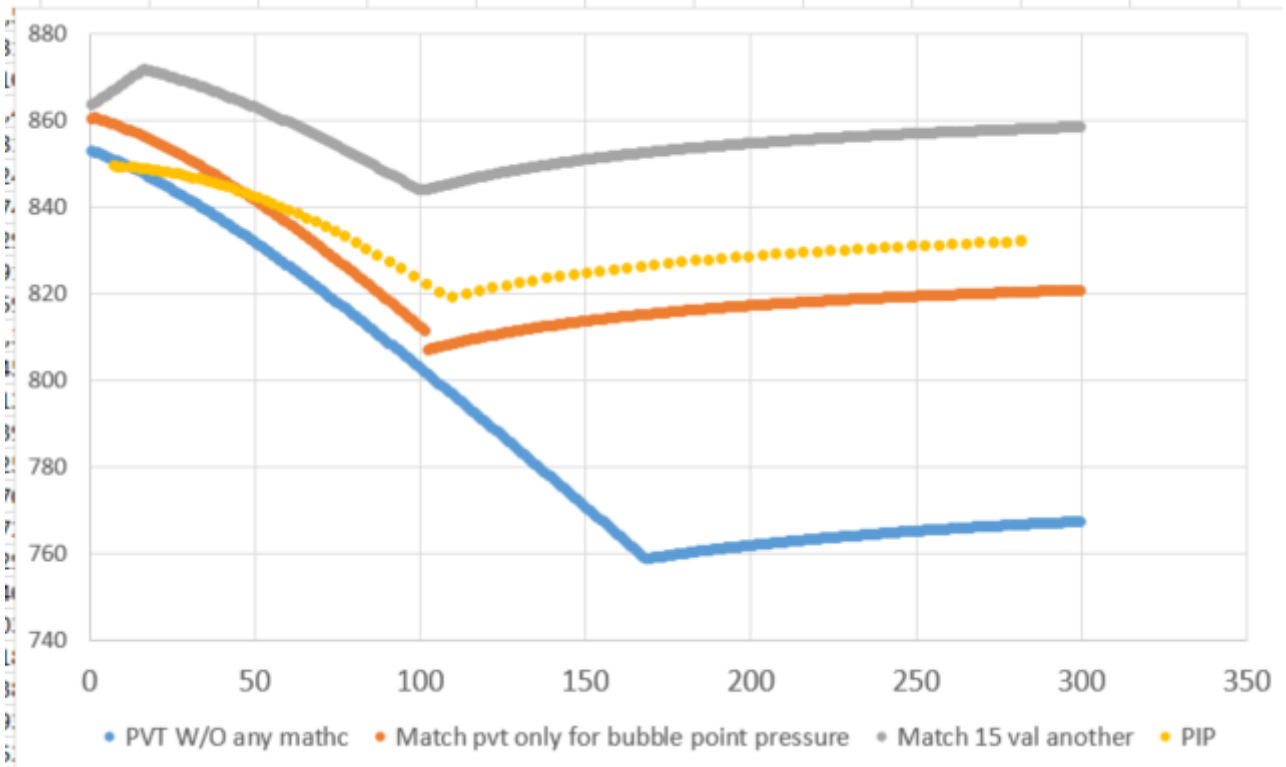
PVT Input 3/3

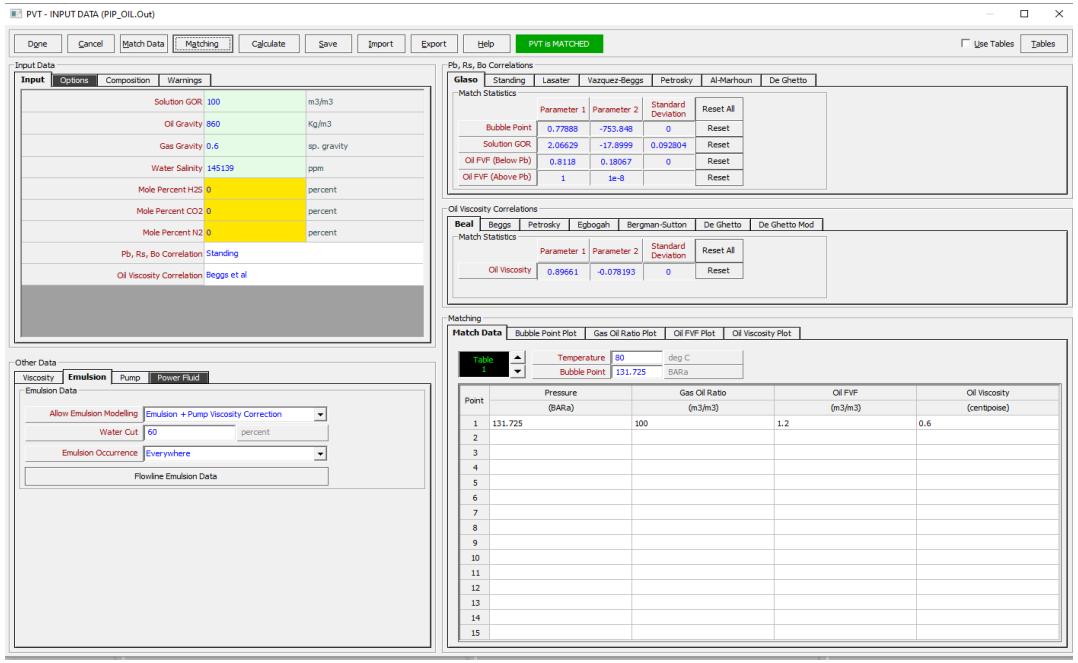

Edit 'Black_oil_fluid'
FLUID
Name: Black_oil_fluid
Description:
Properties
Viscosity
Calibration
Thermal
STOCK TANK PROPERTIES
Watercut : 0 %
GOR : 100 sm3/sm3
Gas specific gravity: 0,6
Water specific gravity: 1,1
DOD : 860 kg/m3
PIPESIM


