Enabling Delek's Digital Transformation with the Enterprise Agreement (EA)

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Director, Training & Operational Excellence

Telling Our Story…

- Delek US at a Glance
- Our Journey to an Enterprise Agreement (EA)
- Delek US PI System Highlight Reel
- Best Practices & Lessons Learned
- Continuing our Digital Transformation Journey
- Summary

Delek US HQ – Brentwood, TN.

Delek US Holdings:

- ***2 Refineries @155K BPD***
  - El Dorado, AK; Tyler, TX.
- ***Logistics (Crude/Product)***

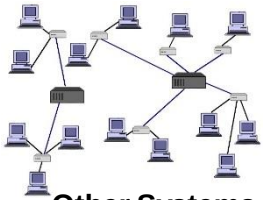
Acquired Alon USA 7/1/2017

- ***2 Refineries @ 147K BPD***
  - Big Spring,TX; Krotz Springs, LA.
- ***14 Asphalt Terminals***

Delek US Holdings at a Glance…

High-level PI System Positioning

PI System Visualization



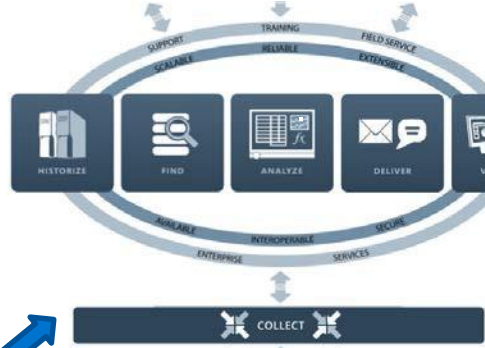
Other Systems

Other DBs

Other data Sources

Spreadsheets

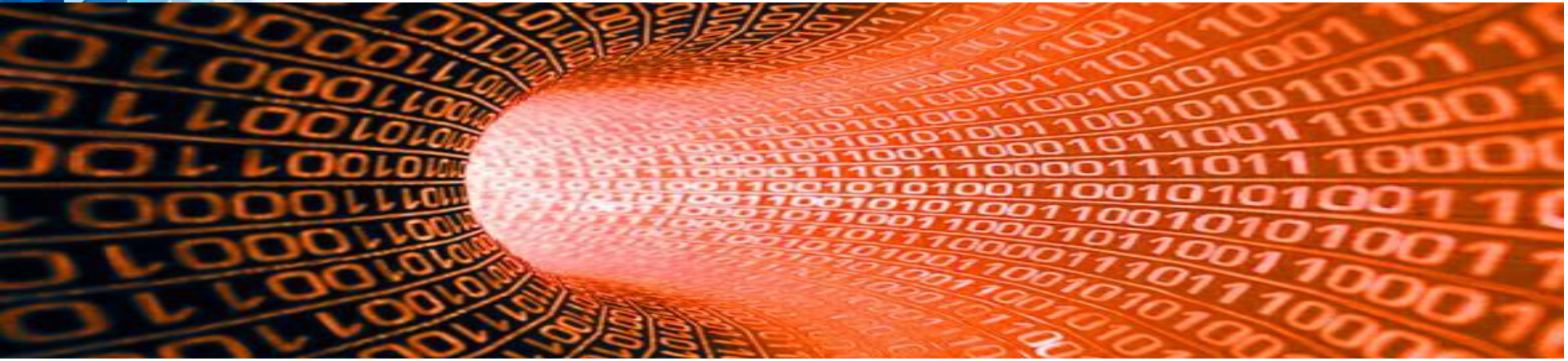
LIMS



Tyler

El Dorado

Logistics



Our main focus was the digital transformation.

What does that mean?

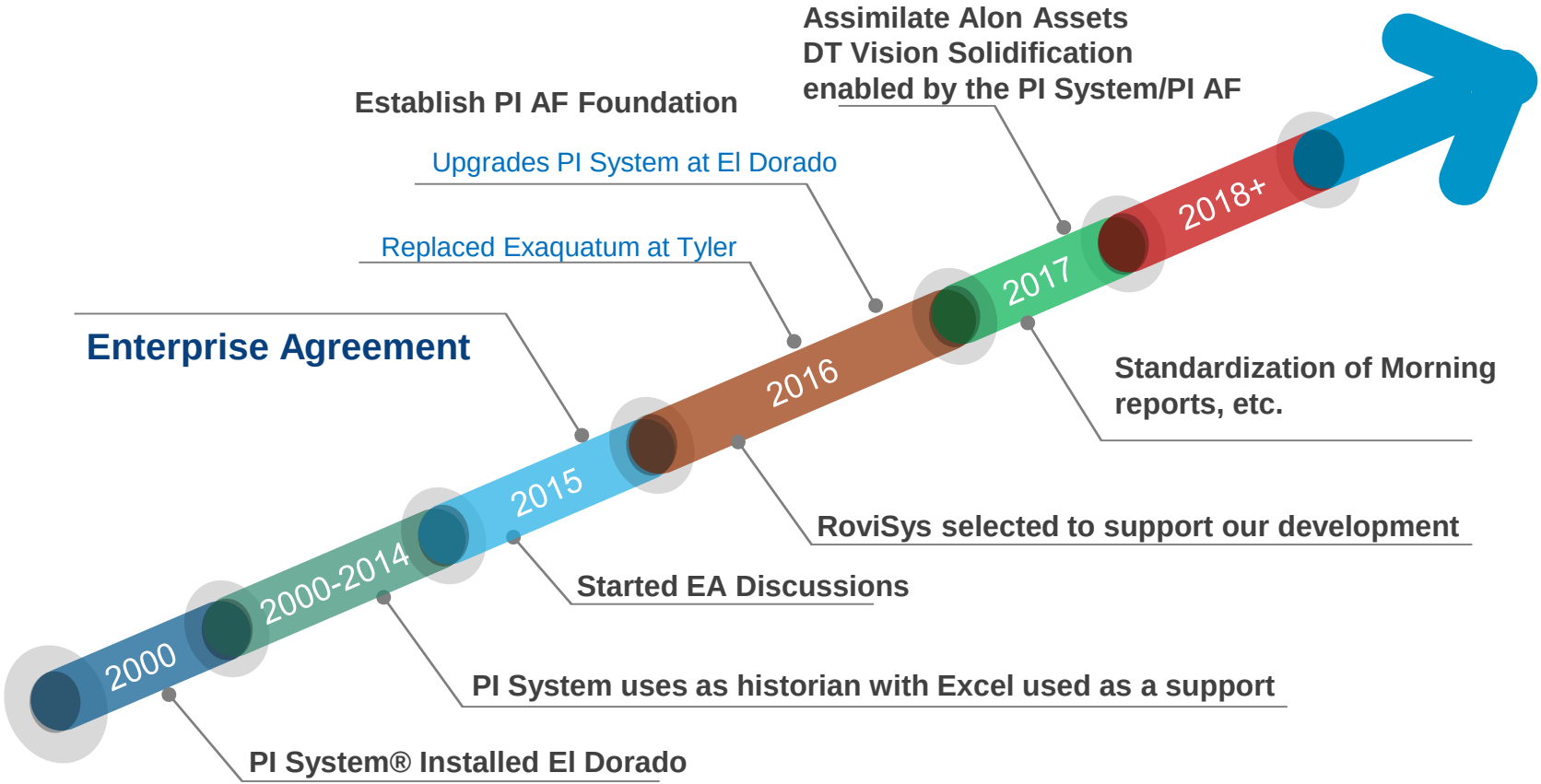
According to Wikipedia: **Digital transformation** is the change associated with the application of digital technology in all aspects of human society.

