

CEPSA corporate PDMS - From data capturing to production optimization

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Production Engineer
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What's Next?

SIS Global Forum 2017

September 13-15

Le Palais des Congrès de Paris

Schlumberger



 **CEPSA**

AGENDA

❑ BACKGROUND

- CEPSA IN THE WORLD
- IT INFRASTRUCTURE

❑ OBJECTIVES

❑ DEPLOYMENT

- DATA CAPTURING-PROCESSING WORKFLOW

❑ TOWARDS PRODUCTION OPTIMIZATION

❑ CONCLUSIONS

❑ QUESTIONS

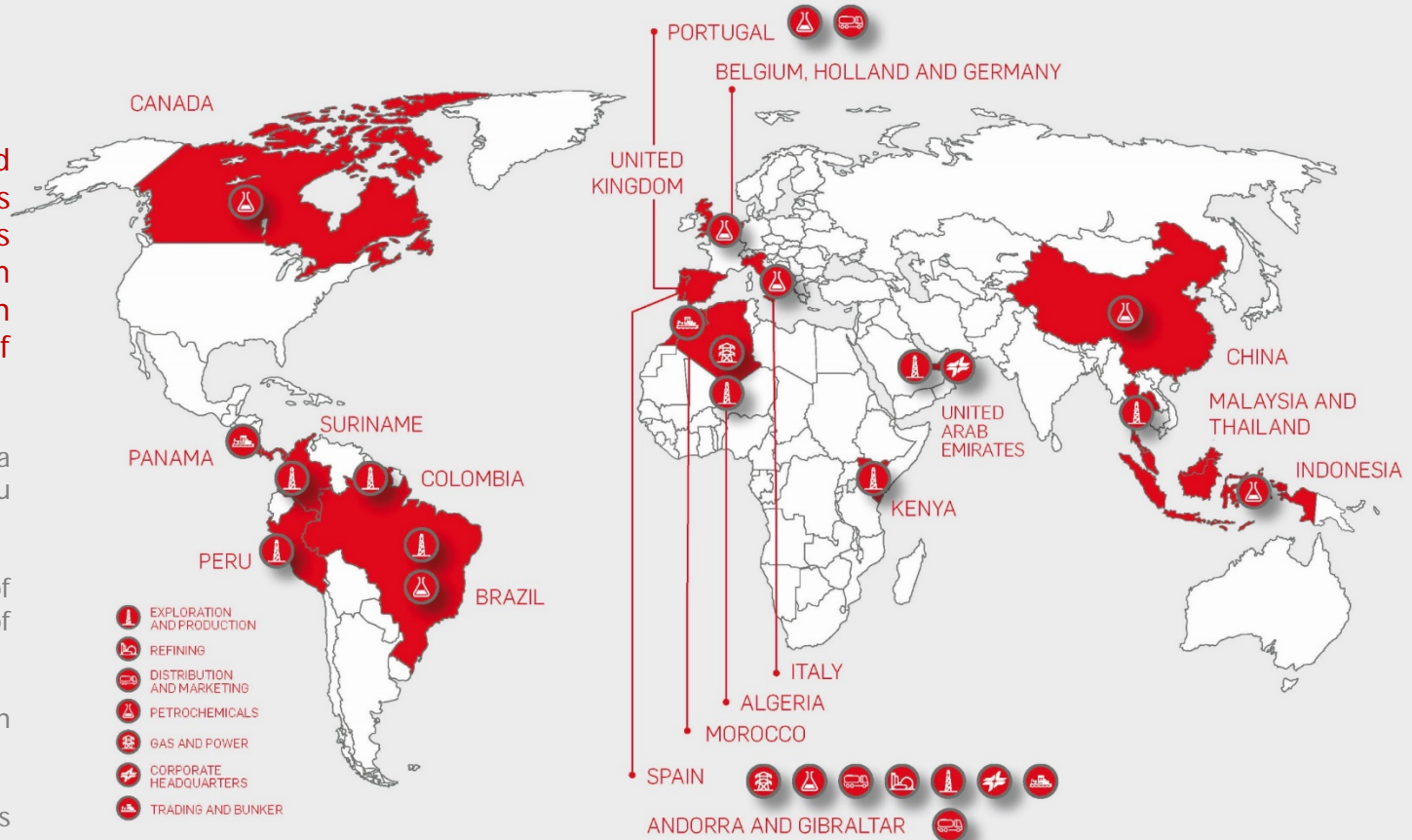




The Company

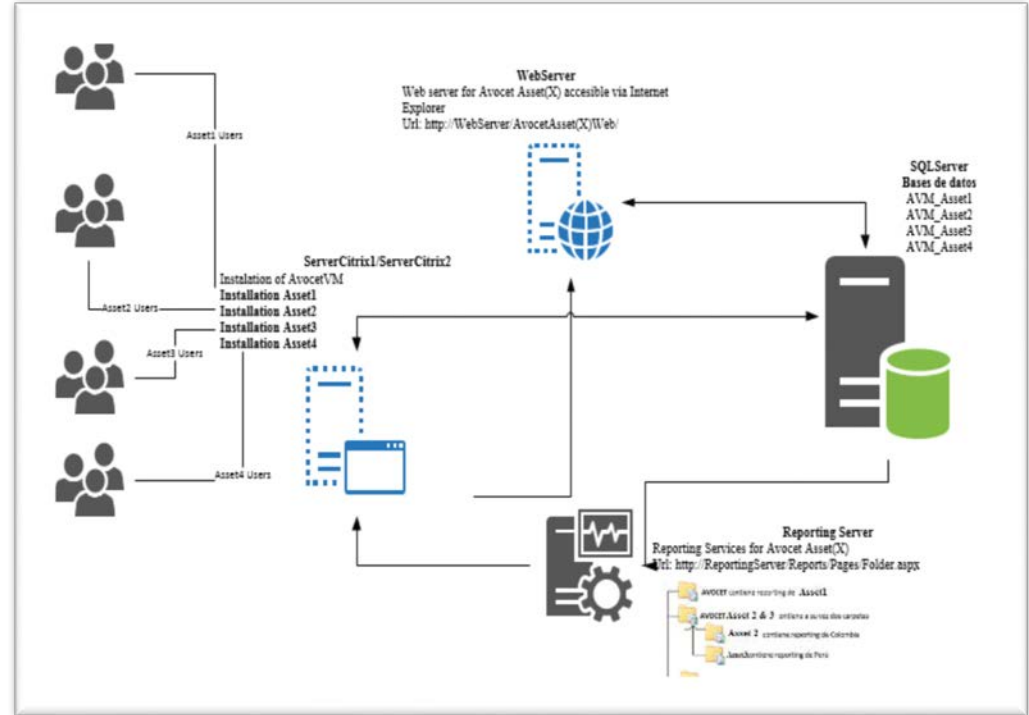
We are an integrated company operating across the entire oil and gas production chain from exploration and production to distribution and sale of final products.

