

Introduction to ODSI



Automated Real-Time Reservoir and Production Engineering Analysis and Surveillance

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Automated Real-Time Service (ARTS)

Real-Time Reporting on Wells / Field KPI's



The ARTS Concept: Physics + Automation + Experienced Surveillance Engineers

Rates & PVT

3-Phase Rate and BHP Calculations

Flow meter Validations

Automated PVT Tuning & Calibration

Water Cut and GOR or Yield Calculations

Production & Reservoir Performance Optimization

Auto Real-Time PTA & Reporting

Scale and/or Asphaltene detection in reservoir, completion & well bore

Recognize Wellbore Lift Issues & Gas Lift Optimization

Recognize Completion & Reservoir Performance Issues (Skin, Scale, Compaction, Velocities)

In-place, Connected and Recoverable Volumes

Producer-Injector Interaction

Tracking on Moving Oil-Water, Gas-Oil, Gas-Water Contacts with time

Know the Maximum Safe Flow Potential of the Well (Spare Capacity)

Flow Assurance

Wax, Hydrates, Asphaltenes, Scale, Corrosion, Emulsion Detection & Mitigation

Topsides/Facilities

Automated Facilities Debottlenecking & Optimization

Recognition of Inefficiently Operating Equipment



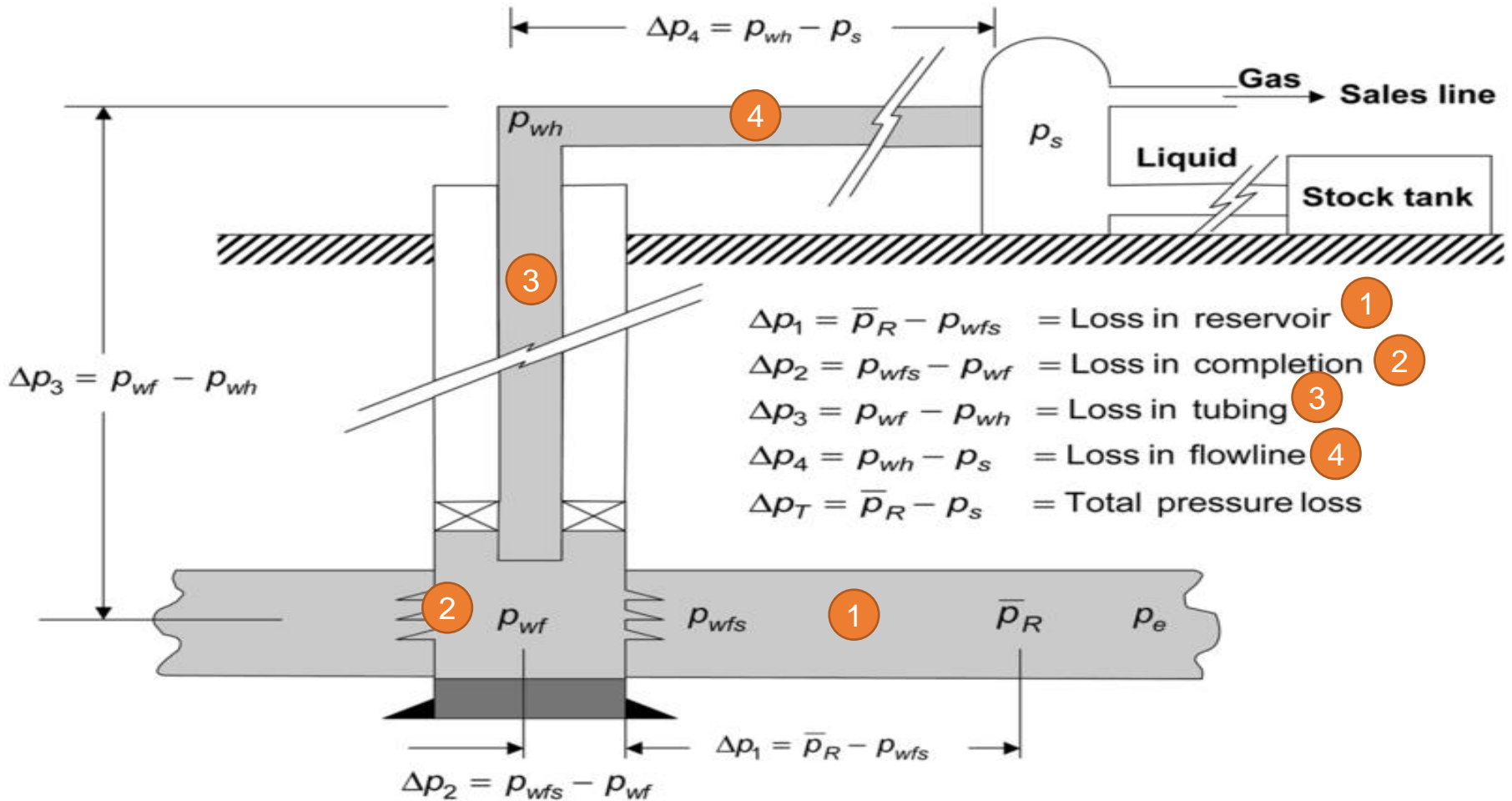
Reservoir & Production Engineering Surveillance