Digital transformation may be thought of as embracing digital technologies:

digital competence → digital usage → digital transformation

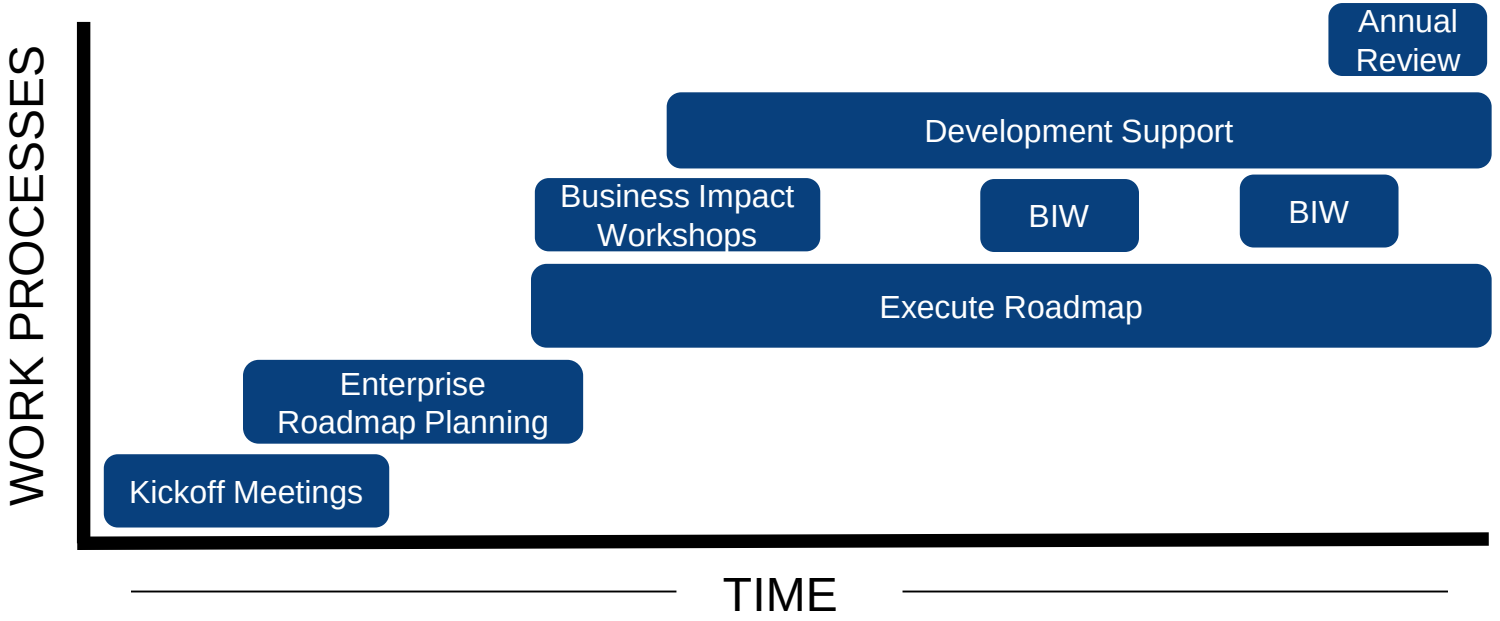
Our Journey to an Enterprise Agreement (EA)