- 1.- Being part of Mubadala Investment Company an Abu Dhabi sovereign wealth fund.
2. With more than 80 years of experience in the world of petroleum.
3. With a team of more than 10,000 professionals.
4. Developing its activity across six business areas



BACKGROUND - CEPSA New IT Infrastructure

- Standardization and centralization of all workflow data system
- Globalization of technical support
- Allowing full integration from different sources
- Citrix environment



AGENDA

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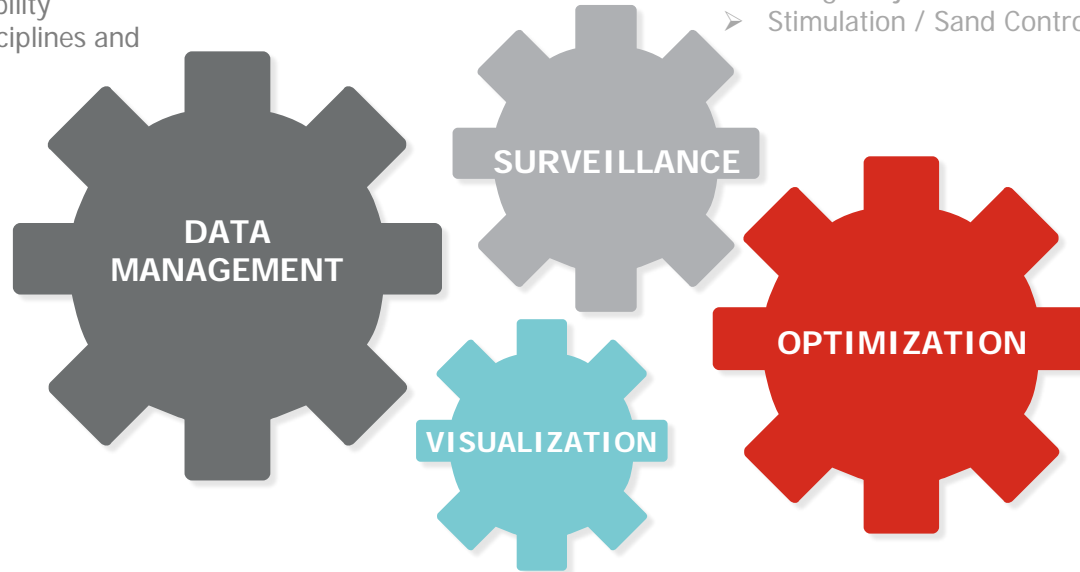
QUESTIONS



OBJECTIVES – PDMS

- Monitoring data capture and QA/QC
- Data Storage and accessibility
- Integration with other disciplines and applications

- Permanent well /Artificial Lift monitoring modeling and efficiency
- Permanent monitoring such as water injection and gas injection
- Stimulation / Sand Control



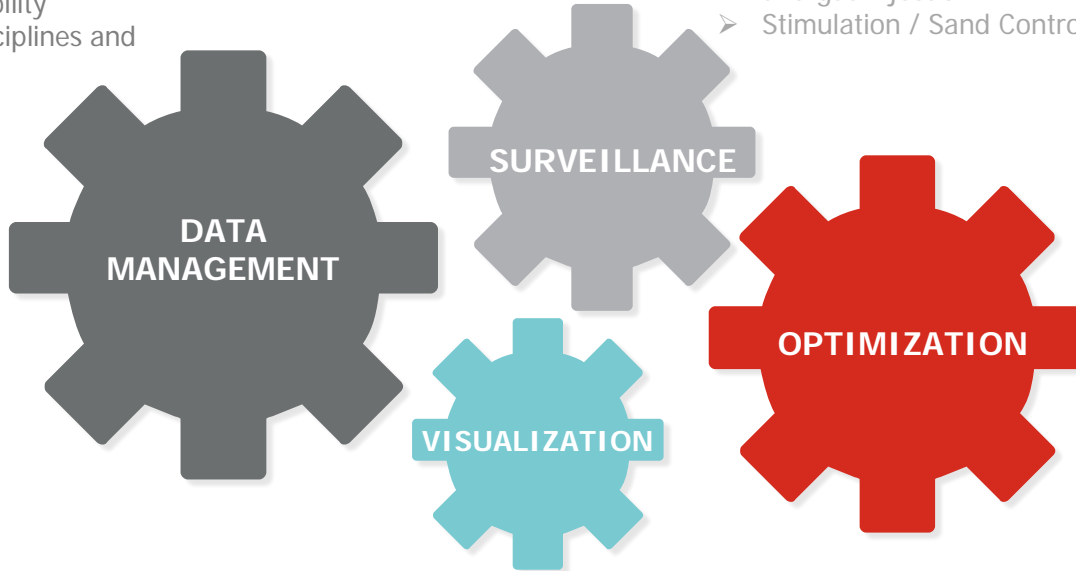
- Production
- Reporting (Trends analysis, KPI 's)
- Subsurface and facilities

- Integrated Asset Management
- Upstream and Downstream bottleneck issue
- Field development planning, production forecasting and simulations based on reliable data