Edit 'Black_oil_fluid'
FLUID
Name: Black_oil_fluid
Save as template
Description:
Properties
Viscosity
Calibration
Thermal
UNDERSATURATED OIL
Correlation: Vasquez & Beggs
LIVE OIL
Correlation: Beggs & Robinson
DEAD OIL
Correlation: Beggs & Robinson
Temperature (1st): 93,33333 degC
Viscosity (1st): 0,002072539 kg/(m.s)
Temperature (2nd): 15,5556 degC
Viscosity (2nd): 0,08430703 kg/(m.s)
MIXTURE
Emulsion viscosity method: Set to viscosity of the continuous p...
Inversion watercut: Specify Calculate
60 %
PIPESIM
Close


Edit 'Oil_ESP'
FLUID
Name: Oil_ESP
Save as template
Description:
Properties
Viscosity
Calibration
Thermal
Calibration
Pressure
Temperature
Correlation
Above BP OFVF : bara degC Vasquez & Beggs
At BP Sat. Gas: 120 sm3/sm3 131,7225 bara 80 degC Standing
At or Below BP OFVF : 1,2 131,7225 bara 80 degC Standing
Live oil viscosity: 0,6 cP 131,7225 bara 80 degC Beggs & Robinson
Gas viscosity: cP bara degC Lee et al.
Gas Z: bara degC Standing
PIPESIM
Close