Our Journey to an Enterprise Agreement & Beyond

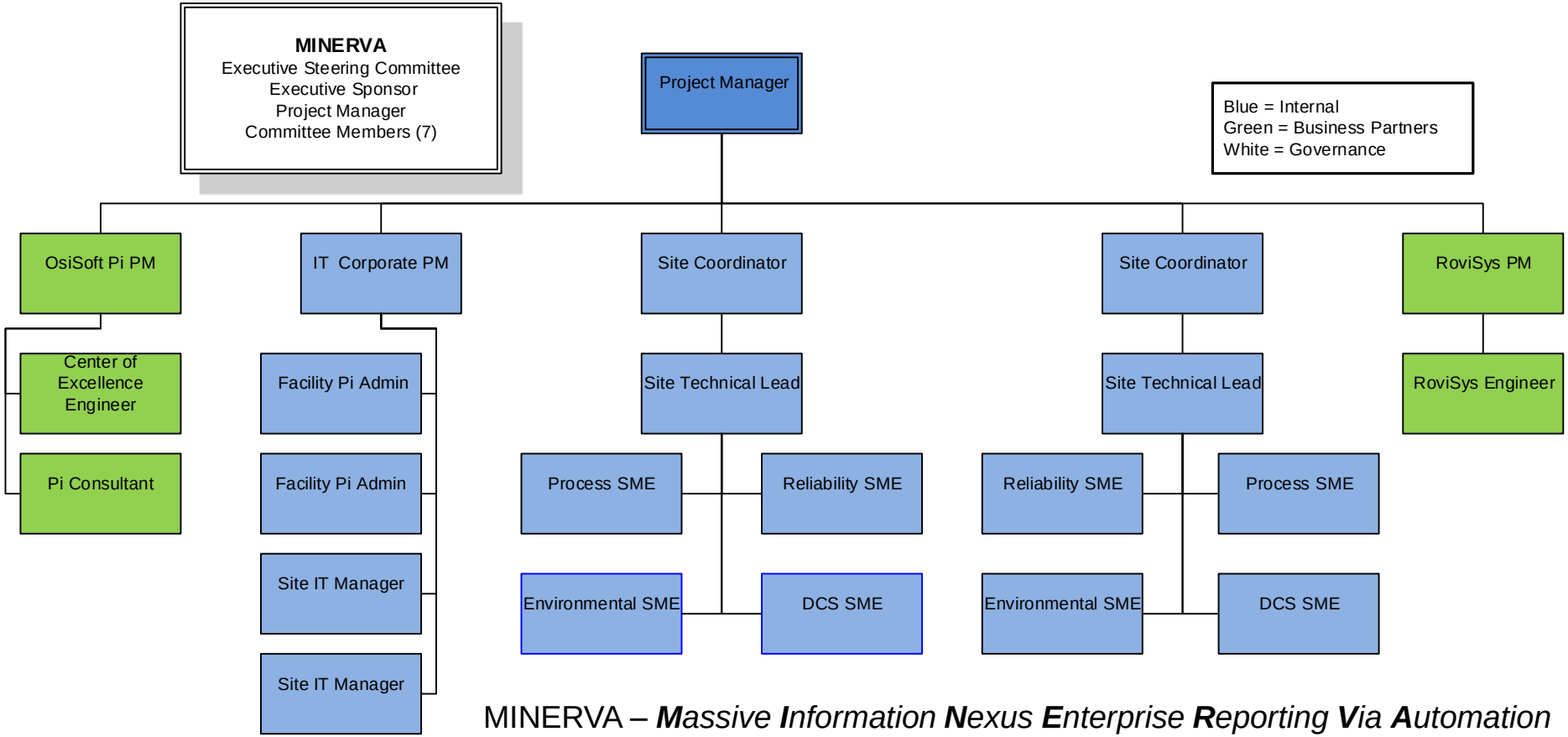


Why the Enterprise Agreement (EA)?

We needed a structured approach . . .

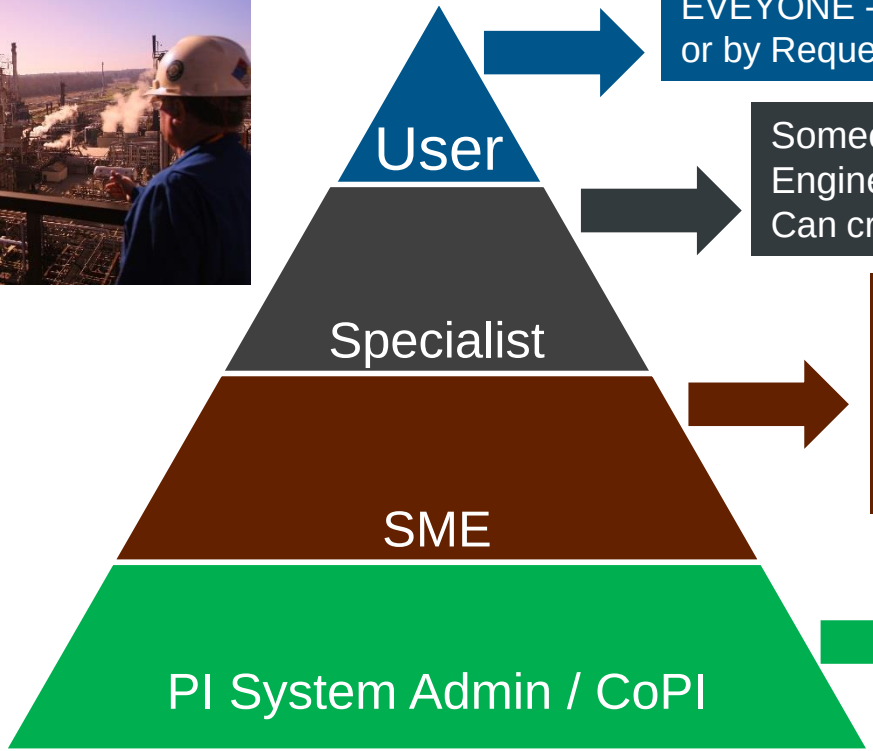


MINERVA COMMITTEE SUPPORT "*ROLES*"



MINERVA – ***M**assive **I**nformation **N**exus **E**nterprise **R**eporting **V**ia **A**utomation*

Minerva Utilization – Training Levels



EVEYONE - Minimal training required. Online Resources or by Request

Someone who works in the System. Process Engineers, Analyst. Trained in both intro classes. Can create and share tools.

A specialist that gets to the next level. The go-to person in the department. Trained in both intro classes. Proficient in tool creation. Can train Users and assist Specialist.