Asset Modeling, Monitoring & Diagnostics

Which Parts of the System Can You Evaluate?



Find the pressure drop that shouldn't be there (and get rid of it)!



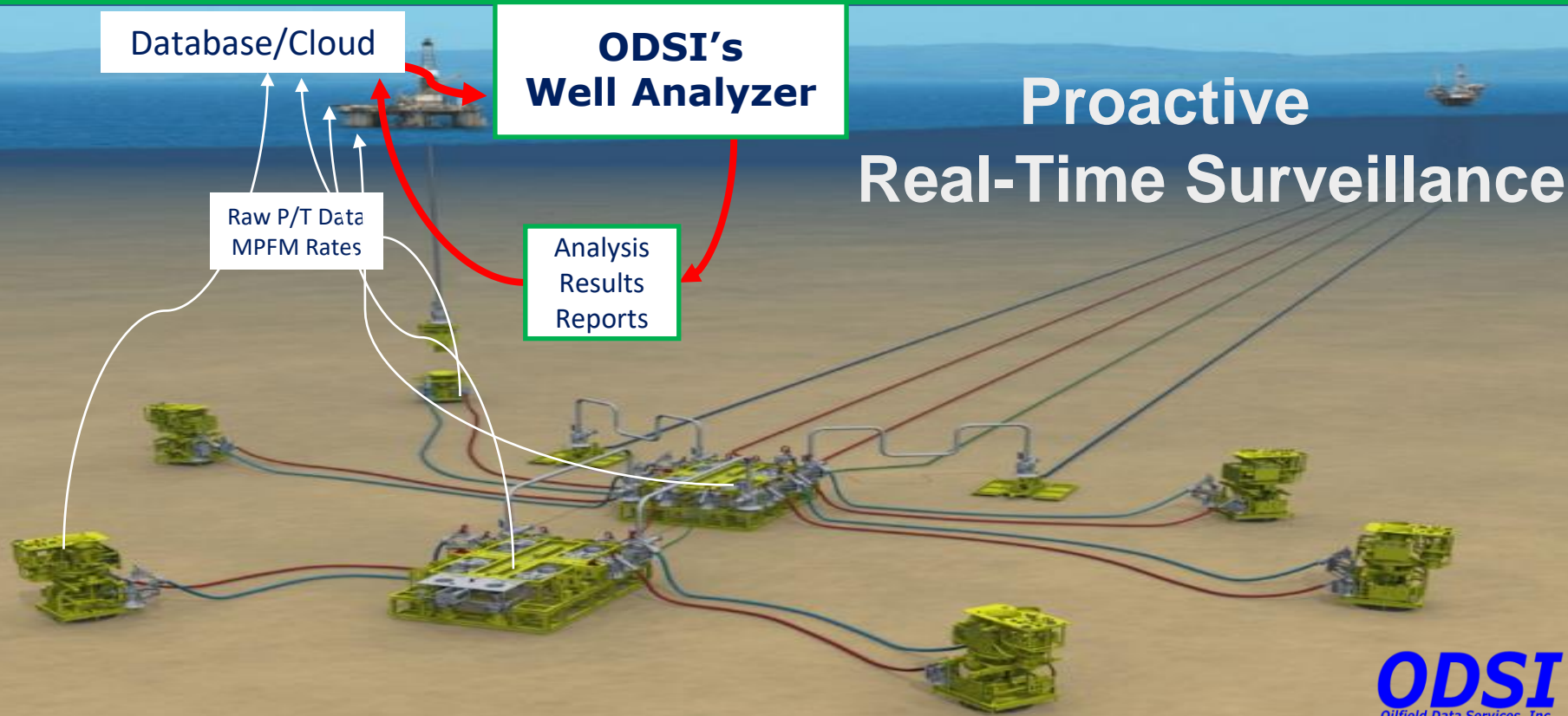
Wellbore Solutions

- **Rate Calculation/Validation**
 - Multiphase Rate Calculations
 - Metered rate validation/calibration
 - WC and/or GOR Calculation (ISIP)
 - Yo and/or Yw Calculation (ISIP)
- **BHP Conversion**
 - From WHP or DHGP data
 - Backup if DHG fails
- **GL Optimization**
 - Inefficient Lift and Loading Flags

