

# Operational Downstream Strategy at PEMEX

Improving Operational  
Safety & Reliability through ONE PI

Presented by **OSIsoft**



# Agenda

- Pemex at a Glance
- The Journey to One Pi
- PEMEX's Operational Portal
- Examples
- Results
- Next Steps
- Conclusion



# About PEMEX



Corporate



E&P



Gas & Basic  
Petrochemicals



Petro  
Chemicals



Refining



## A Snapshot

### Exploration and Production

- Crude oil production: 2,513 Mbd<sup>1</sup>
- Natural gas production: 6,406 MMcf<sup>1</sup>
- 7<sup>th</sup> oil producer worldwide<sup>2</sup>
- 76% of crude oil output is produced offshore
- 1P reserves-life<sup>3</sup>: 10.2 years

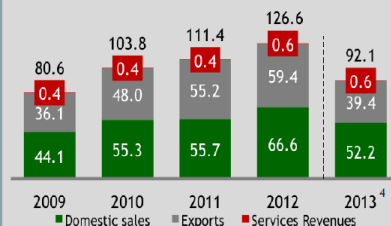
### Downstream

- Refining capacity: 1,690 Mbd<sup>1</sup>
- Strategically positioned infrastructure
- JVs and associations with key operators in the Mexican petrochemical and natural gas transportation industry

### International

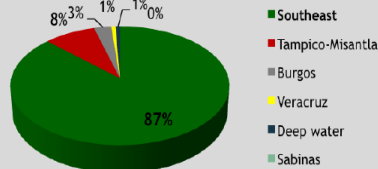
- Crude oil exports: 1,187 Mbd<sup>1</sup>
- 3<sup>rd</sup> largest oil exporter to the USA
- Long-term relationship with USGC refiners
- JV with Shell in Deer Park
- 10% stake in Repsol

### Total revenues (USD billion)



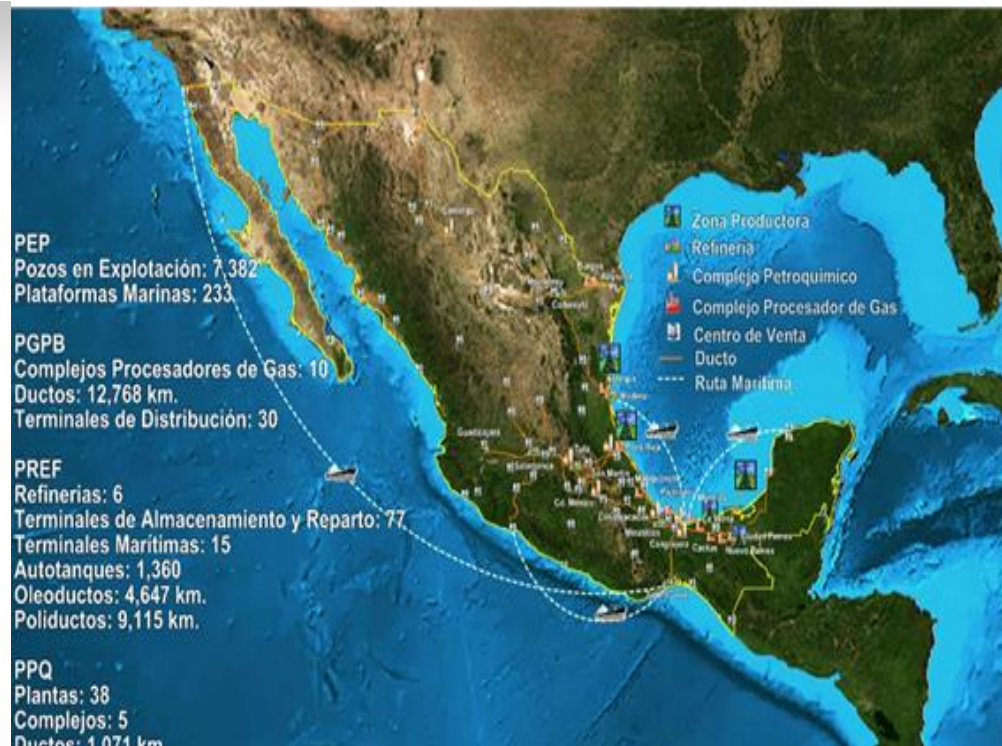
### Proved Reserves

Proved Reserves 13.9 MMMboe



www.pemex.com

- (1) As of November 30, 2013.  
 (2) 2013 PIW Ranking.  
 (3) At current production levels of approximately 2.5 MMbd.  
 (4) As of September 30, 2013.