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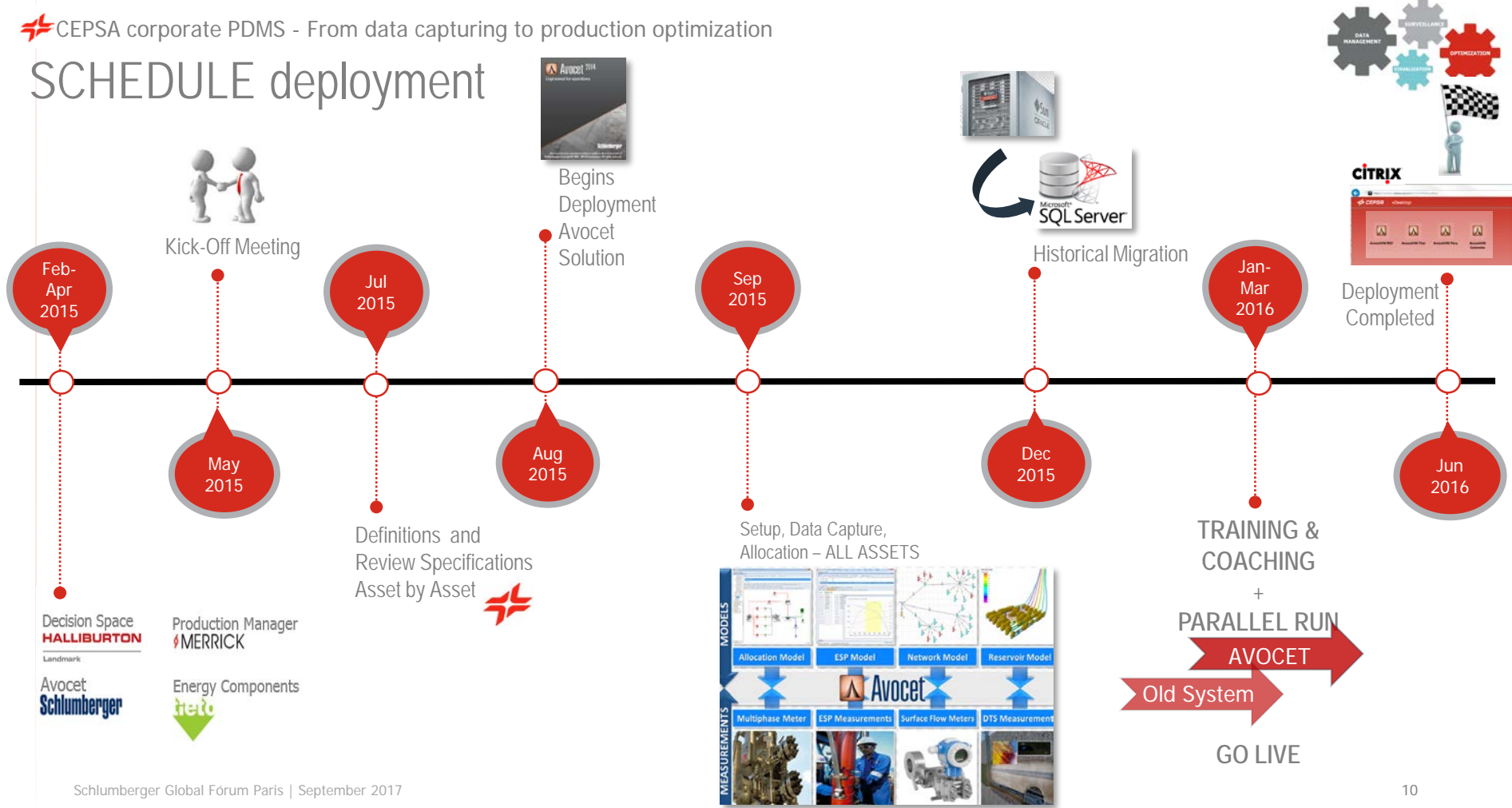
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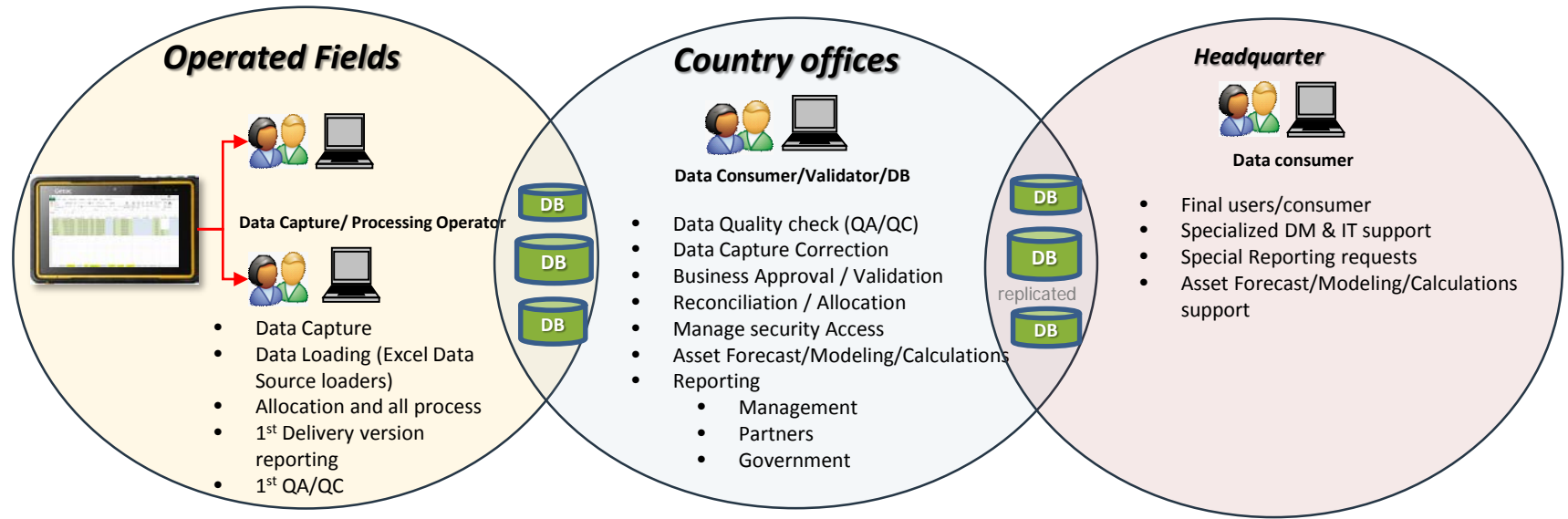


SCHEDULE deployment





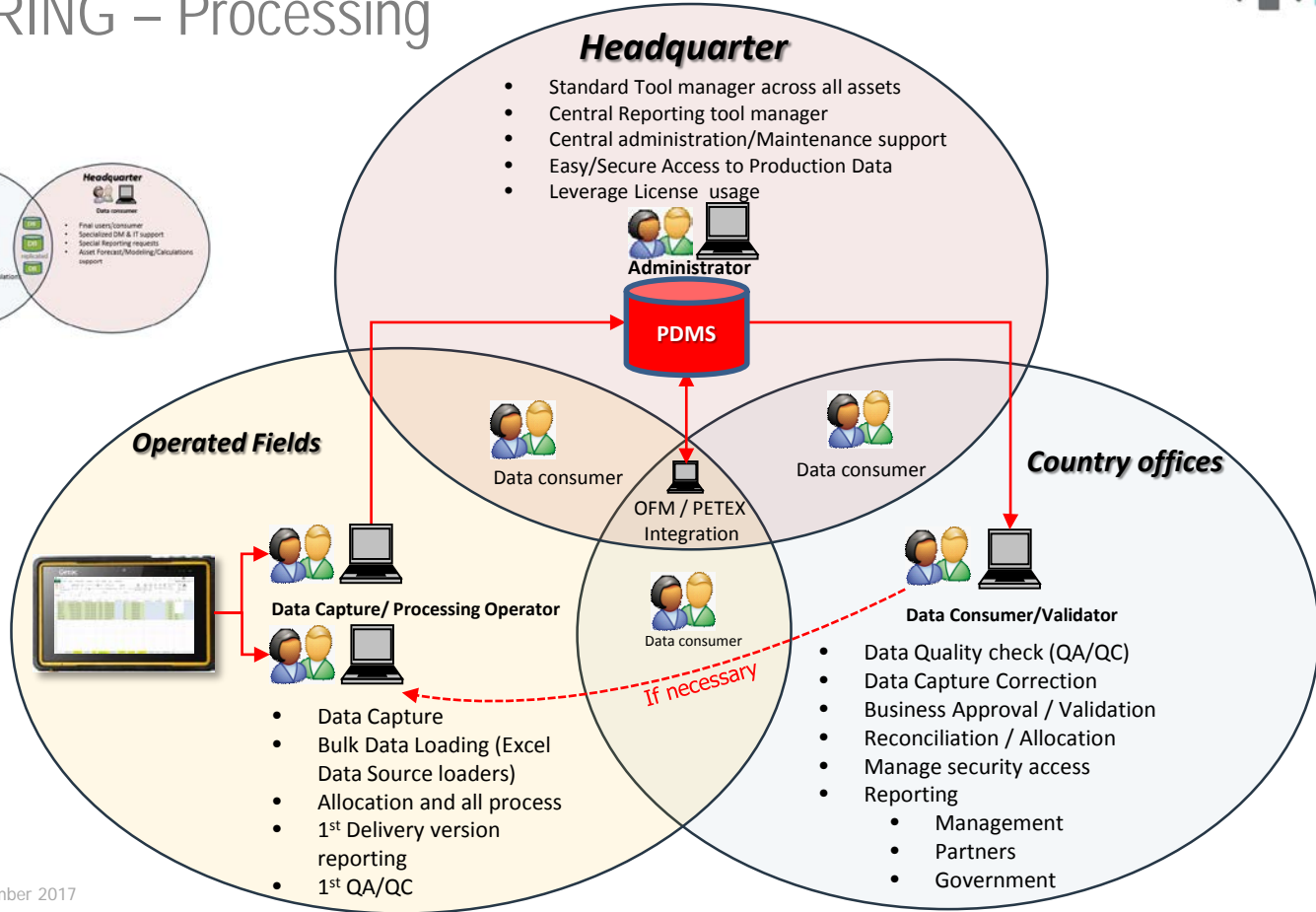
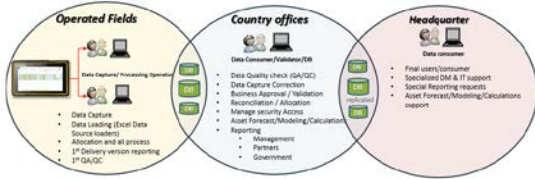
DATA CAPTURING – Processing Workflow