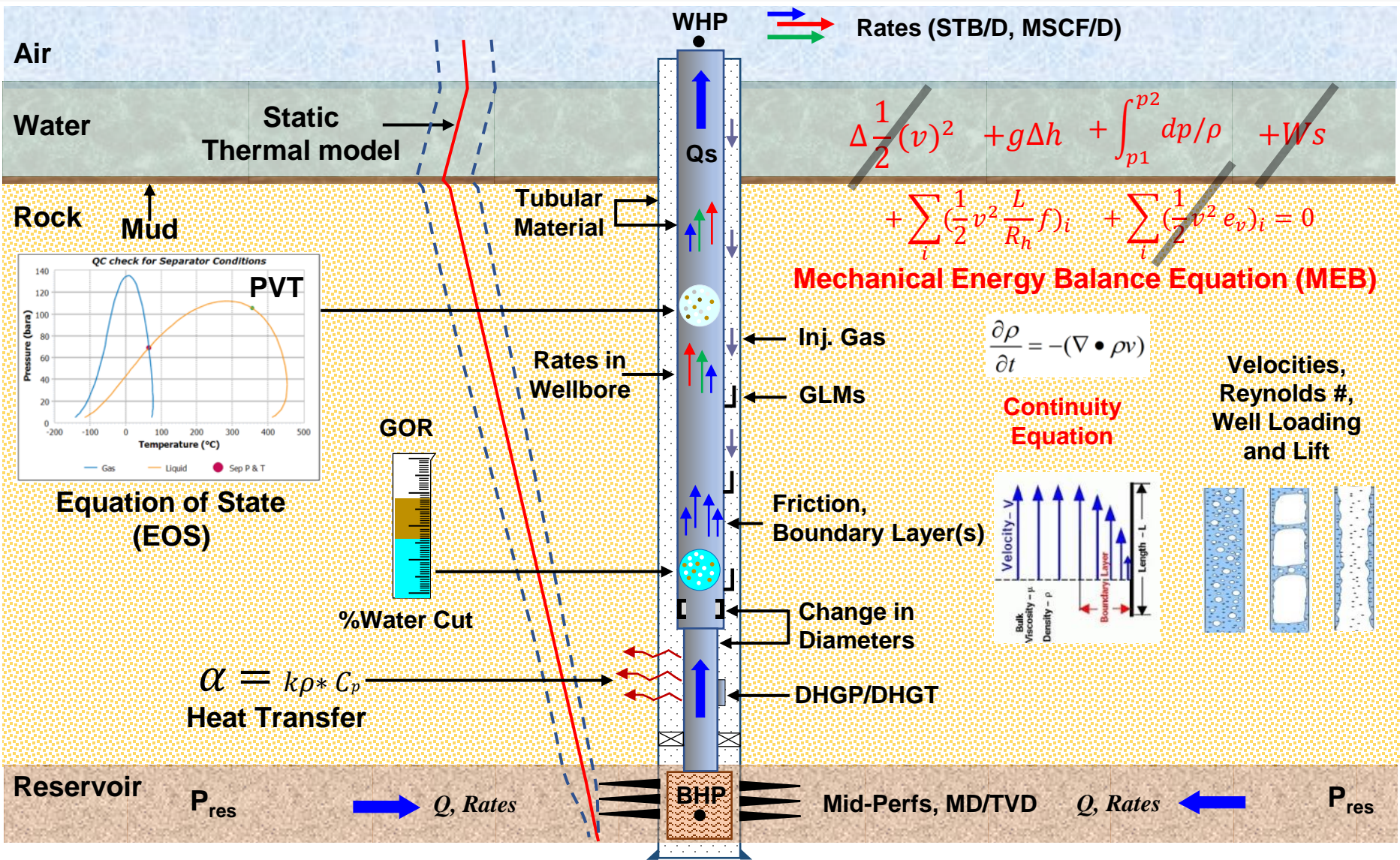


Reservoir Solutions

- **Auto PTA (Buildups and Drawdowns)**
 - Skin
 - Permeability
 - Reservoir Pressure
 - Productivity (PI)
- **Reservoir Volume Calculations**
 - In-place (Static MBAL, WaveX, Boundary Volumetrics)
 - Hydraulically Connected (Flowing MBAL & DP/DT Decline)
 - Mobile Volume (TTA Decline)
 - EURs (P90/50/10)