Coordinators of Process Information – full time in Minerva / PI System Expert Level Training Three weeks classroom Six Months Full Time Experience

Challenges we had to Overcome

- Prior Processes vs. Future Processes
- Scope Creep – what we didn't know using the PI System
- Communication – who was responsible / assumptions
- Understanding of strategy and getting individuals and team alignment
- Ownership of future processes

DELEK Highlight Reel

Crude

	Target	Now	Last 24	WTD
Charge (R1/R2/R3)	56,000	56,419	55,403	55,593
LSR Yield	6,000	2,425	2,711	2,669
Preflash Naphtha Yield	7,000	4,238	3,153	3,181
SR Naphtha Yield	11,000	7,628	7,530	7,585
Kerosene Yield	11,000	11,154	11,053	11,028
ATM Diesel Yield	17,500	9,478	9,710	9,524
AGO Yield	4,000	181	194	197
Crude Heater Outlet	690.00	661.82	661.48	662.82
Atm Heater Duty	135.00	129.13	139.19	129.46
Crude Charge Gravity	38.30	35.60	35.48	35.11
Unstab LSR Dry Point	175.00	171.50	173.64	174.75
Stab LSR RVP	15.50	15.50	15.44	15.53
PF Naphtha 90%	280.00	279.90	273.32	279.32
SR Naphtha 90%	280.00	281.70	280.80	285.17
Kerosene 90%	480.00	484.30	479.54	487.36
Atm Diesel 90%	620.00	614.50	618.25	618.23

Vacuum

	Target	Now	Last 24	WTD
Vac Charge	26,000	24,635	25,446	25,706
Vac Diesel Yield	4,000	1,843	1,855	1,847
HVGO Yield	16,000	15,395	14,844	14,325
VTB Yield	5,750	12,205	13,301	14,203
Vacuum Tower Pressure	35.00	48.02	47.89	45.94
Heater Outlet	760.00	760.24	750.55	743.19

DHT

	Target	Now	Last 24	WTD
Total Charge	28,000	26,193	24,018	24,460
LCO Charge	4,000	2,125	1,639	1,591
Stripper Overhead Naphtha	500.00	536.56	411.86	617.63
ULSD Yield	27,184	11,481	11,495	11,434
Heater Outlet	665.00	639.28	631.56	633.56
Heater Duty	20.00	42.37	35.98	38.05
Naphtha 90%	320.00	303.60	302.11	310.41
ULSD 90%	590.00	590.90	590.02	590.42
ULSD Sulfur	8.00	9.35	6.78	6.42
ULSD Flash	140.00	142.00	147.27	149.82
ULSD Cloud	11.00	4.00	4.00	4.10
ULSD Haze	1.00	1.00	1.00	1.00
ULSD Pour Point	1.00	0.00	0.00	0.00

MSAT

	Target	Now	Last 24	WTD
Charge	20,000	12,801	12,015	11,824
Overhead Yield	3,000	4,402	4,330	4,296
Bottoms Yield	17,000	8,392	8,272	8,200
Benzene	0.20	0.00	0.00	0.00
Cyclohexane	0.40	0.00	0.00	0.00

Typical Mass Balance Screen

Refinery Overview | Safety | Environmental | Maintenance & Reliability | Operations | Inventories | Production & Sales | Expenses | Economics | Yields

Mass Balance | Yields | KPI | Crude/Vac | Sat Gas | NHT/Plat | FCCU | DHT | Alky | GHT | LNHT/Penex | Asphalt