DATA CAPTURING – Processing

Old version





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TOWARDS THE PRODUCTION OPTIMIZATION - Improvements

DATA MANAGEMENT - SURVEILLANCE

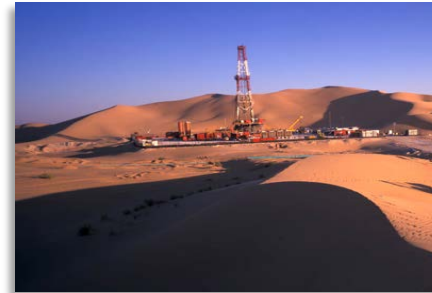
- Data QA/QC
- Permanent Production – Injection monitoring
- Artificial Lift Systems

VISUALIZATION

- Management on production downtime and losses
- Reporting
 - *Internal*
 - *Partners/Governments*

ASSET OPTIMIZATION

- PETEX Integration
- Digital Oil Field vision

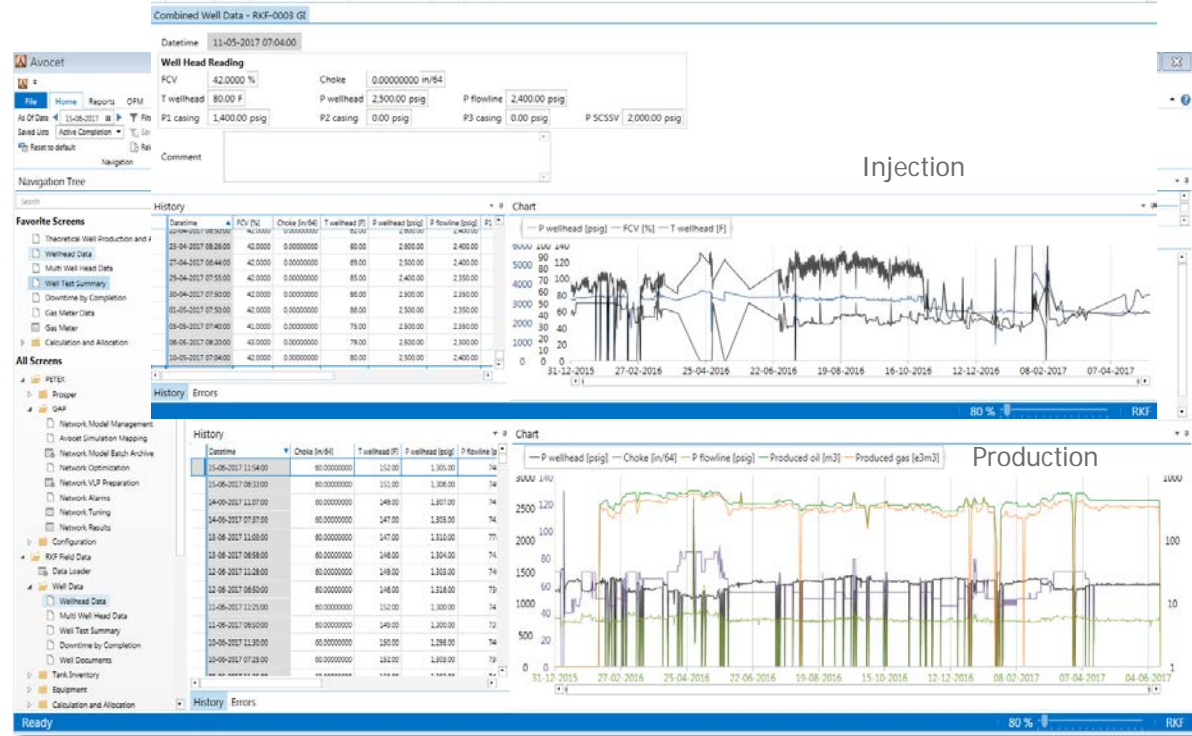




DATA MANAGEMENT - SURVEILLANCE

- Permanent graphical monitoring

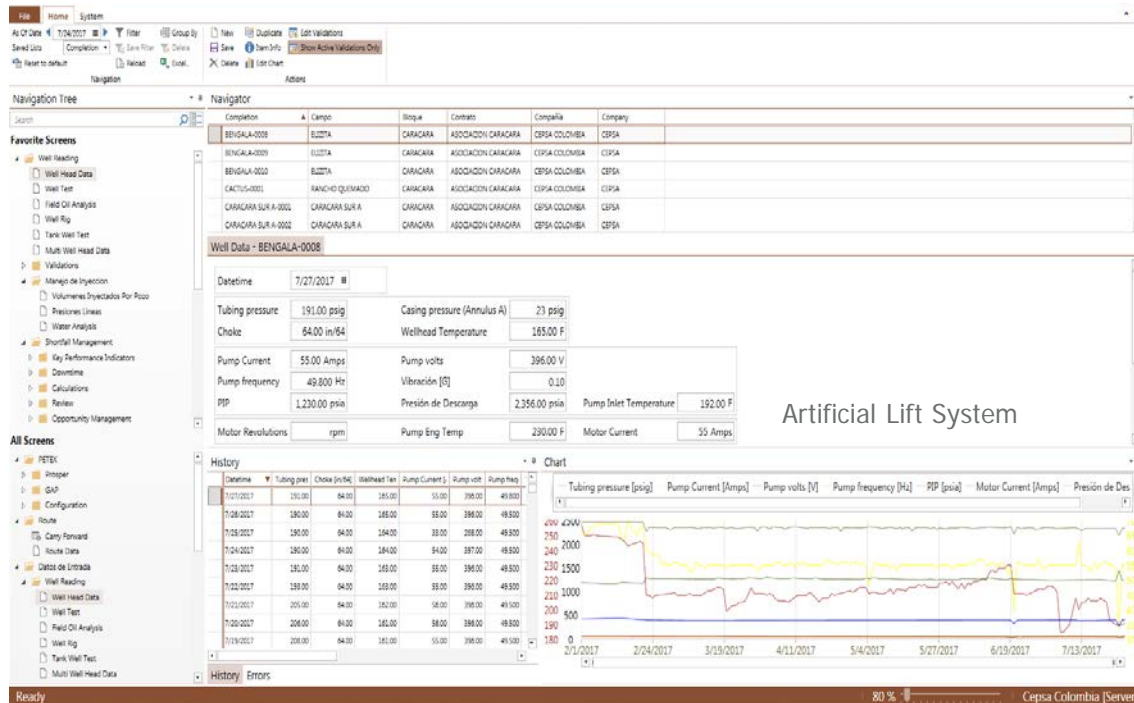
Production – Injection





DATA MANAGEMENT - SURVEILLANCE

- Permanent graphical monitoring Production – Injection
- Troubleshooting and monitoring artificial lift systems behaviors





DATA MANAGEMENT - SURVEILLANCE

- Permanent graphical monitoring Production – Injection
- Troubleshooting and monitoring artificial systems behaviors
- Appointed rule for QA/QC for data validations and verifications