ODSI's Complete Wellbore Solution

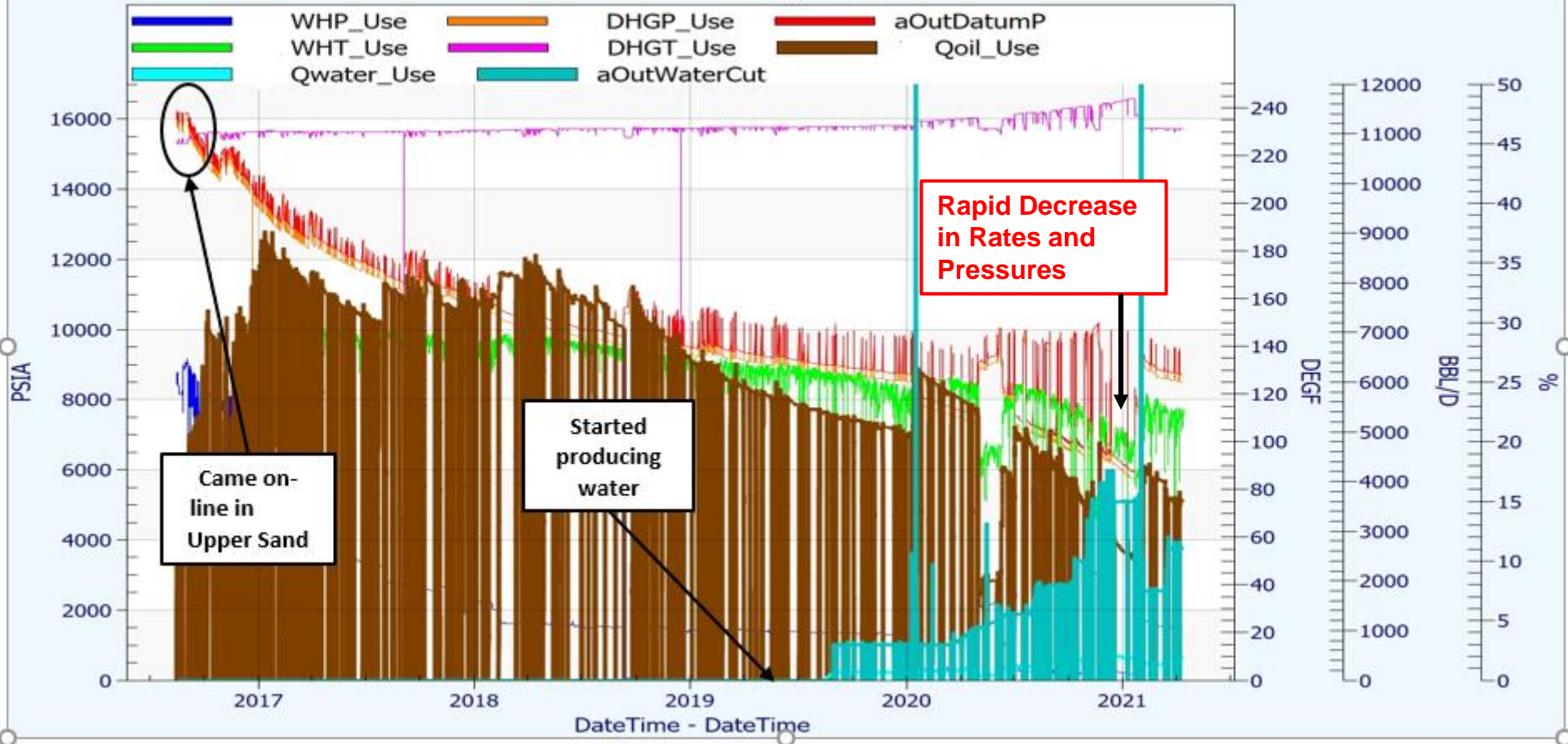


Time-Lapse Auto PTA – Production History



Oilfield Data Services Inc.