Density





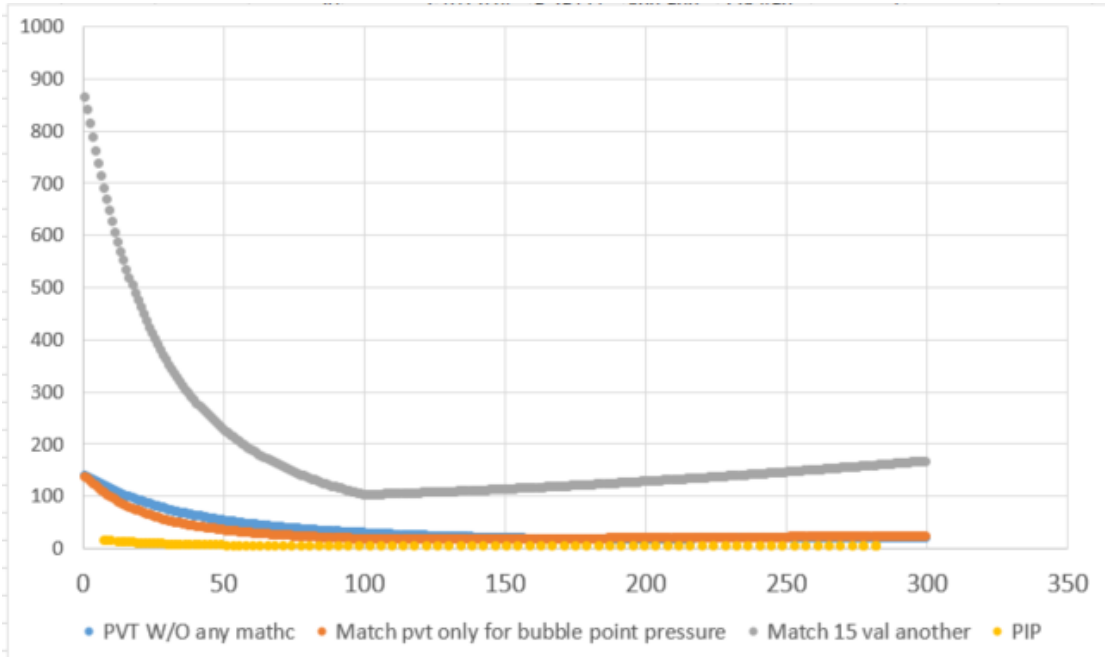
T = 30 C

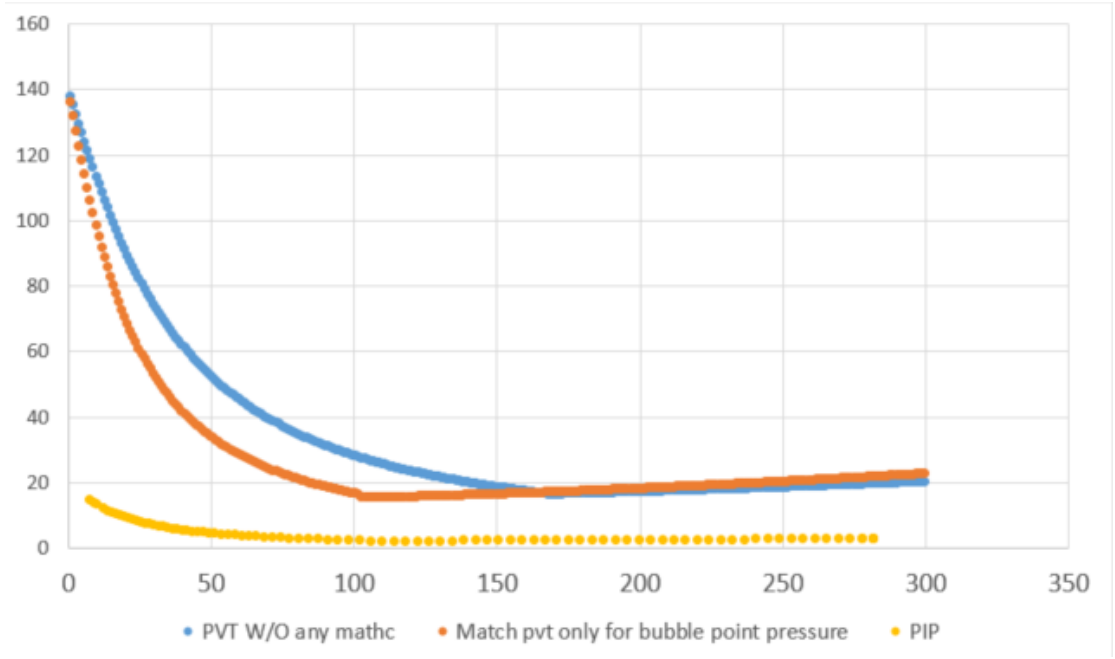
Pb = 131.725 BARA

Pb = 102,624

Pb = 109

Visc

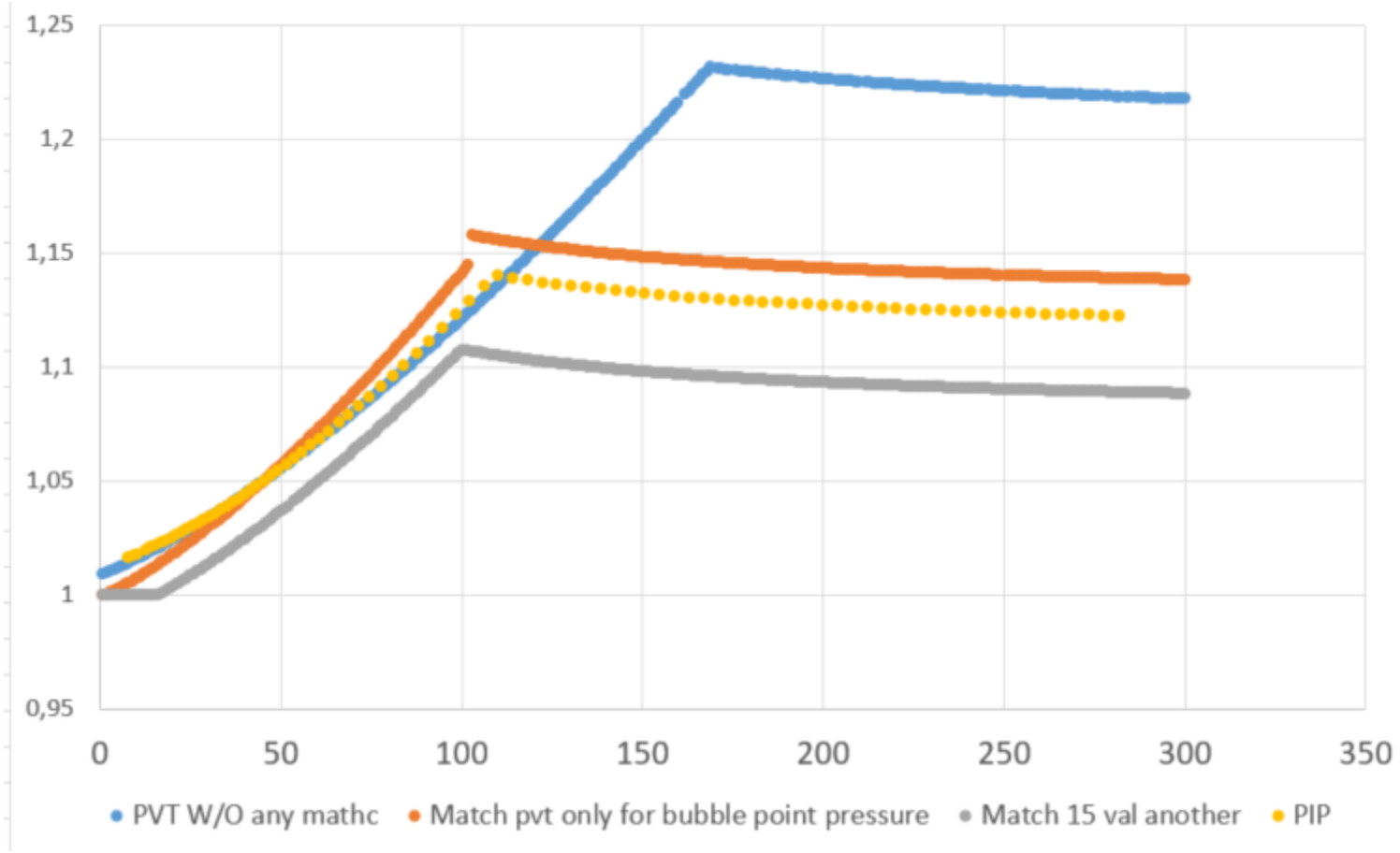




T = 30 C

Pb = 131.725 BARA

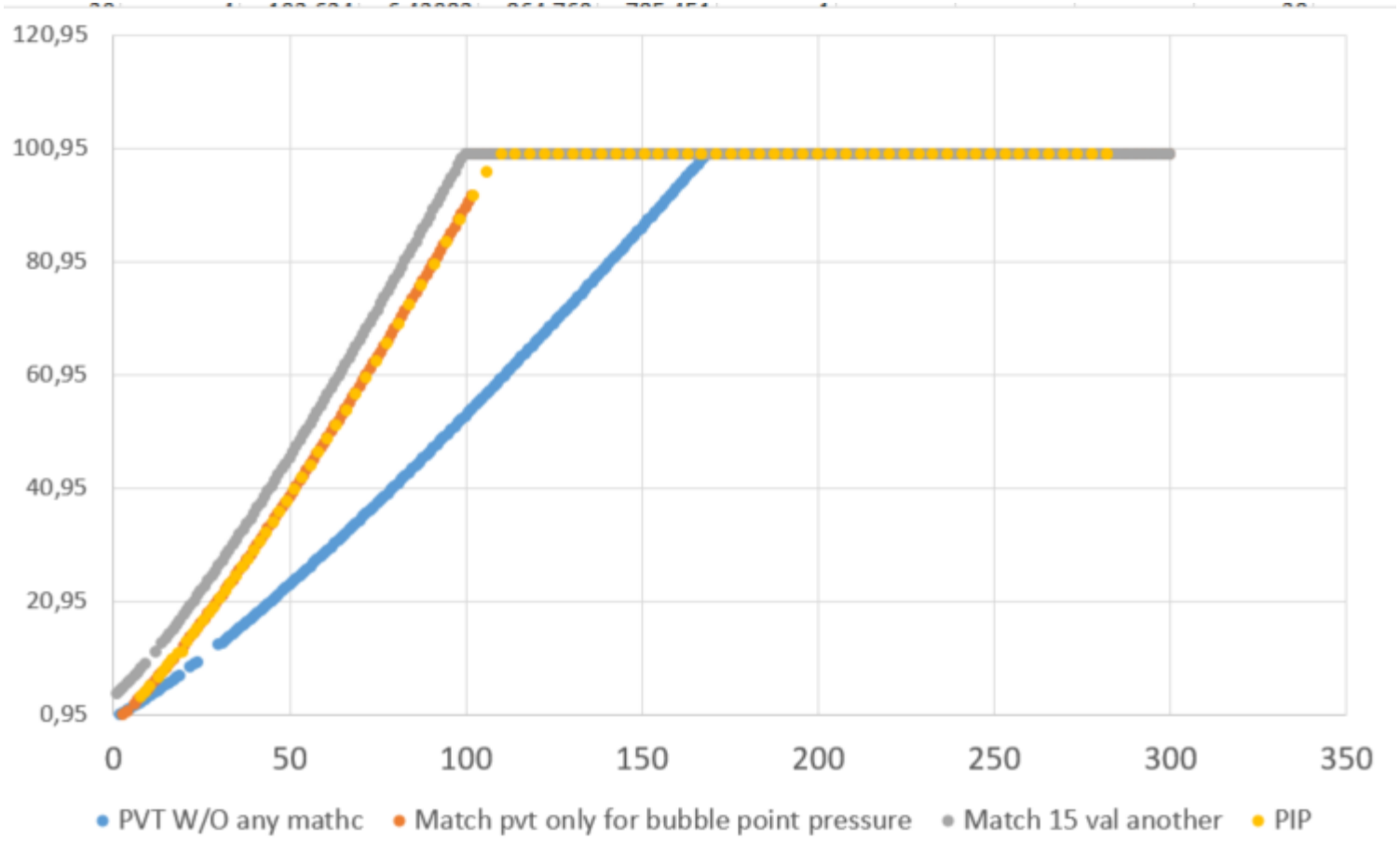