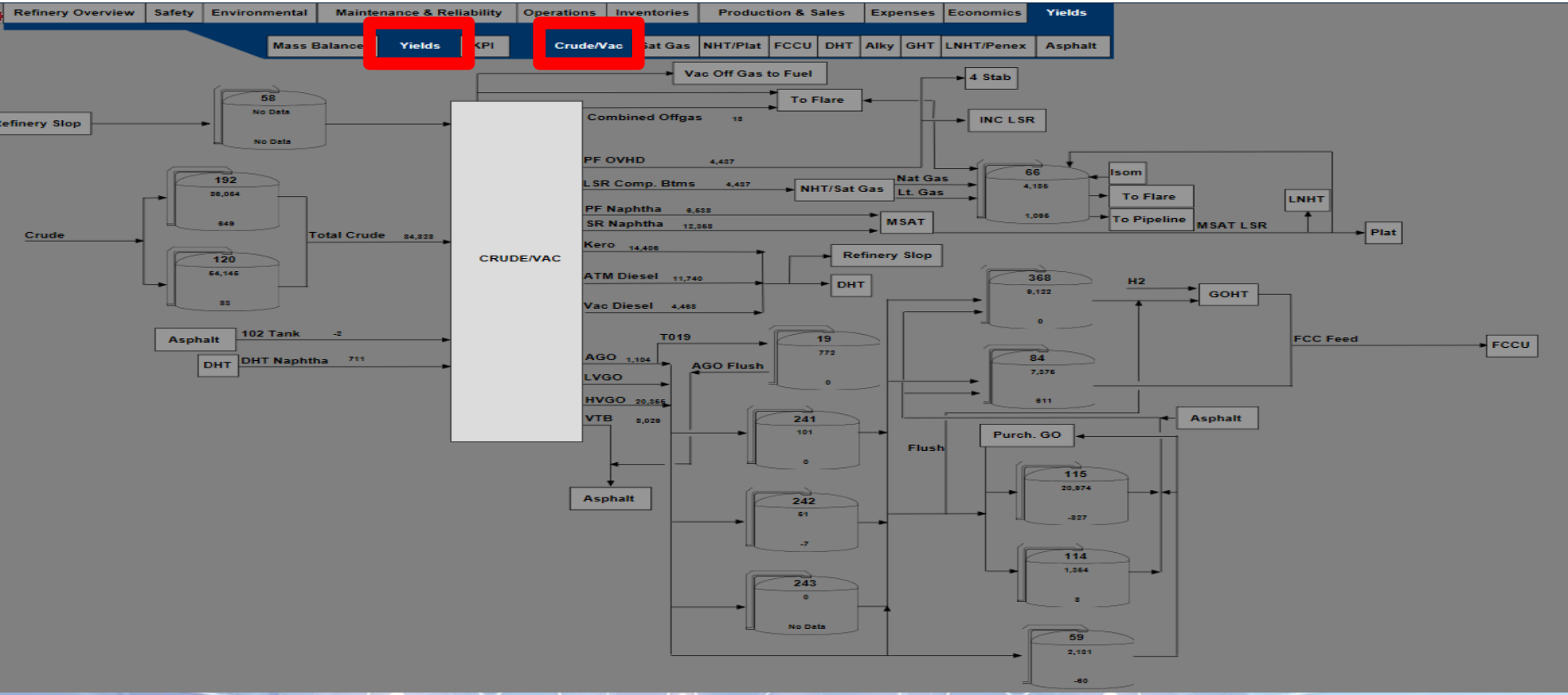
Inputs

	Actual Data								Normalized Daily Data				Normalized MTD Data			
	Flow	API Gravity	Mol Wt	Temp	Pressure	Mass (lb/hr)	wt%	Liq Vol%	Flow	Mass (lb/hr)	wt%	Liq Vol%	Flow	Mass (lb/hr)	wt%	Liq Vol%
Crude Oil (Minus BS&W)	76,938	42.37	--	84.00	--	913,414	98.68%	98.52%	76,938	913,414	98.63%	98.52%	76,787	909,364	98.26%	98.08%
DHT Excess LPG	652	64.80	--	84.44	--	6,858	0.74%	0.84%	652	6,858	0.74%	0.84%	792	8,267	0.89%	1.01%
Naphtha from Tk 163	503	63.36	--	84.00	--	5,327	0.58%	0.64%	503	5,327	0.58%	0.64%	712	7,876	0.85%	0.91%
Topped Crude from Storage	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inputs	78,093					925,599	100.00%	100.00%	78,093	925,599	99.95%	100.00%	78,292	925,506	100.00%	100.00%