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PTA Dashboard – Accreting Skin Example



Compaction

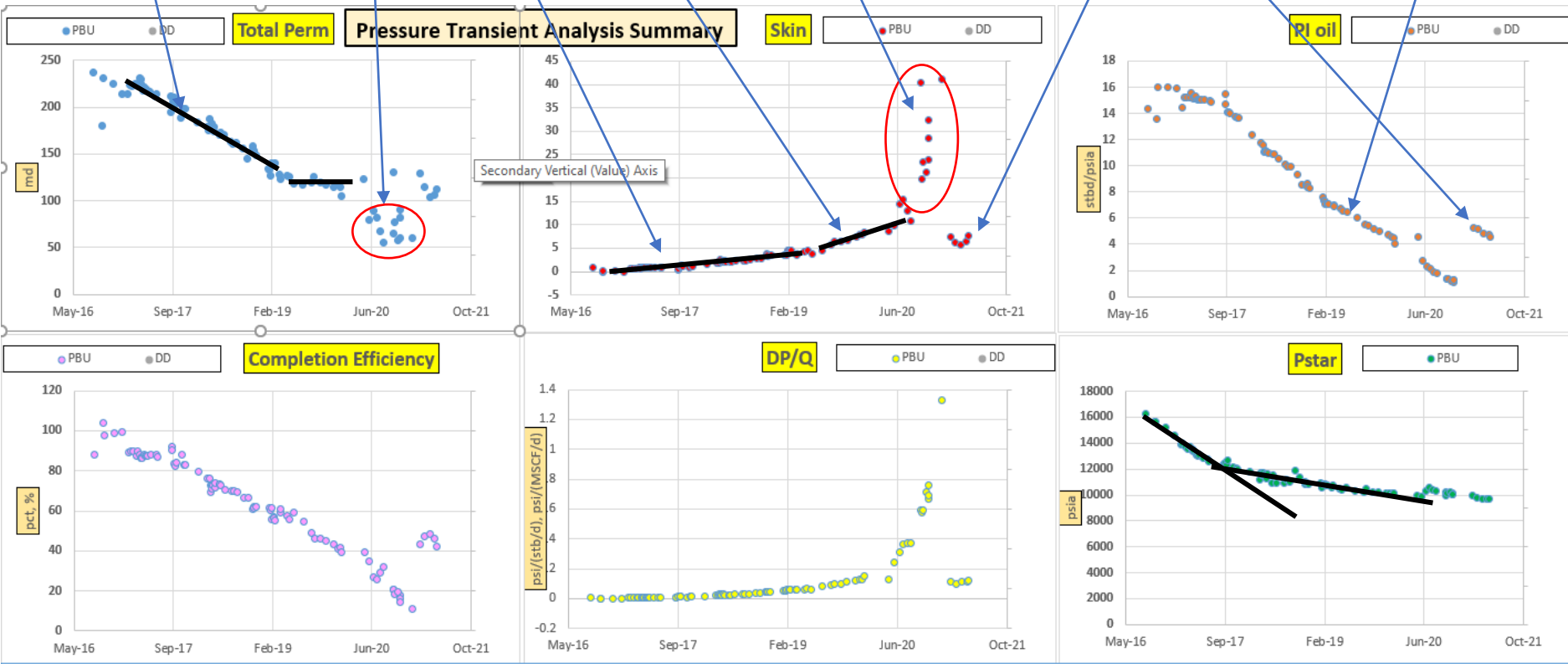
Significant & Unexpected Decrease in Perm Asphaltenes?

