

AVEVA PI WORLD

ExxonMobil: Simplifying the Well Test process with PI Asset Framework

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The What

Well tests are performed by gathering data to discover the potential of a particular well. It is vital to ensure that data is archived, analyzed and interpreted accurately for better decision-making processes.

The Why

Well tests are used to determine monthly production from which royalties to partners are paid. The practice is considered critical for daily operations, production planning, and regulatory reporting.

Problem Statement

Legacy Technology

- The current solution uses heritage programming language on spreadsheets and PI Performance Equation (PIPE)
- Intermediate calculations are not visible
- Manual intervention to manage well test configuration
- Solutions differ across multiple assets



Problem Statement (cont'd)

Poor Data Reliability

- Skipped well test values
- Incapable of backfilling data
- Trouble identifying the well flowing to the test separator
- Varied vendor technologies and practices from asset to asset



Problem Statement (cont'd)

Support and Sustainability

- Limited knowledge on legacy tool
- Limited ability to apply security patches and new secure coding practices
- Support team had to retain programming add-ins
- Insufficient audit trails made troubleshooting tasks tough



The Development

Heritage programming language, spreadsheets and PI Process Book Solutions



Understanding the backend of how the existing tool works



Gain trust of stakeholders and users – new tool, (*perceived*) new numbers



Collaboration across multiple disciplines: PI team, Asset team, OSIsoft, etc.



Leveraging Asset Framework to improve on calculation methods with consideration for future support



Coordination for a seamless cutover to the new solution

Legacy Well Test Application

Multiple components build up a solution

Input Tag Description (Information Only)	Processing
Separator Name	SEPLOOK
Test Start Year	PASS
Test Start Month	TIMEFORM
Test Start Day	TIMEFORM
Test Start Hour	TIMEFORM
Test Start Min	TIMEFORM
Test Duration (Hours)	PASS
Test End Time	TIMEEND
Well ID	WELL LOC
Test Status	PASS
Well test Valid From Date	VALFRM
Test Type	PASS

Configuration Spreadsheet

- All WellTest tags were defined on a spreadsheet
- New/modified WellTest tags will need to be managed on this sheet

```
History As Boolean = True
String = "WTLog.txt"
Integer = 3
String = "WtIn.txt"
As Boolean
Types As Boolean = True

boolean
As PointList
Data
amedValues
ntValues
SDK.PI SDK
SDK.PI SDK
DK.Server
As PISDK.IPIcollective
DK.PIPoints
s String
C As Double
String = "dd-MM-yyyy HH:mm:ss"
String = "yyyyMMdd HHmmss"
```

Calculations

- WellTest calculations were written on a heritage programming language
- PI Performance Equation (PIPE) was also used for the calculations

Name	Status	Triggers	Next Run Time	Last Run Time	Last Run Result
WellTest_SepA	Running	At system startup		9/6/2021 8:04:48 AM	The task is curre
WellTest_SepB	Running	At system startup		9/6/2021 8:04:51 AM	The task is curre

Task Scheduler

- Continuously running the scheduler to trigger the calculations during WellTest

```
2021 19:20:08
2021 19:20:18
ep-2021 19:20:18] Separator Index [1] EventPipe C
e [ON]
BDataReady] PointID [41084] Timestamp from
WTBDATAREADY] Timestamp From [07-Sep-202
e [ON]
BDataReady] PointID [41084] Timestamp from
WTBDATAREADY] Timestamp From [07-Sep-202
e [ON]
BDataReady] PointID [41084] Timestamp from
TBDATAREADY] Timestamp From [07-Sep-202
TBDATAREADY
s [07-Sep-2021 19:17:00] UTC [1631017020]
F overridden is [07-Sep-2021 16:17:00] UTC [16310
gger Time [07-Sep-2021 19:17:00] In the routine
parator No.= [1]
Function SEPLOOK OutPut Tag is | .TESTSEPB.Se
Function PASS OutPut Tag is .TESTSEPB.WT.St
.WTBStartYear]
0:00:00] EndT
urned is [07
:27:00]
rtYear] Vali
WTBS
Function
0:00:00] En
turned is [0
:27:00]
rtMonth] Vali
Function TII
0:00:00] En
rned is [07
27:00]
```

WellTest Logs

- To view the message logs defined in the code

PI Asset Framework (AF) WellTest

Fully utilize Asset Framework (AF) capabilities for All in One Solution

ID	Well_Name	ECIS	Prefix	Type	CHK	BHP	BHT	OP_Commer	SAND	Service	Test_Type	Test_Status	GL_Rate	WHP
1			21	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
2			22	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
3			23	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
4			24	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
5			216	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
6			26	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
7			25	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
9			212	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
10			224	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
11			27	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
12			225	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
13			221	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
16			211	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
17			227	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
18			223	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
19			226	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
20			215	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
21			242	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
22			243	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
23			244	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
24			245	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
25			241	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
26			240	FREEFLOW				OILPROD		OILPROD	ALOC	NEW		
27			NC1	FREEFLOW				OILPROD	ZERO	OILPROD	ALOC	NEW		
28			NC2	FREEFLOW				OILPROD	ZERO	OILPROD	ALOC	NEW		
29			NC3	FREEFLOW				OILPROD	ZERO	OILPROD	ALOC	NEW		
31			NC4	FREEFLOW				OILPROD	ZERO	OILPROD	ALOC	NEW		
33			NC5	FREEFLOW				OILPROD	ZERO	OILPROD	ALOC	NEW		