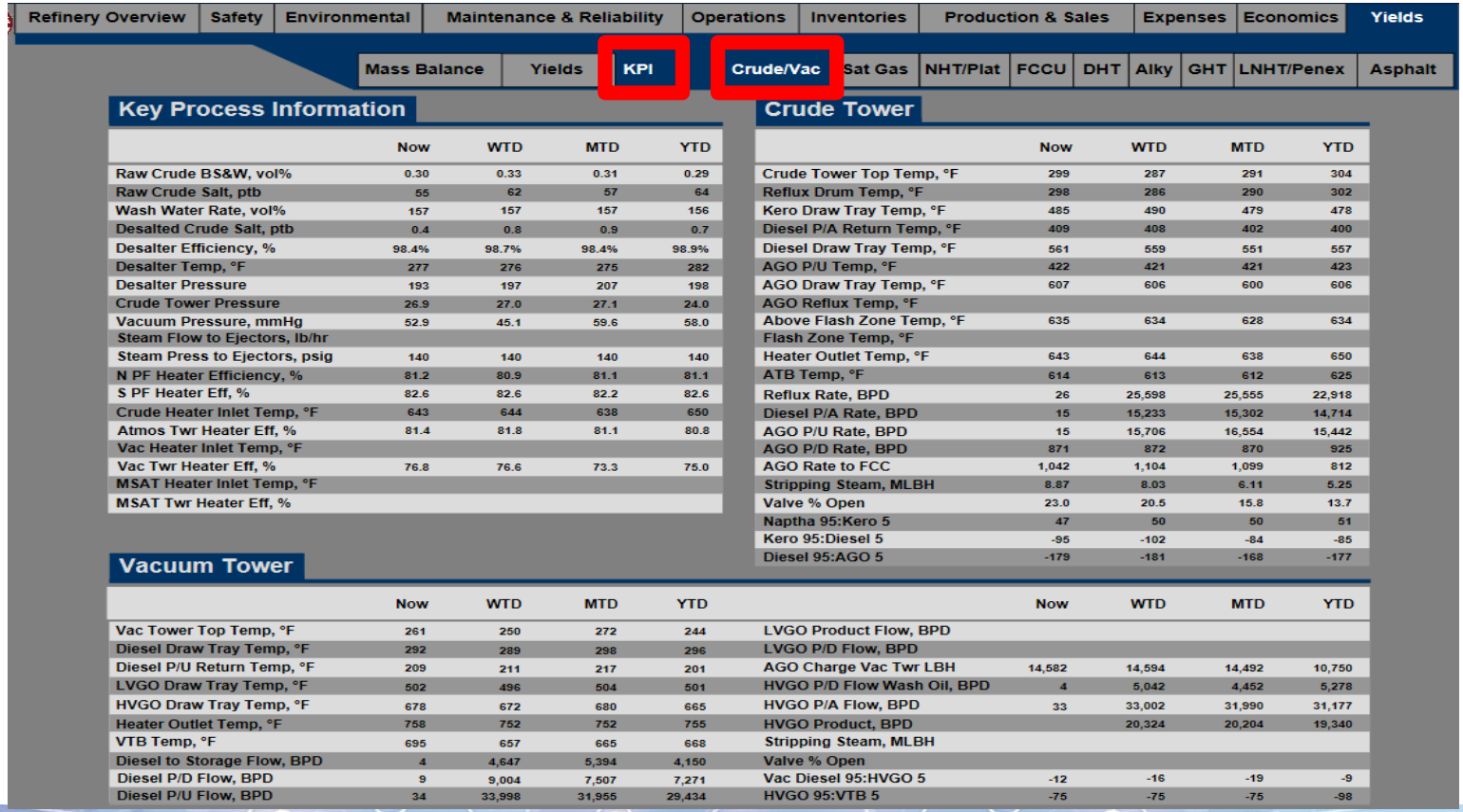
Outputs

	Actual Data								Normalized Daily Data				Normalized MTD Data			
	Flow	API Gravity	Mol Wt	Temp	Pressure	Mass (lb/hr)	wt%	Liq Vol%	Flow	Mass (lb/hr)	wt%	Liq Vol%	Flow	Mass (lb/hr)	wt%	Liq Vol%
Atmos Tower Offgas	184	--	35.02	111.94	167.2	714	0.08%	--	58	721	0.08%	--	60	746	0.08%	--
Vacuum Tower Offgas	163	--	39.25	91.00	1.5	703	0.08%	--	59	710	0.08%	--	86	1,035	0.11%	--
Preflash Naphtha to Sat Gas	15,398	66.84	--	117.79	--	160,240	17.31%	19.72%	15,576	161,790	17.48%	49.76%	15,612	162,360	17.54%	19.94%
Atmos Naphtha to Sat Gas	9,486	58.25	--	111.42	--	103,188	11.15%	12.15%	9,596	104,187	11.26%	12.95%	9,596	114,735	12.40%	13.54%
Preflash Naphtha to V-3	0	66.84	--	117.79	--	0	0.00%	0.00%	0	0	0.00%	0.00%	0	0	0.00%	0.00%
Naphtha to Tk 163	4,849	63.26	--	84.00	--	51,392	5.55%	6.21%	4,905	51,889	5.61%	5.11%	4,905	36,102	3.90%	4.36%
Kerosene	7,620	46.10	--	170.97	--	88,561	9.57%	9.76%	7,708	89,418	9.66%	10.09%	7,708	92,156	9.96%	10.15%
SR Diesel	15,600	37.60	--	287.26	--	190,426	20.57%	19.98%	15,781	192,269	20.77%	20.20%	15,600	190,062	20.54%	19.93%
AGO to FCC	1,414	31.37	--	633.76	--	17,921	1.94%	1.81%	1,430	18,094	1.95%	2.48%	1,430	26,482	2.86%	2.47%
Topped Crude to Storage	0	41.19	--	112.86	--	0.00	0.00%	0.00%	0	0.00	0.00%	0.00%	0	0.00	0.00%	0.00%
Vacuum Diesel	2,353	33.60	--	336.14	--	29,416	3.18%	3.01%	2,380	29,701	3.21%	3.12%	2,417	30,219	3.27%	3.09%
IVGO to FCC	0	32.49	--	440.31	--	0	0.00%	0.00%	0	0	0.00%	0.00%	0	0	0.00%	0.00%
HVGO to FCC	14,040	25.43	--	562.92	--	184,668	19.95%	17.98%	14,202	186,455	20.14%	18.09%	13,936	184,173	19.90%	17.80%
VTB	6,305	13.91	--	675.64	--	89,499	9.67%	8.07%	6,378	90,365	9.76%	7.89%	6,099	86,159	9.31%	7.79%
Total Outputs	77,413					916,730	99.04%	98.68%	78,074	925,599	100.00%	129.69%	77,557	922,447	99.86%	99.06%

Typical Yields Screen



Typical Key Process Information Screen



Refinery Overview | Safety | Environmental | Maintenance & Reliability | Operations | Inventories | Production & Sales | Expenses | Economics | Yields

Mass Balance | Yields | KPI | Crude/Vac | Sat Gas | NHT/Plat | FCCU | DHT | Alky | GHT | LNHT/Penex | Asphalt

Key Process Information

	Now	WTD	MTD	YTD
Raw Crude BS&W, vol%	0.30	0.33	0.31	0.29
Raw Crude Salt, ptb	55	62	57	64
Wash Water Rate, vol%	157	157	157	156
Desalted Crude Salt, ptb	0.4	0.8	0.9	0.7
Desalter Efficiency, %	98.4%	98.7%	98.4%	98.9%
Desalter Temp, °F	277	276	275	282
Desalter Pressure	193	197	207	198
Crude Tower Pressure	26.9	27.0	27.1	24.0
Vacuum Pressure, mmHg	52.9	45.1	59.6	58.0
Steam Flow to Ejectors, lb/hr				
Steam Press to Ejectors, psig	140	140	140	140
N PF Heater Efficiency, %	81.2	80.9	81.1	81.1
S PF Heater Eff, %	82.6	82.6	82.2	82.6
Crude Heater Inlet Temp, °F	643	644	638	650
Atmos Twr Heater Eff, %	81.4	81.8	81.1	80.8
Vac Heater Inlet Temp, °F				
Vac Twr Heater Eff, %	76.8	76.6	73.3	75.0
MSAT Heater Inlet Temp, °F				
MSAT Twr Heater Eff, %				

Crude Tower

	Now	WTD	MTD	YTD
Crude Tower Top Temp, °F	299	287	291	304
Reflux Drum Temp, °F	298	286	290	302
Kero Draw Tray Temp, °F	485	490	479	478
Diesel P/A Return Temp, °F	409	408	402	400
Diesel Draw Tray Temp, °F	561	559	551	557
AGO P/U Temp, °F	422	421	421	423
AGO Draw Tray Temp, °F	607	606	600	606
AGO Reflux Temp, °F				
Above Flash Zone Temp, °F	635	634	628	634
Flash Zone Temp, °F				
Heater Outlet Temp, °F	643	644	638	650
ATB Temp, °F	614	613	612	625
Reflux Rate, BPD	26	25,598	25,555	22,918
Diesel P/A Rate, BPD	15	15,233	15,302	14,714
AGO P/U Rate, BPD	15	15,706	16,554	15,442
AGO P/D Rate, BPD	871	872	870	925
AGO Rate to FCC	1,042	1,104	1,099	812
Stripping Steam, MLBH	8.87	8.03	6.11	5.25
Valve % Open	23.0	20.5	15.8	13.7
Naptha 95:Kero 5	47	50	50	51
Kero 95:Diesel 5	-95	-102	-84	-85
Diesel 95:AGO 5	-179	-181	-168	-177