Rapid Skin Increase – Need to Plan for Xylene Treatment

Post-stim job – Back to Normal (Still dealing with compaction)

PI Reduction due to compaction and skin accretion (fines & scale)

Fines (skin) Scale & Fines



Understand as much as you can about your well/reservoir:


- Formation Strength & Stress
- Sanding Potential & Shear Failure
- Skin (scale, fines, asphaltenes?), Perm, P*
- Coning Potential
- Compaction
- Screen and Wellbore Velocities
- Moving Fluid Contacts (OWC)

Turn that Knowledge into Dashboards that Everyone Can Understand (and Use to Make More Money!)

Deepwater Subsea Oil Well – Threat Board



SS01 Oil Example: Big Problem Checklist

Potential Issue	Good/Bad/Ugly?	Comment
Compaction/Shear	Manageable	The well shouldn't get below 5500 psia unless it develops a large skin
Completion Velocity/ Screen Cutting	Possible Issues	Screen Cutting is possible if we try to flow the well at high rates with a high skin
Scale	Treatable	Drop Acetic/HCl if the skin gets above 20
Fines	Manageable	Normal Fines accretion...any stimulation/solvent treatment will push them back
Asphaltenes	Severe!!!	Stay above 8500 psia!!! Potential Asphaltene Death Spiral! 
Flow Behind Pipe	Possible	That Water Sand about 100' up the hole looks ornery...if it breaks through, the reserves justify a R/C Squeeze
Early Water Front Arrival	Possible	Trying to balance withdrawal rate from SS03 and SS01 decay to shape the water front/Maximize EUR & Stay Above AOP

Spare Capacity Spreadsheet w/Threat Board



Spare Capacity:														
Well	ODSI Current Rate (Oil)	Allocated Oil	Δoil	ODSI Current WC	Excess Capacity (Oil)	FDHGP or BHP (no DHG)	Minimum DHGP	Threat Board						Comments:
	STB/D	STB/D	STB/D	%	STB/D	Psia	Psia	Severity						
								0	1	2	3	4	5	
SS01	10360	10807	-447	16	2800	9593	8500	Compaction						Maintain Current choke setting. Plan to stimulate if Skin exceeds 20
								Permeability						
								Asphaltene Precipitation						
								Wellbore Lift						
								Skin						
								Water						
								Screen Velocity						
SS02	2475	2356	119	18	550	9500	8500	Compaction						Maintain current Choke setting
								Permeability						
								Asphaltene Precipitation						
								Wellbore Lift						
								Skin						
								Water Encroachment						
								Screen Velocity						
SS03	5194	4851	343	53	0	10100	8500	Compaction						Flow the well as hard as possible to keep water away from SS01
								Permeability						
								Asphaltene Precipitation						
								Wellbore Lift						
								Skin						
								Water Encroachment						
								Screen Velocity						
SS04	5396	5294	102	12	550	8650	6200	Compaction						Okay to increase choke but monitor closely
								Permeability						
								Asphaltene Precipitation						
								Wellbore Lift						
								Skin						
								Water Encroachment						
								Screen Velocity						
Sum	23425	23308	117	Excess Potential Oil (STB/D)			3900							