Asset Framework (AF) Table

- Well ID was assigned to each of the Well and their associated input WellTest tags

Asset Framework (AF) Table Lookup

- Table Lookup data reference was used to get all input WellTest tags

Name	Value	Duration
UTCTime	09/07/2021 16:26:00	
BHP_Name		
BHT_Name		
CHK_Name		
DUR	14400 s	
Duration	4	
DurationEC	4	
Well	201	
Well_MGL	0	
OFF	OFF	
ON	ON	
OILPROD	OILPROD	
Z1		
21R2		
OP		
NEW		

Get the WellTest values based on recorded timestamp

- Used the captured timestamp to get the outputs

Capture the start & end time of the WellTest

- Utilized analysis to get the correct timestamp/duration of WellTest

Name	Expression
CHP	IF WTReddy and EndTimeGood THEN (IF NextVal('CHP',outputtime) = 0 then prevval('CHP',outputtime) ELSE NoOutput() IF WTReddy and EndTimeGood THEN (IF NextVal('CHP',outputtime) = 0 then prevval('CHP',outputtime) ELSE NextVal('CHP',outputtime)) ELSE NoOutput()
CHT	IF WTReddy and EndTimeGood THEN (IF NextVal('CHT',outputtime) = 0 then prevval('CHT',outputtime) ELSE NoOutput()
FLP	//IF WTReddy and EndTimeGood THEN TagVal('FLP') ELSE NoOut IF WTReddy and EndTimeGood THEN (IF NextVal('FLP',outputtime) = 0 then prevval('FLP',outputtime) ELSE NoOutput()

Expression	Ve	Ve	Or
If ArrayLength(filterdata(RecordedValues('Mode','*-2h','*-2h')) > 0 then true Else False			
//IF 'Mode'='ON' THEN true ELSE False			
If ArrayLength(filterdata(RecordedValues('Mode','*-2h','*-2h')) > 0 then true Else False			
//IF 'Mode'='ON' THEN true ELSE False			
If ArrayLength(filterdata(RecordedValues('Mode','*-2h','*-1h')) > 0 then true Else False			
WTStartDayGood			
WTStartMonthGood			
WTStartYearGood			

The Solution

PI Asset Framework Analysis and Event Frames



Delivered precise and reliable well test data to the business with backfilling capability



Enabled automation for triggering well test analysis and sharing it to users



Templates provided for consistent implementation across affiliates and ability to bulk edit



Supportable modern tool enabled by the enterprise agreement



Provides the foundation to leverage event frames, PI Vision, and more!

THANK YOU

謝謝

DZIĘKUJĘ CI

NGIYABONGA

TEŞEKKÜR EDERİM

DANKIE

TERIMA KASIH

GRACIES

WHAKAWHETAI KOE

DANKON

TANK

TAPADH LEAT

SALAMAT

SPASIBO

GRAZIE

MATUR NUWUN

ХВАЛА ВАМ

MULTUMESC

PAKMET CIZGE

고맙습니다

GRAZIE

شكرا

FAAFETA

ESKERRIK ASKO

HVALA

GO RAIBH MAITH AGAT

БЛАГОДАРЯ

GRACIAS

ТИ БЛАГОДАРАМ

MAHADSANID

TEŞEKKÜR EDERİM

OBRIGADO

TAK

DANKE

MAHALO IĀ 'ŌE

TAKK SKAL DU HA

MERCİ

DI OU MÈSI

ĐAKUJEM

RAHMAT

MERCİ

GRAZZI

PAKKA PÉR

HATUR NUHUN

PAXMAT CAĞA

CẢM ƠN BẠN

WAZVIITA

FALEMINDERIT

ありがとうございました

SIPAS JI WERE

TERIMA KASIH

UA TSAUG RAU KOJ

ТИ БЛАГОДАРАМ

СИПОС

KÖSZÖNÖM

KEA LEBOHA

MISAOTRA ANAO

БЯЯРЛАЛАА

ТАРАДХ ЛЕІВН

ДЗЯКУЎ

FAAFETA

ESKERRIK ASKO

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TEŞEKKÜR EDERİM

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PAKKA PÉR

PAXMAT CAĞA

CẢM ƠN BẠN

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ありがとうございました

SIPAS JI WERE

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ТИ БЛАГОДАРАМ

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