Validation Error Acknowledgements

Date	Wellhead	Data Type	Data Property	Value	Status	Message
1-02-2017	RKF-0004	COMPLETION	Well Reading	Wellhead Pressure (Bar)	82.27	Value (82.27) is differs from the moving average (81.28) by 12.00%
2-04-2017	RKF-0004	COMPLETION	Well Reading	Wellhead Pressure (Bar)	78.32	Value (78.32) is differs from the moving average (81.27) by 13.52%
1-03-2017	RKF-0004	COMPLETION	Well Reading	Wellhead Pressure (Bar)	81.75	Value (81.75) is differs from the moving average (85.55) by 24.44%
01-02-2017	RKF-0004	COMPLETION	Well Reading	Wellhead Pressure (Bar)	84.23	Value (84.23) is differs from the moving average (81.61) by 10.05%

Well Head Reading

Wellhead	Pressure
Choke	60.00000000 in[64]
T wellhead	1.490.00 F
P wellhead	1.305.00
P1 casing	1.500.00 psig
P2 casing	200.00

History

Date	Choke [in[64]]	T wellhead [F]	P wellhead [psig]	Casing [psig]	P2 casing [psig]	P2 casing [psig]
01-06-2017 12:15:00	60.00000000	1500.00	730.00	1,500.00	20	20
01-06-2017 07:22:00	60.00000000	149.00	1,308.00	738.00	1,500.00	20
11-05-2017 12:00:00	60.00000000	149.00	1,308.00	738.00	1,500.00	20
01-06-2017 06:55:00	60.00000000	146.00	1,305.00	740.00	1,500.00	20
30-09-2017 12:18:00	60.00000000	147.00	1,310.00	738.00	1,500.00	20
29-05-2017 11:37:00	60.00000000	148.00	1,305.00	740.00	1,500.00	20
29-05-2017 08:00:00	60.00000000	149.00	1,297.00	738.00	1,500.00	20
28-05-2017 11:50:00	60.00000000	151.00	1,295.00	738.00	1,500.00	20
26-05-2017 06:30:00	60.00000000	150.00	1,305.00	737.00	1,500.00	20
27-05-2017 12:00:00	60.00000000	151.00	1,300.00	738.00	1,500.00	20

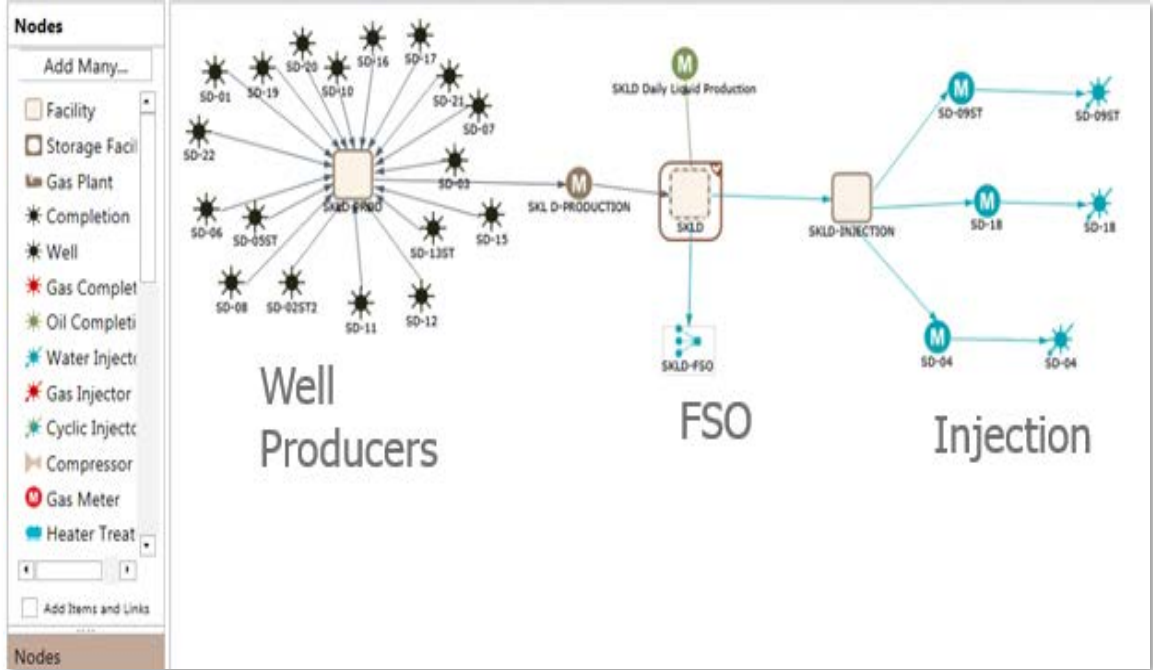
Chart

Legend: P wellhead [psig], Choke [in[64]], P flowline [psig], Produced oil [m3], Produced gas [e3m3]



DATA MANAGEMENT - SURVEILLANCE

- Permanent graphical monitoring Production – Injection
- Troubleshooting and monitoring artificial systems behaviors
- Appointed rule for QA/QC for data validations and verifications
- Subsurface and surface production and equipment behaviours





TOWARDS THE PRODUCTION OPTIMIZATION - Improvements

□ DATA MANAGEMENT - SURVEILLANCE

- Data QA/QC
- Permanent Production – Injection monitoring
- Artificial Lift Systems

□ VISUALIZATION

- Management on production downtime and losses
- Reporting
 - *Internal*
 - *Partners/Governments*

□ ASSET OPTIMIZATION

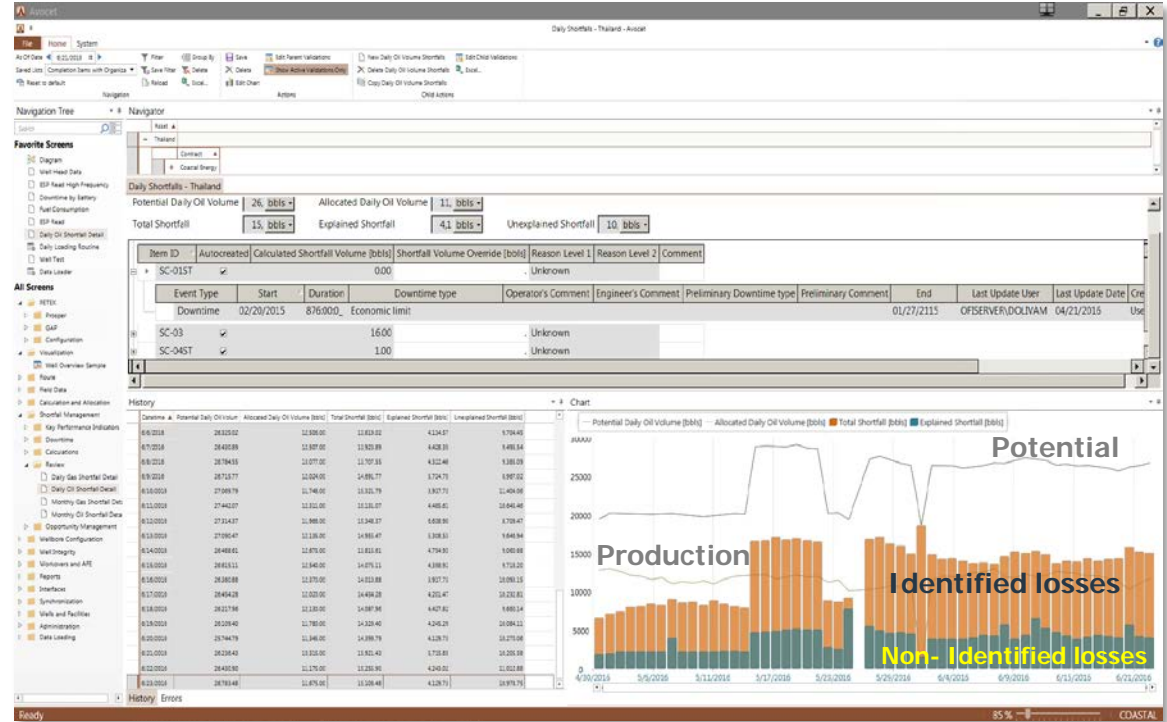
- PETEX Integration
- Digital Oil Field vision