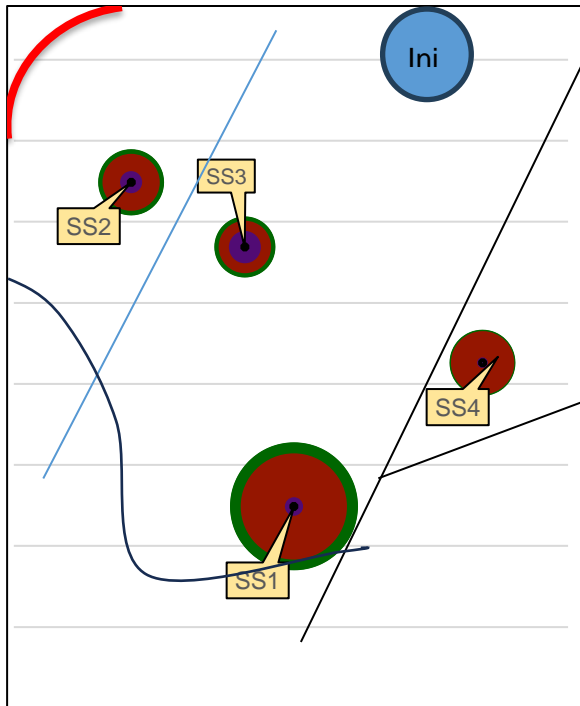
Field Level – How Much is Left?

Which Wells are Worth Fixing if Something Bad Happens?