OFVF



T = 30 C

Pb = 131.725 BARA

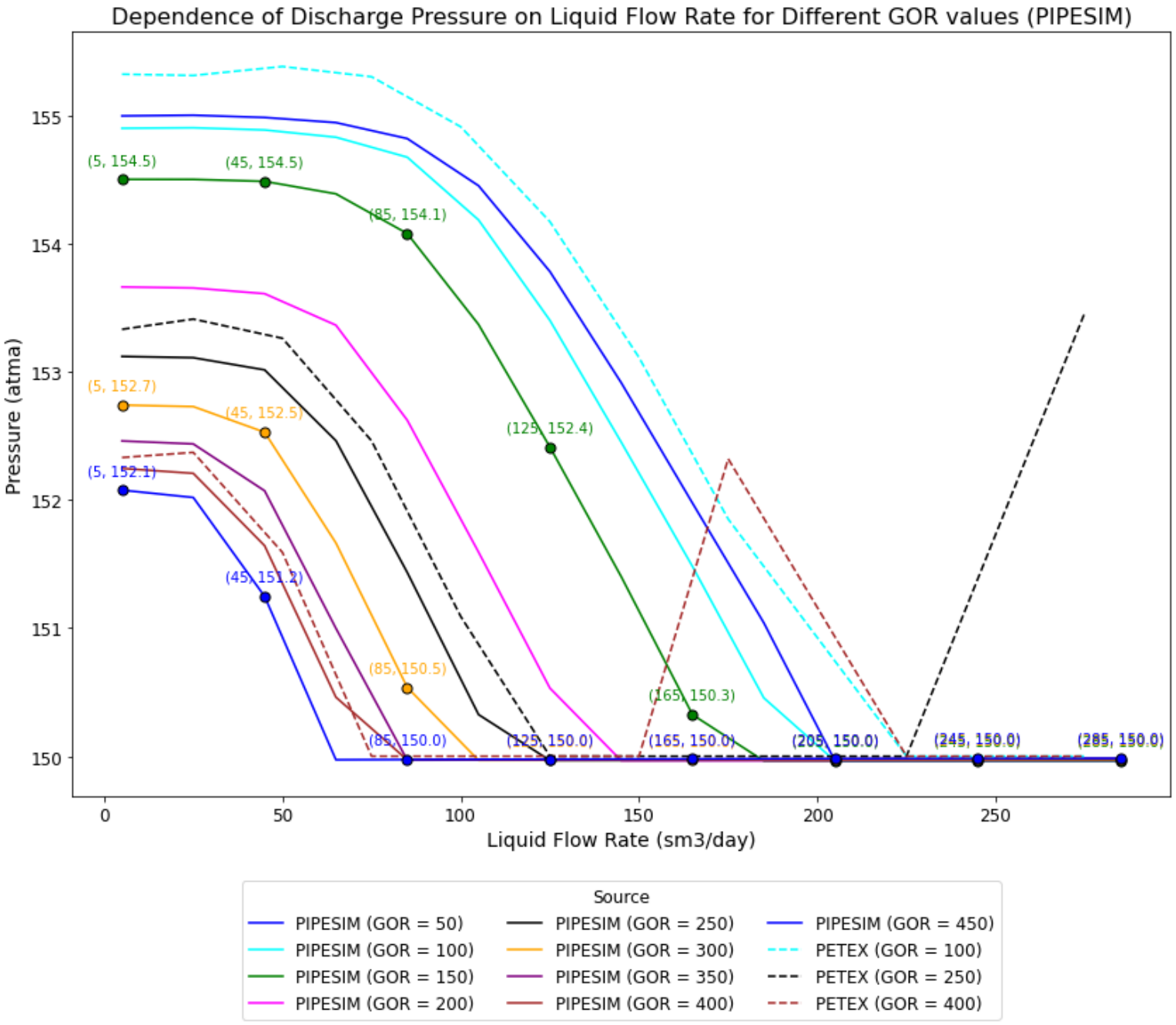
GOR



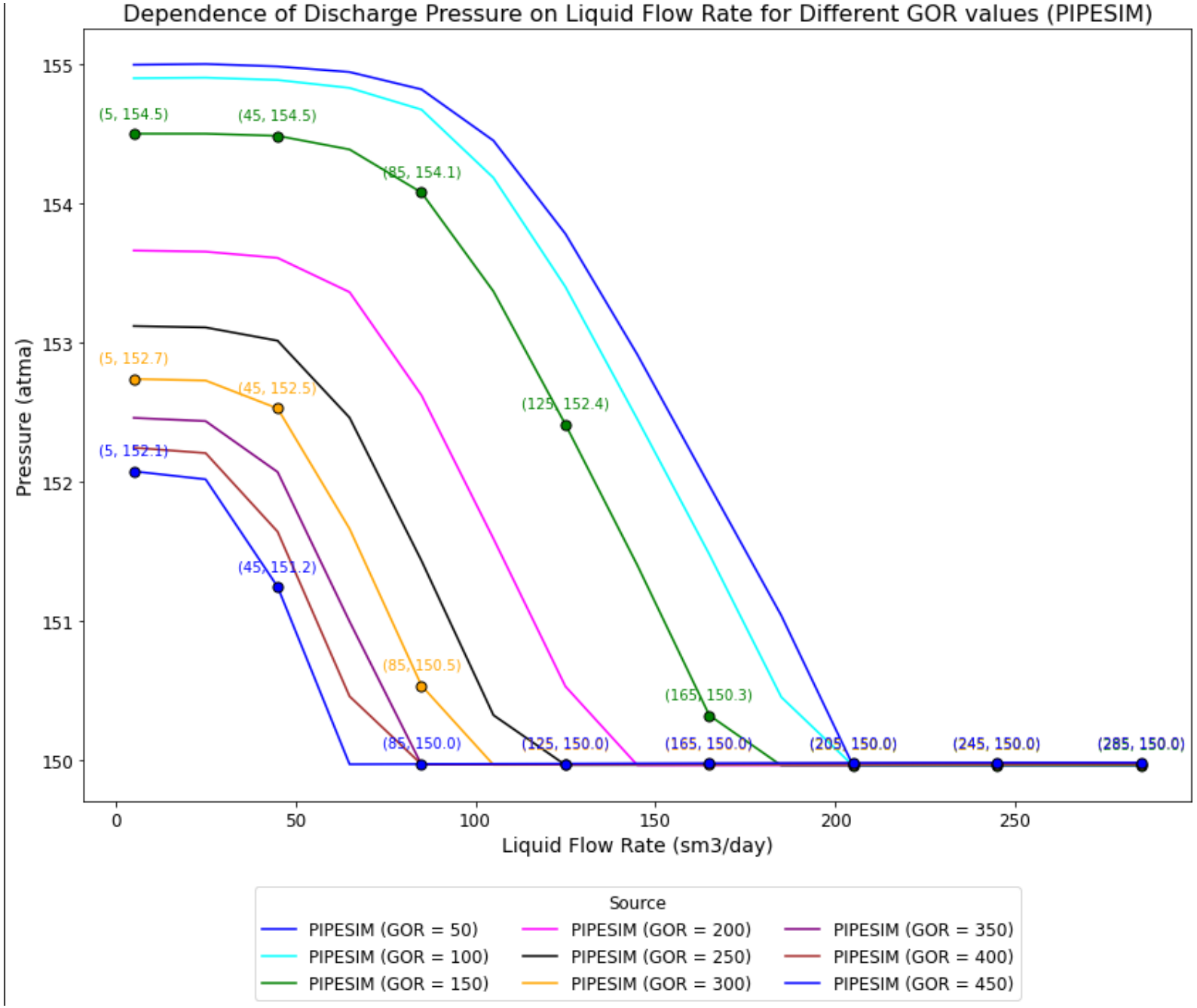
T = 30 C

Pb = 131.725 BARA

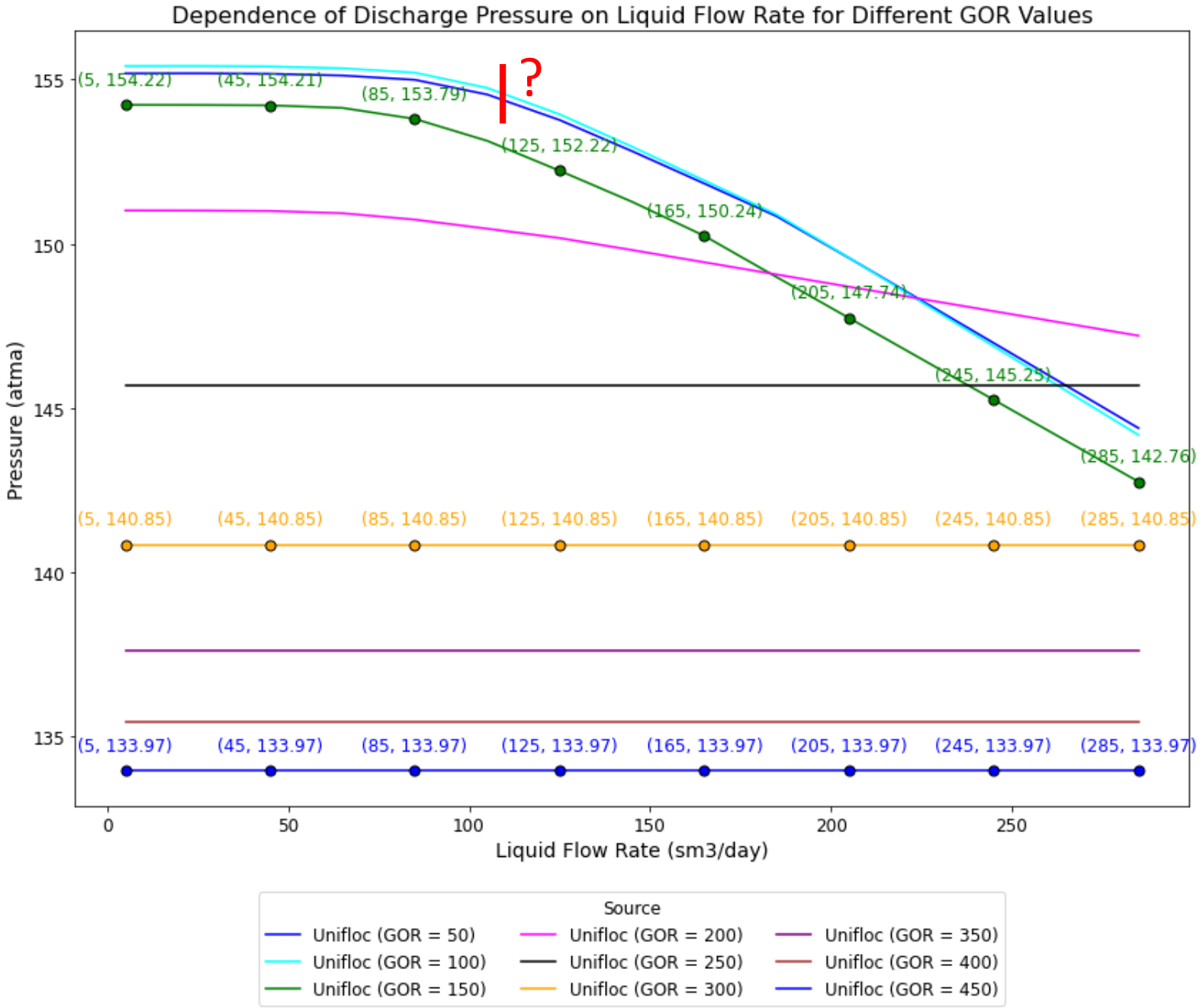
Pdis


Dependence of Discharge Pressure on Liquid Flow Rate for Different GOR values (PIPESIM)
Pressure (atma)
Liquid Flow Rate (sm3/day)
155
154
153
152
151
150
0
50
100
150
200
250
(5, 154.5)
(45, 154.5)
(85, 154.1)
(125, 152.4)
(165, 150.3)
(5, 152.7)
(45, 152.5)
(5, 152.1)
(45, 151.2)
(85, 150.5)
(85, 150.0)
(125, 150.0)
(165, 150.0)
(205, 150.0)
(245, 150.0)
(285, 150.0)
Source
PIPESIM (GOR = 50)
PIPESIM (GOR = 100)
PIPESIM (GOR = 150)
PIPESIM (GOR = 200)
PIPESIM (GOR = 250)
PIPESIM (GOR = 300)
PIPESIM (GOR = 350)
PIPESIM (GOR = 400)
PIPESIM (GOR = 450)
PETEX (GOR = 100)
PETEX (GOR = 250)
PETEX (GOR = 400)