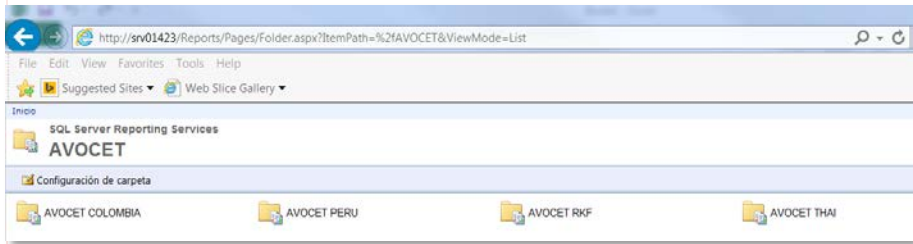
VISUALIZATION - SURVEILLANCE

- Production losses/downtime standardization
- Comparison between identified losses, non-identified, oil potential and real production in real time

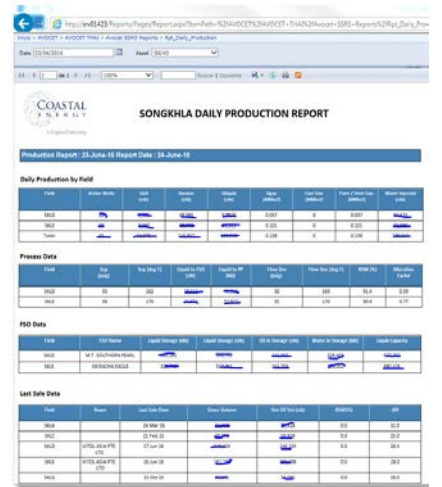
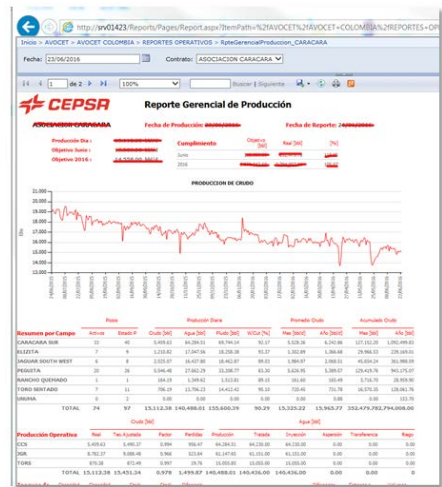
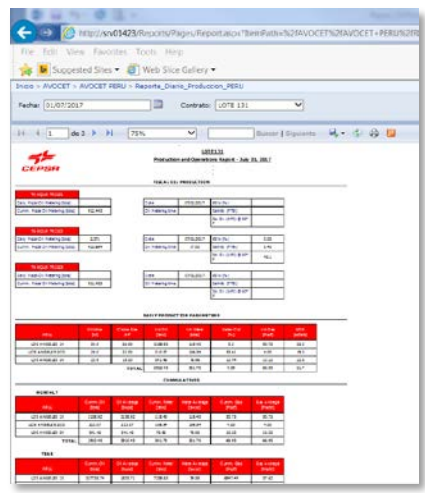




CORPORATE REPORTING – Visualization vía web



- Centralized reporting tool accessibility via Web. For internal corporates reports (KPIs and Dashboards)
- All levels data available, for technical and top management





INTERNAL REPORTING – Visualization vía web

KPIS MON

Year	Month	Monthly Target Oil Prod (bb)	Target
2016	January	48,300	48,300
2016	February	48,300	48,300
2016	March	48,300	48,300
2016	April	48,300	48,300
2016	May	48,300	48,300
2016	June	48,300	48,300
2016	July	48,300	48,300
2016	August	48,300	48,300
2016	September	48,300	48,300
2016	October	48,300	48,300
2016	November	48,300	48,300
2016	December	48,300	48,300

RKF DASHBOARD

Date	Oil (Allrd)	Target	Difference	GOR
01/05/2017	11,249,000	11,374,000	126,000	98.830
02/05/2017	10,902,000	11,374,000	472,000	95.853
03/05/2017	11,024,000	11,374,000	350,000	96.926
04/05/2017	10,894,000	11,374,000	480,000	95.776
05/05/2017	10,626,000	11,374,000	748,000	96.064
06/05/2017	11,083,000	11,374,000	291,000	97.446
07/05/2017	11,001,000	11,374,000	373,000	96.724
08/05/2017	11,233,000	11,374,000	141,000	98.766
Total Average	11,036,875	11,374,000	338,125	97.056
Total Sum	88,313,000	90,962,000	2,661,000	NA

Gas Balance

Date	Produced	Consumed
01/05/2017	43,300.81	1,830.00
02/05/2017	43,675.97	1,830.00
03/05/2017	43,614.23	1,830.00
04/05/2017	43,149.38	1,825.42
05/05/2017	43,914.59	1,824.79
06/05/2017	42,895.32	1,830.00
07/05/2017	42,980.98	1,830.00
08/05/2017	43,527.38	1,830.00

Daily Production

ASOCIACION CARACARA

Selected Fields: Various

Daily Oil Production - Multi

Production Losses

Total Production Losses by Category on Period (Itemized Reasons)

Category	Loss (bb)
Espora equipo	26,918.66
Defecto de fondo sistema extracción	11,616.74
Mejora o adecuación de instalación	7,495.37
Cambio por producción arena	6,773.81
Corte columna ténica	6,200.18
Piso productor en workover	4,418.32
Apretamiento sistema de extracción	3,214.08
Acción protecciones	2,761.86
Desp. de tablero o variador de electrosuministro	1,325.88
Cambio bomba de profundidad	1,276.24
Espora u opera unidad de coiled tubing	626.63
Falta capacidad de instalaciones internas	635.30

Comparative Chart - Current vs Prior Year, by Month

Production Losses on Last Year



TOWARDS THE PRODUCTION OPTIMIZATION - Improvements

□ DATA MANAGEMENT - SURVEILLANCE

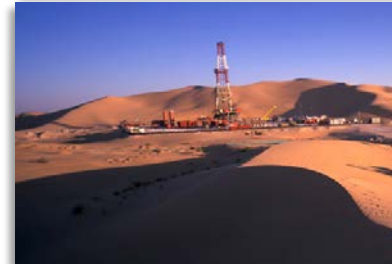
- Data Capture -> Database
- Data QA/QC
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PETEX INTEGRATION - Processing

- Standard workflows for all units
- Workflows accessible from all assets using Avocet (in-situ) with real data up to date
- Permanent collaboration from Headquarter

All Screens

- PETEX
 - Prosper
 - Batch Model Upload
 - Well Model Management
 - Threshold
 - Depth Reading
 - Tolerance
 - Well Performance Workflow
 - Well Performance
 - PCP Read
 - GL Read
 - GL Comp Analysis
 - Well Performance Alarm
 - Well Model Batch Archive
 - GAP
 - Network Model Management
 - Avocet Simulation Mapping
 - Network Model Batch Archive
 - Network Optimization
 - Network VLP Preparation
 - Network Alarms
 - Network Tuning
 - Network Optimization Results
 - Configuration