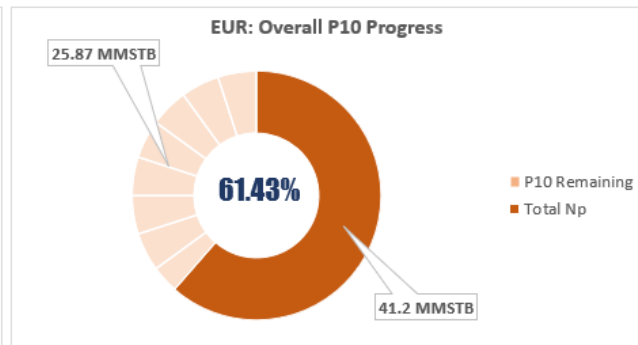
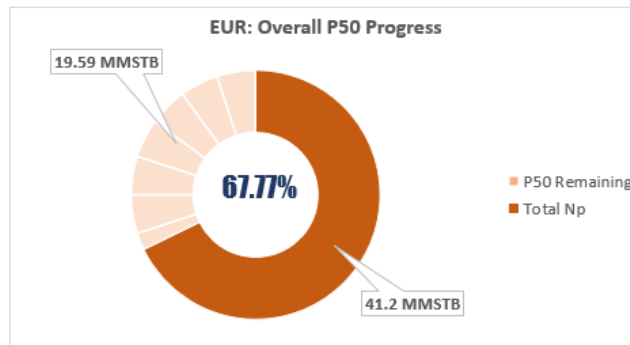
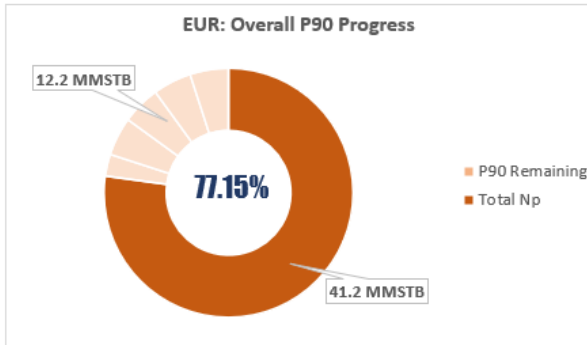
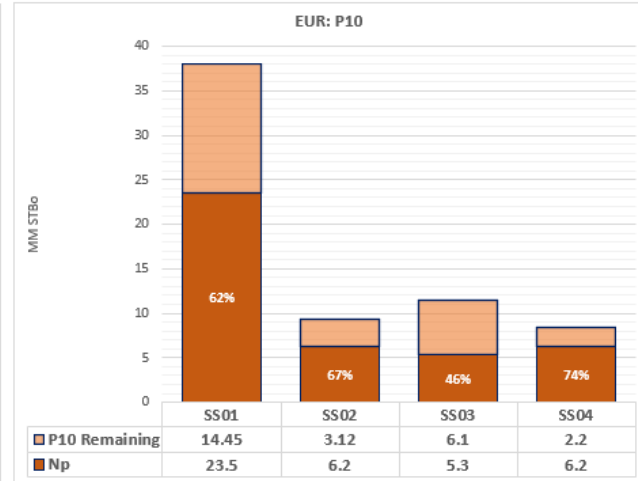
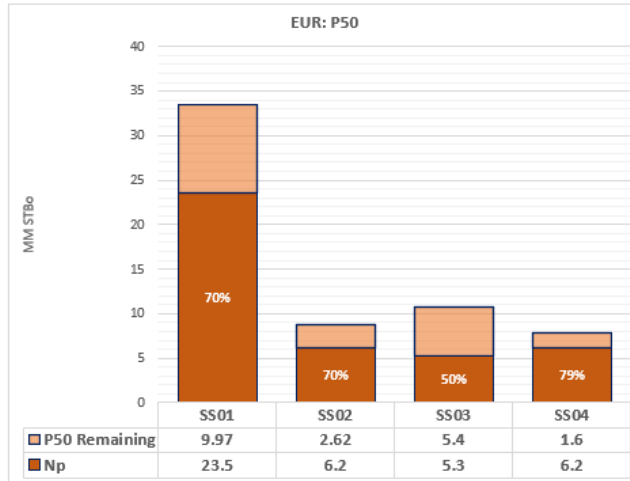
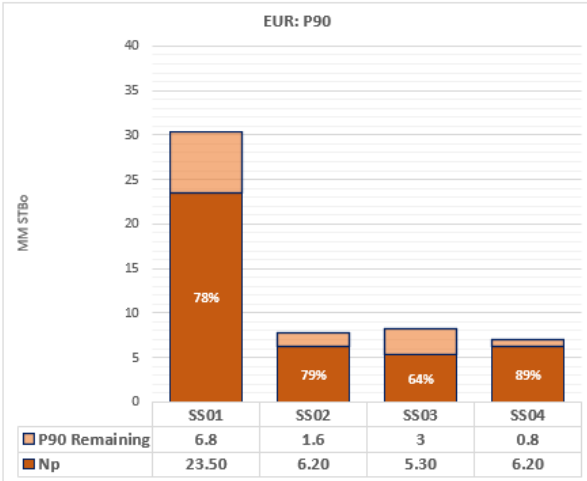
Proactive Surveillance keeps you informed of your Current EUR

GOM Subsea Field



Well	Cum. Oil	Cum. Gas	Cum. Water	Remaining EUR - MM STBo			Comments/ Recommendations
	MM STBo	BSCF	MM STBw	P90	P50	P10	
SS01	23.5	16.3	1.8	6.8	10.0	14.5	Maintain Current choke setting. Plan to stimulate if Skin exceeds 20
SS02	6.2	4.7	0.7	1.6	2.6	3.1	Maintain current Choke setting
SS03	5.3	4.0	1.5	3.0	5.4	6.1	Flow the well as hard as possible to keep water away from SS01
SS04	6.2	5.8	0.4	0.8	1.6	2.2	Okay to increase choke but monitor closely

Subsea Deepwater GOM



Proactive Surveillance keeps you well informed of your current EUR & NPV

Reservoir and Production Engineering Surveillance & Management Course

Chris Fair, Oilfield Data Services, Inc. (ODSI)
Don Nguyen, Esperanza Capital Partners
Hieu Le, Oilfield Data Services, Inc (ODSI)

April 16, 2024
8:00am - 12:00 noon