Vacuum Tower

	Now	WTD	MTD	YTD
Vac Tower Top Temp, °F	261	250	272	244
Diesel Draw Tray Temp, °F	292	289	298	296
Diesel P/U Return Temp, °F	209	211	217	201
LVGO Draw Tray Temp, °F	502	496	504	501
HVGO Draw Tray Temp, °F	678	672	680	665
Heater Outlet Temp, °F	758	752	752	755
VTB Temp, °F	695	657	665	668
Diesel to Storage Flow, BPD	4	4,647	5,394	4,150
Diesel P/D Flow, BPD	9	9,004	7,507	7,271
Diesel P/U Flow, BPD	34	33,998	31,955	29,434

	Now	WTD	MTD	YTD
LVGO Product Flow, BPD				
LVGO P/D Flow, BPD				
AGO Charge Vac Twr LBH	14,582	14,594	14,492	10,750
HVGO P/D Flow Wash Oil, BPD	4	5,042	4,452	5,278
HVGO P/A Flow, BPD	33	33,002	31,990	31,177
HVGO Product, BPD		20,324	20,204	19,340
Stripping Steam, MLBH				
Valve % Open				
Vac Diesel 95:HVGO 5	-12	-16	-19	-9
HVGO 95:VTB 5	-75	-75	-75	-98

Tank Inventory Management System

HOME | TANK INVENTORIES | REAL-TIME INVENTORI… | TRANSFERS | GASOLINE BLENDS | SHIPMENTS/RECEIPTS

Filter By Tank | Filter By Departm.. | Filter By Material | 09/12/2017

Tank Number	Material	Level FT	Level IN	BS&W FT	BS&W IN	API	Temp	Volume
109	#4DIE/KERO/#7LCO TO #8	0	0.000	0	0.000	38.2	60.0	0
112	140/160 PEN ASPHALT	5	9.000	0	0.000	8.2	290.0	16,393
113	NO. 14 GC CRKED GASO	5	3.000	0	0.000	57.2	65.0	7,268
114	NO. 4 VACUUM GAS OIL	0	9.000	0	0.000	30.6	60.0	1,354
115	NO. 4 VACUUM GAS OIL	11	7.750	0	0.000	24.3	95.0	20,974
119	RACK DIESEL - ULTRA LO S…	33	8.250	0	0.000	39.0	70.0	22,941
120	NON HYDROCARBONS	27	1.000	0	0.000	24.1	80.0	54,145
121	DIESEL - ULTRA LO SULFUR	11	7.500	0	0.000	39.1	68.0	23,090
122	DIESEL - ULTRA LO SULFUR	19	10.750	0	0.000	38.7	70.0	39,766
123	84 OCTANE SUB-GRADE GA…	32	2.500	0	0.000	60.9	95.0	52,165
124	93 OCTANE SUPER PREMI…	42	2.000	0	0.000	58.8	80.0	46,536
125	RACK 84 OCTANE SUB-GRA…	29	5.250	0	2.500	60.7	89.0	39,444
126	RACK 93 OCTANE SUPER P…	8	1.000	0	0.500	55.9	74.0	10,446
128	84 OCTANE SUB-GRADE GA…	8	3.000	0	0.000	61.3	92.0	12,630

Effect of PI Notifications

GOAL

Develop an improvement process to **stay compliant** with regulatory compliance

CHALLENGE

Improve proactive communications on any deviations

We need to:

- Early notifications on any possible emissions
- Early notifications on tank levels (min/max)