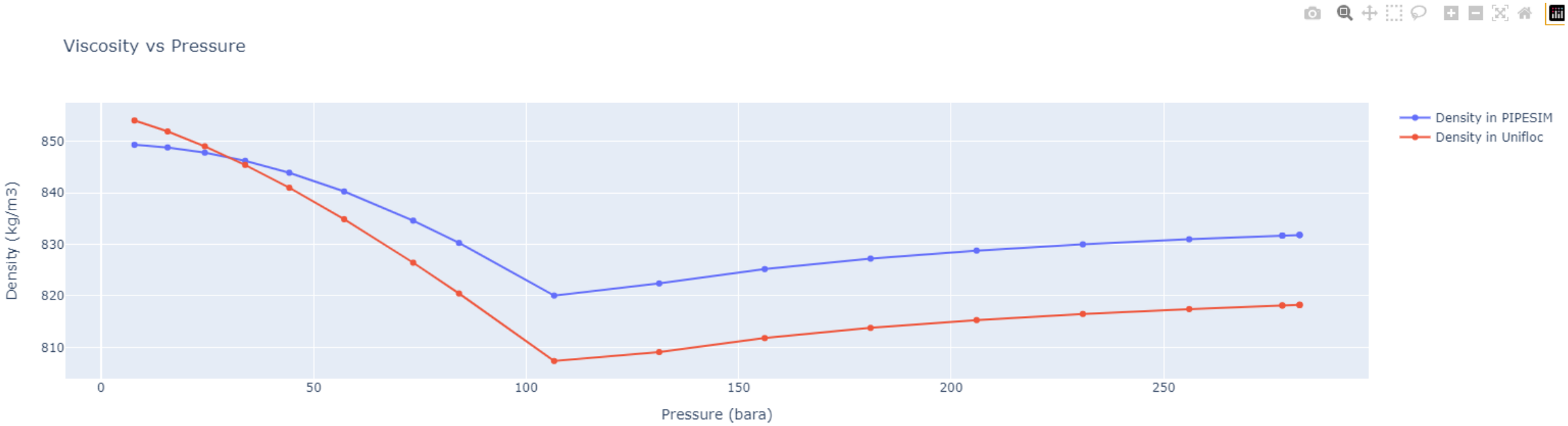
Pdis pip only

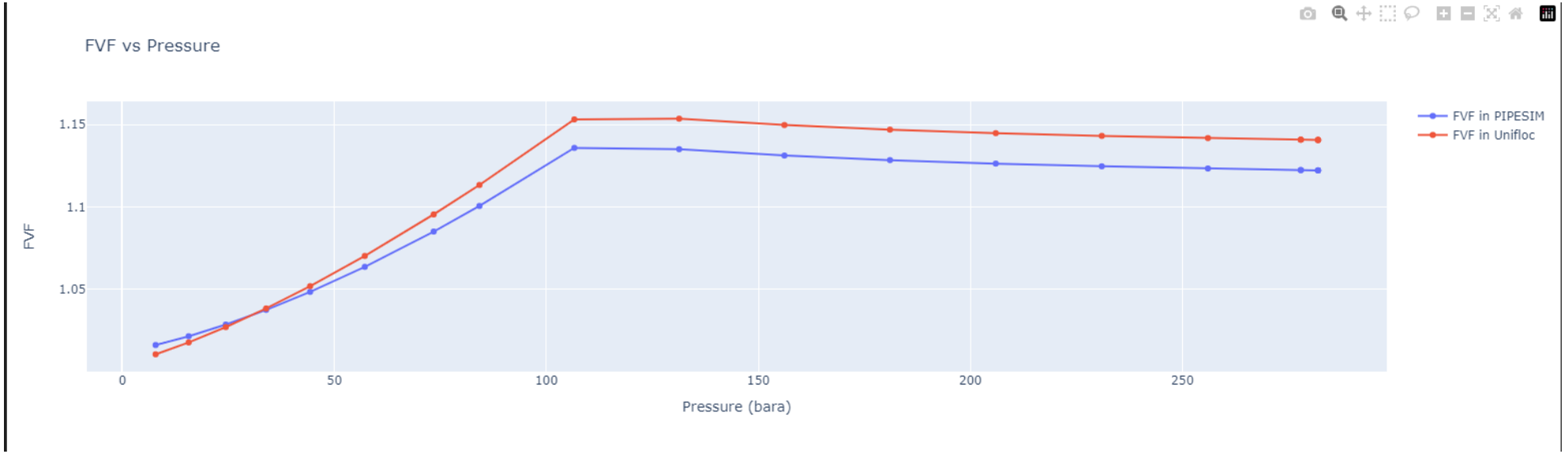


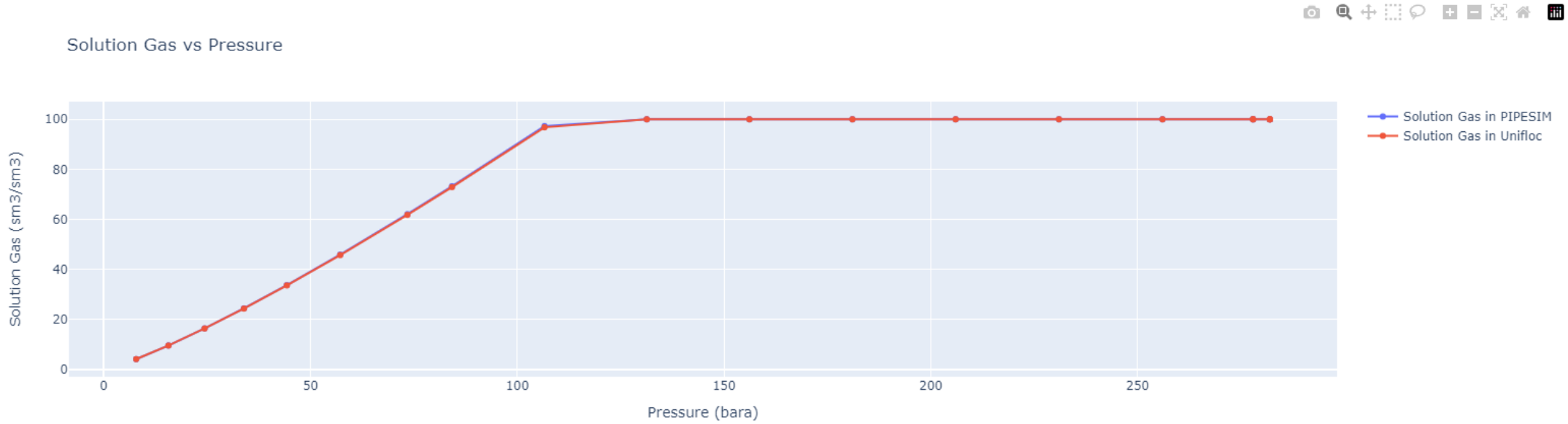
Unifloc pip only

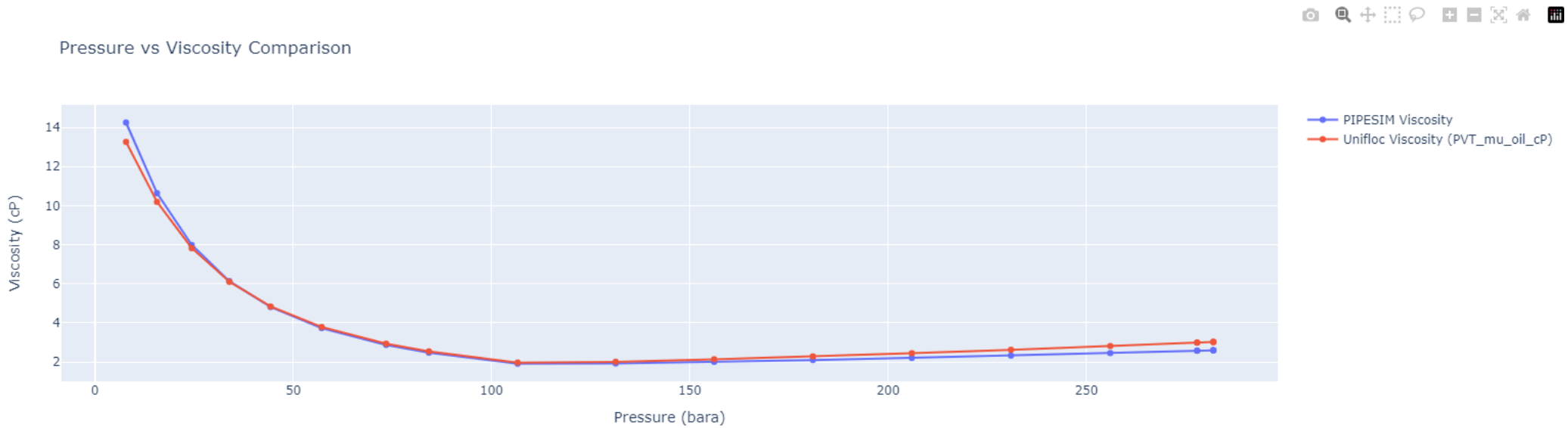


Unifloc


Viscosity vs Pressure
Density (kg/m3)
850
840
830
820
810
0
50
100
150
200
250
Pressure (bara)
Density in PIPESIM
Density in Unifloc


FVF vs Pressure
FVF
1.15
1.1
1.05
0
50
100
150
200
250
Pressure (bara)
FVF in PIPESIM
FVF in Unifloc


Solution Gas vs Pressure
Solution Gas (sm3/sm3)
Pressure (bara)
Solution Gas in PIPESIM
Solution Gas in Unifloc
0
20
40
60
80
100
0
50
100
150
200
250


Pressure vs Viscosity Comparison
Viscosity (cP)
Pressure (bara)
PIPESIM Viscosity
Unifloc Viscosity (PVT_mu_oil_cP)
2
4
6
8
10
12
14
0
50
100
150
200
250