Datetime: 1/1/2008 00:00:00 Last Update User: 11315M Last Update Date: 10/17/2016 16:49:53

Divergence Comparison			
Liquid Rate	3,563.47 bbl/d	Actual Liquid Rate	3,363.24 bbl/d
Oil Rate	352.32 bbl/d	Actual Oil Rate	369.95 bbl/d
Gas Rate	11.87 mcf/d	Actual Gas Rate	11.20 mcf/d
Water Rate	1,685.26 m³/d	Actual Water Rate	2,005.23 m³/d
POP	1,007.09 psia	Actual POP	1,246.38 psia
PCP	2,376.62 psia	Actual PCP	1,821.71 psia
FBHP	1,127.88 psia	Actual FBHP	1,177.18 psia
3-Divergent	<input checked="" type="checkbox"/>		

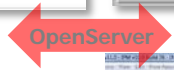
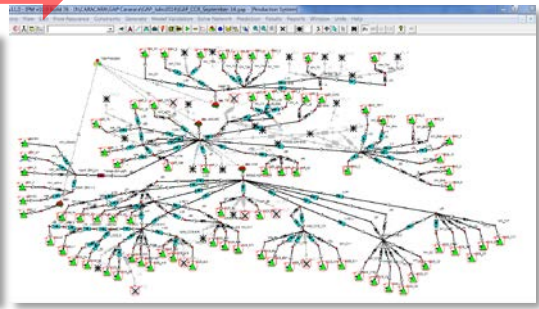
Calibration Parameters			
Reservoir Pressure	2,000.00 psia	Tubing Head Pressure	196.90 psia
Reservoir Temperature	180.00 F	GOR	0.0302 / mcf/bbl
Productivity Index	0.00 bbl/(d·psi)	Water Cut	88.99 %
FBHP	1,127.16 psia	Tubing Head Temperature	131.00 F
DPM Model	Vogel	ESP Frequency	59.00 Hz
		Pump Wear Factor	0.00

Divergent

Well	Flow	Rate	Pressure	Temperature	GOR	Water Cut	FBHP	PCP	POP	3-Divergent
EPA2	SP1	Water	1819	530.3	3918	2814	1320	1147		400
EPA2	SP1	Brine	2418	420.3	4214	1717	1320	1147	1201	400
EPA2	SP1	Offshore	2181	2001	3811	3811	1011	1011		1011
EPA2	SP1	1-w	1819	530.3	3918	2814	1320	1147		400

Non-Divergent

Well	Flow	Rate	Pressure	Temperature	GOR	Water Cut	FBHP	PCP	POP	3-Divergent
EPA2	SP1	Water	1819	438.0	1252	3713	1320	1147		910
EPA2	SP1	Brine	3110	537.4	1458	1814	1320	1147	1147	910
EPA2	SP1	Offshore	2181	2001	3811	3811	1011	1011		1011
EPA2	SP1	1-w	2212	438.0	1252	3713	1320	1147		910



PETEX INTEGRATION – Results/Optimization

Network Optimization Scenario - GAP NETWORK

Datetime: 25-05-2017
Scenario Name: Caso Base
Optimizer Mode: **No Opt Mode**

- No Opt Mode
- Rule Based
- With All Constraints
- With Potential Constraints Only

History

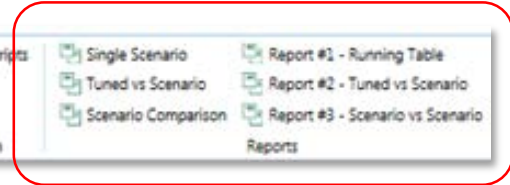
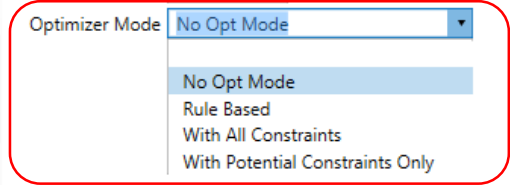
Datetime	Scenario Name	Optimizer Mode
25-05-2017	Caso Base	No Opt Mode

As Of Date: 15-06-2017

Tools | Design

Single Scenario | Report #1 - Running Table
Tuned vs Scenario | Report #2 - Tuned vs Scenario
Scenario Comparison | Report #3 - Scenario vs Scenario

Reports





PETEX INTEGRATION – Results/Optimization

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Datetime	Scenario Name	Optimizer Mode
25-05-2017	Caso Base	No Opt Mode

Network	Scenario	Optimization Mode								
Testing_Opt1_ESP_PCPFrequency	v1	With All Constraints								
Scenario Name	Separator	Liquid Rate (bb/d)	Oil Rate (bb/d)	Gas Rate (Mc/d)	Water Rate (bb/d)	Pressure (psia)				
v1	SEPARATOR	24997.7	15096.28	32715.84	9901.42	59.7				
Well	Scenario Name	THP (psia)	Liquid Rate (bb/d)	Oil Rate (bb/d)	Water Rate (bb/d)	Gas Rate (Mc/d)	Water Cut (%)	GOR (1000t3/bbl)	FBHP (psia)	Pi ((bbl/d)/psi)
ESP-01	v1	186.95	2696.81	296.65	2400.16	8.9	89	0.03	1643.04	6.88
ESP-02	v1	230.16	5548.56	1553.6	3994.96	46.61	72	0.03	1477.27	8.98
ESP-03	v1	204.59	3582.07	322.39	3259.68	9.67	91	0.03	1529.15	6.33
GL-01	v1	134.52	3268.72	3268.72	0	454.03	0	0.1389	482.35	101.02
NF-01	v1	989.44	1772.18	1536.66	235.52	21440.96	13.29	13.953	2275.7	0.99
NF-02	v1	970.61	2407.44	2396.37	11.07	5724.92	0.46	2.389	3369.22	2.86
NF-03	v1	971.35	4059.71	4059.71	0	4879.78	0	1.202	3807.23	8
PCP-01	v1	83.82	1661.83	1661.83	0	149.56	0	0.09	518.63	8.09

As Of Date: 15-06-2017

Tools: Edit Scripts

Design: Single Scenario, Report #1 - Running Table, Tuned vs Scenario, Report #2 - Tuned vs Scenario, Scenario Comparison, Report #3 - Scenario vs Scenario