SOLUTION

Developed method to gather tank data

We built a solution including

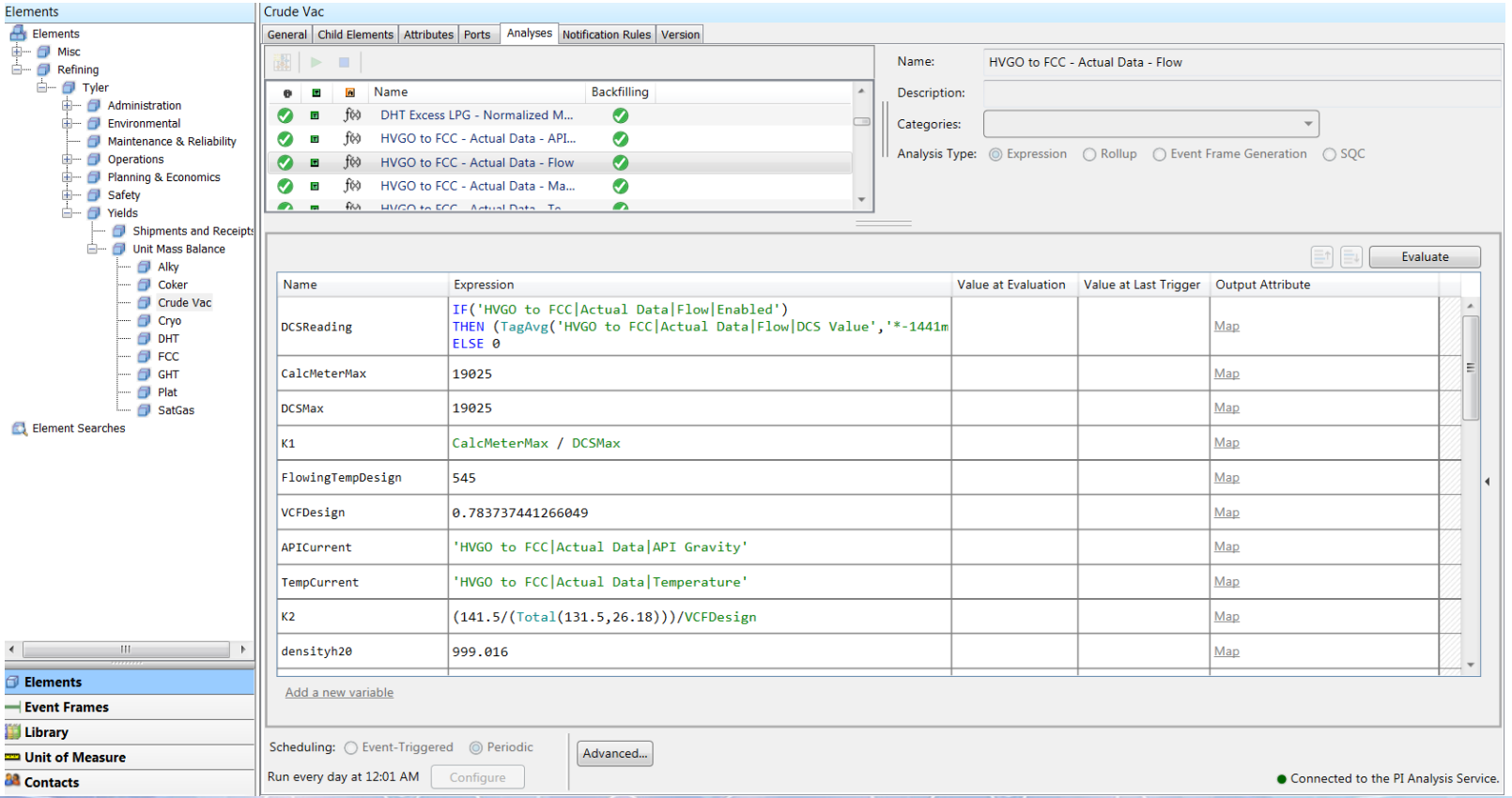
- UFL Interface
- Notifications

RESULTS

EHS&R is able to respond quickly to field issues and resolve them much quicker

- Staying compliant with regulators
- Reducing our emissions in the process

PI Asset Framework & PI Analytics



Summary of PI System Install & Configured Solutions

- ***Interfaces***
  - **Interface Instance** Count: 93
  - **Interface Types:**
    - IntFix
    - OPC DA
    - OPD HDA
    - PI-to-PI
    - PIPerfMon
    - PIPESchd
    - *RampSoak*
    - *Random*
    - RDBMS
    - UFL
- ***Tag Counts***
  - El Dorado: 41,737
  - Tyler: 29,289
- **Analyses Counts**
  - El Dorado: 4,893
  - Tyler: 3,547
- **Notifications:**
  - El Dorado: 14
  - Tyler: 87
- **Screen Counts**
  - El Dorado: 68
  - Tyler: 55
- **Transfers**
  - El Dorado: 6,000
  - Tyler: 700
- ***Solutions Deployed***
  - Daily Operating Dashboards
  - Executive Dashboard
  - Unit Mass Balances
  - Unit Yields
  - Heater Efficiencies
  - Tank Inventories & Transfers
  - MAINTelligence
    - New Rounds Handhelds
  - PI Manual Logger
    - Electronic Data Entry
  - Ad Hoc Visualizations

Best Practices & Lessons Learned

My Perspective for Consideration

Best Practices:

- MINERVA Committee / Executive Committee meetings
- Roles versus job- interested resources to support continuous improvement
- Implemented an online change request form for minor / major changes changes
- Implemented “Sandbox” and “Production” database – MOC-type process to test / validate in “Sandbox” before moving to “Production”
- Each PI System administration supports each others refinery
- Production database replaces Sandbox once a quarter

My Perspective for Consideration

Lessons Learned:

- Identify “Scope Creep” and dealt with it
- A lot of assumptions were being made
- “My” process vs. “Our” process – getting everyone on board
- Digital transformation is an growing process that needs to be embraced

Continuing our Digital Transformation Journey

Digital Transformation – *Journey Continues . . .*

- Expand MINERVA to other Business Units
- Integration of MINERVA within the business units within the Company
- Continue work progress with Enterprise Agreement to further expand on what possibilities are available
- Continue to “educate & empower” our resources on the capabilities of the PI System
- Continuous improvement with audits and “Yearly Reviews”

Summary

Enabling Our Digital Transformation(DT) with the EA

GOAL

Become a 1st Quartile Performer in key Solomon indices and EBITDA though a digitally enhanced operational excellence program – a Digital Transformation.

CHALLENGE

Diverse culture and operational data systems inhibiting desired business performance risking long term sustainability

- Multiple historians and "Excel hell"
- Inefficient work processes, sharing of best practices and knowledge
- No local and enterprise wide, proactive, exception based data based decisions

SOLUTION

Entered into a strategic, value focused partnership with the EA and started our DT journey with

- Focus on historian and excel normalization via PI AF Templates
- Initially focused on KPIs, dashboards, and reports – normalization of data
- Started analytics with PI AF Templates
- Leveraged PI Coresight/Vision for self serve BI and mobility

RESULTS

Standardization of key dashboards, KPIs, & reports; foundation for the next chapter in DT journey

- Defined the Delek "language" with PI AF
- Brought culture together and capturing knowledge, best practices, and standards in PI AF via analysis rules and process
- Established a foundation for improved definition of our DT vision and "chapters"
- Ability to abstract new Alon refineries into our "OT chart of accounts" using PI AF

Contact Information

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Director, Training & Operational Excellence

Delek US

Questions

Please wait for the **microphone** before asking your questions

Please state your **name & company**

Please don't forget to…

complete the Post Event Survey

Continuing our Digital Transformation Journey