Reports

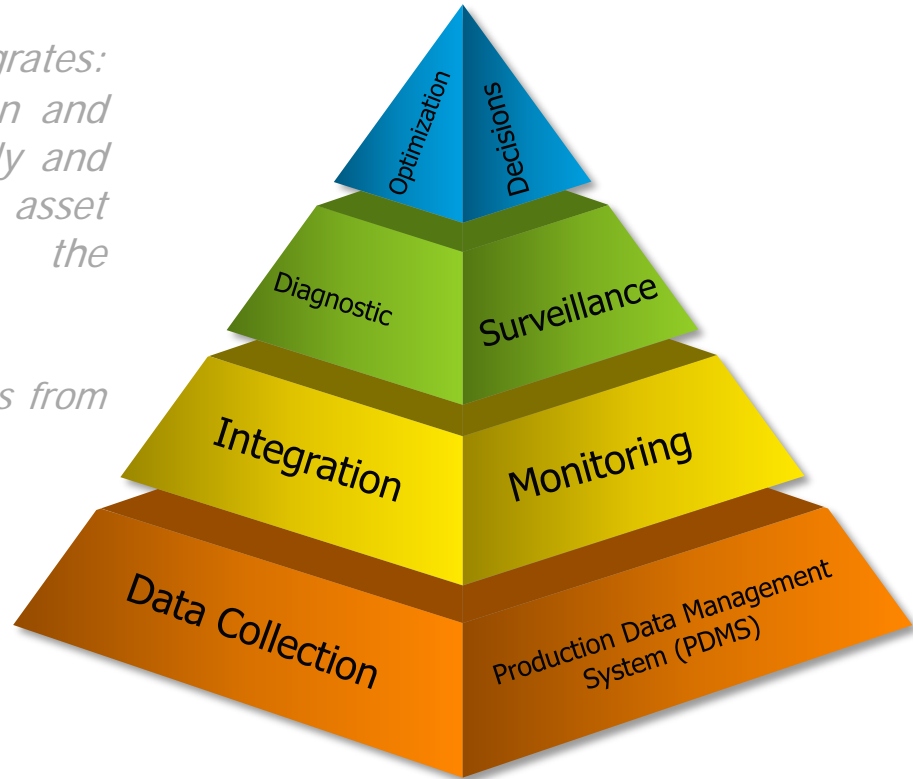
Network	Scenario Name	Date	Optimization Mode													
Testing_Opt1_ESP_PCPFrequency	v1	05/05	With All Constraints													
SEPARATOR (3 Items)				Type	Liquid Rate (bb/d)	Oil Rate (bb/d)	Gas Rate (Mc/d)	Water Rate (bb/d)	Pressure (psia)							
				Tuned	28715.16	15420.79	32723.63	13212.37	59.7							
				Opt Scenario - v1	24997.7	15096.28	32715.84	9901.42	59.7							
				Difference (%)	12.94	2.1	0.08	25.51	0							
ESP-01 (3 Items)				Type	WHP (psia)	Liquid Rate (bb/d)	Oil Rate (bb/d)	Water Rate (bb/d)	Gas Rate (Mc/d)	Water Cut (%)	GOR (1000t3/bbl)	FBHP (psia)	Pi ((bbl/d)/psi)	ESP Frequency (Hz)	ESP PAP (psia)	ESP PDP (psia)
				Tuned	244.96	4200.18	462.44	3737.74	13.87	88.99	0.03	1424.71	6.88	40	1304.33	2276.01
				Optimization	186.95	2696.81	296.65	2400.16	8.9	89	0.03	1643.04	6.88	30	1522.49	2156.69
				Difference (%)	23.64	35.79	35.85	35.79	35.83	0.01	0	15.32	0	25	16.79	5.24
ESP-02 (3 Items)				Type	WHP (psia)	Liquid Rate (bb/d)	Oil Rate (bb/d)	Water Rate (bb/d)	Gas Rate (Mc/d)	Water Cut (%)	GOR (1000t3/bbl)	FBHP (psia)	Pi ((bbl/d)/psi)	ESP Frequency (Hz)	ESP PAP (psia)	ESP PDP (psia)
				Tuned	262.1	5555.34	1493.89	3541.44	44.82	72	0.03	1500.99	8.98	50	1247.88	2182.65
				Optimization	230.16	5548.56	1553.6	3994.96	46.61	72	0.03	1477.27	8.98	50.342	1234.17	2135.76
				Difference (%)	18.41	4	4	4	3.99	0	1.58	0	0.88	1.8	2.15	
ESP-03 (3 Items)				Type	WHP (psia)	Liquid Rate (bb/d)	Oil Rate (bb/d)	Water Rate (bb/d)	Gas Rate (Mc/d)	Water Cut (%)	GOR (1000t3/bbl)	FBHP (psia)	Pi ((bbl/d)/psi)	ESP Frequency (Hz)	ESP PAP (psia)	ESP PDP (psia)
				Tuned	292.56	6007.23	545.65	5466.58	16.22	91	0.03	1146.26	6.33	50	817.72	2157.85
				Optimization	204.59	3582.07	322.39	3259.68	9.67	91	0.03	1529.15	6.33	33.653	1203.57	1989.91
				Difference (%)	30.07	40.37	40.37	40.37	40.38	0	33.4	0	32.69	47.19	7.78	



THE FOUNDATION FOR DIGITAL OIL FIELD

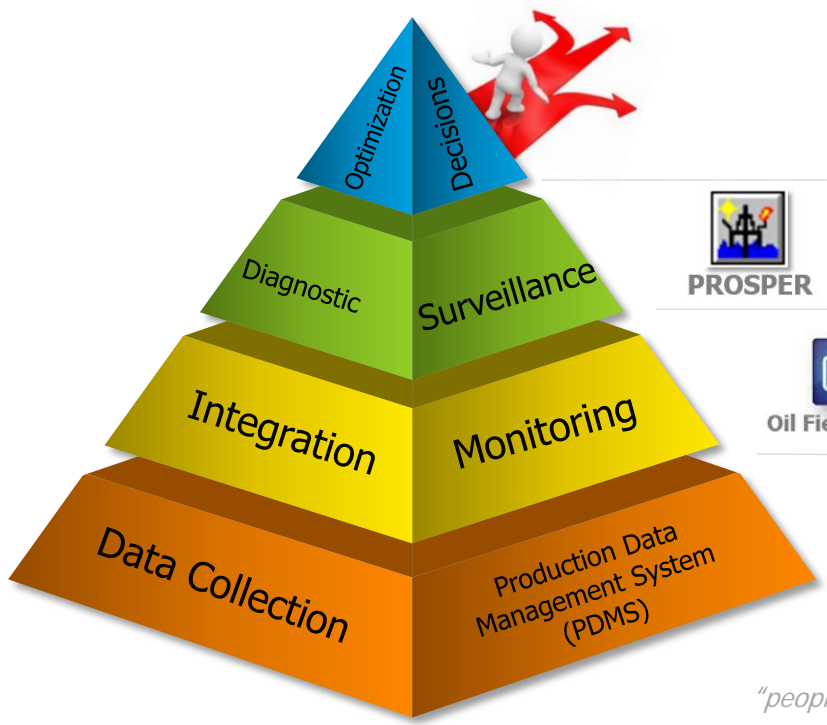
“The DOF is the solution that integrates: technology, people, process & organization and information, using online data to efficiently and effectively maximize oil and gas asset performance and value throughout the production life cycle”

Source: David Rossi – DOF Maximizing values from online data – Feb 2016





THE FOUNDATION FOR DIGITAL OIL FIELD



"people, process & organization, information, technology"



AGENDA

BACKGROUND

- CEPSA IN THE WORLD
- IT INFRASTRUCTURE

OBJECTIVES

DEPLOYMENT

- DATA CAPTURING-PROCESSING WORKFLOW

TOWARDS PRODUCTION OPTIMIZATION

CONCLUSIONS

QUESTIONS





CONCLUSIONS

- ❑ Successfully deployed within budget and schedule.
- ❑ Objectives achieved in terms of: centralized storage and repository, QA/QC, reporting centralization and visualization at all levels, integration with software beyond Schlumberger products, automation of analysis and surveillance, improved response for changing well – facilities behaviors/conditions.
- ❑ Cepsa gained in security, consistency and integrity of the data besides cost reduction within a robust system architecture.
- ❑ The benefits are across all E&P units: Production, Reservoir, G&G, finance and top management, based on data reliable and available.
- ❑ Centralization on data monitoring allow quick identification of field issue such as, subsurface and surface production constraints and bottlenecks.



THANKS FOR YOUR ATTENTION!

QUESTIONS?



CEPSA