# OSIsoft @ Pemex production assets

## PEMEX EXPLORACION PRODUCCION

- Región Norte
  - ATG y Al Poza Rica
  - Al Veracruz
  - Al Burgos
- Región Sur
- RMNE
  - Cantarel
  - Kumalop
- RMSO
- SDC

## PEMEX GAS:

- Villahermosa
- Cactus
- Nuevo Pemex
- Cd Pemex
- La Venta
- Coatzacoalcos
- Matapionche
- Poza Rica
- Arenque
- Reynosa

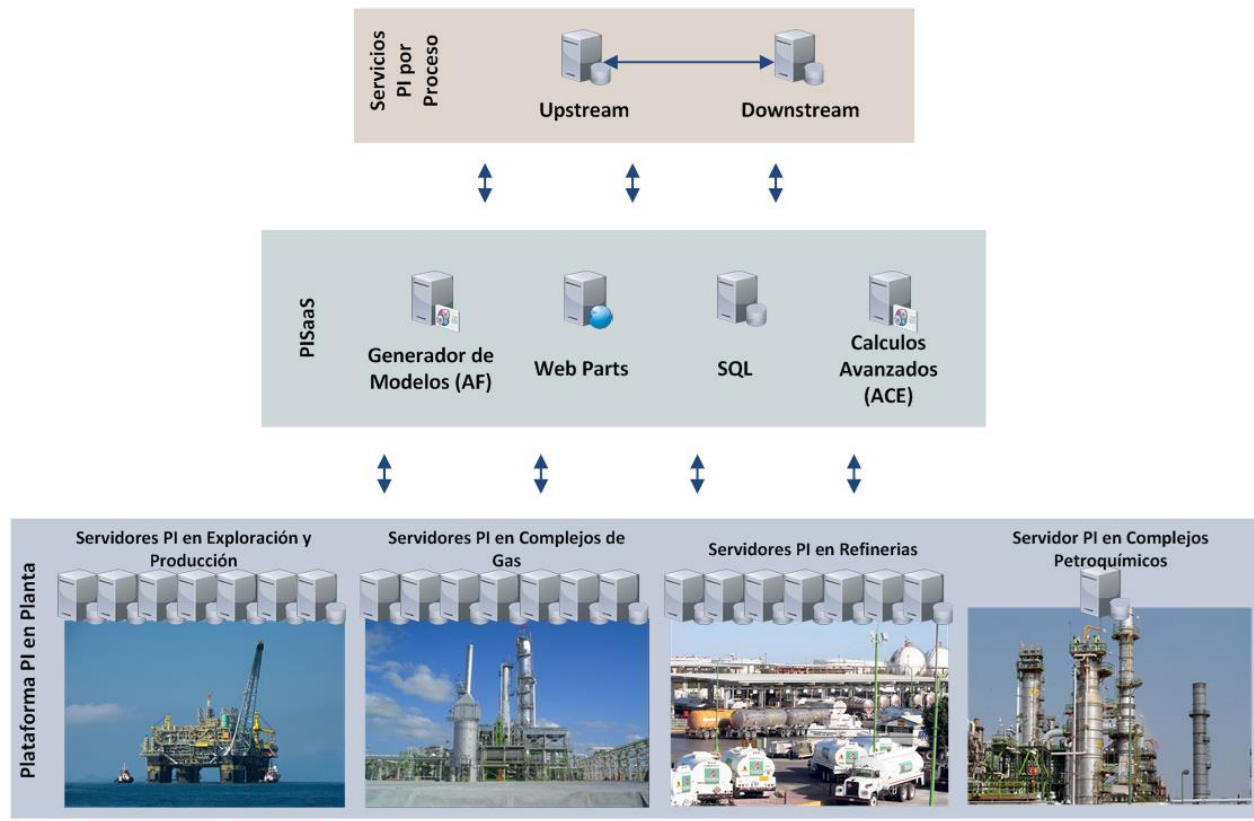
## PEMEX PPQ

## PEMEX REFINACION:

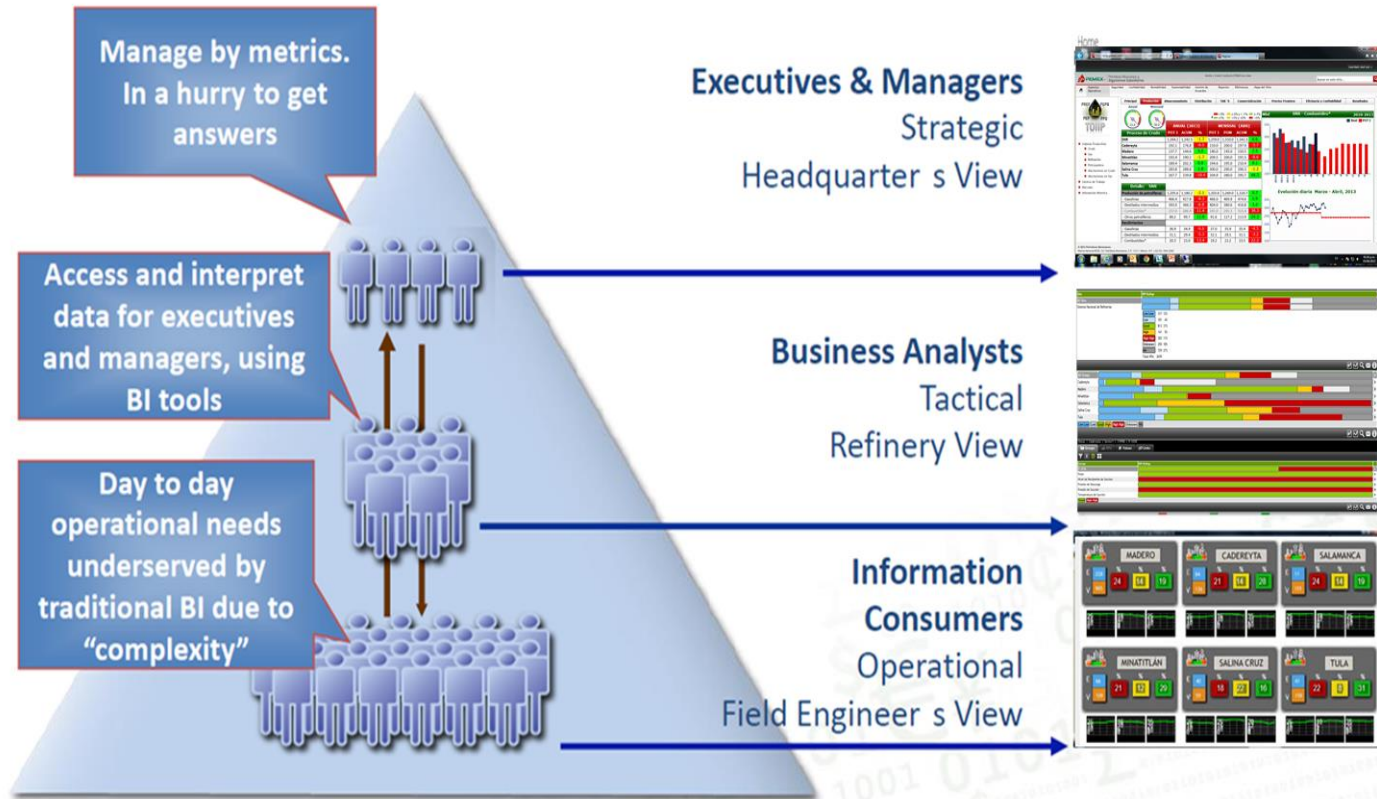
- Mexico City headquarters
- Cadereyta
- Madero
- Minatitlan
- Tula
- Salamanca
- Salina Cruz



# Proyecto ONE PI en Pemex



# Data and Information in Context with Integrated High Fidelity Drill Down –The Backbone of Dashboards





# Implementing PI as core in process control at PEMEX Refining

*"We have implemented a proof of concept for Operational Control that provides system wide KPIs for critical assets and refineries. The initial results have been improving asset reliability, safety, and performance with positive impact of yield and production."*

Mr. Carlos Manzano

Dirección Corporativa de Tecnología de Información  
y Procesos del Negocio, SCADA & Industrial Automation  
. Pemex

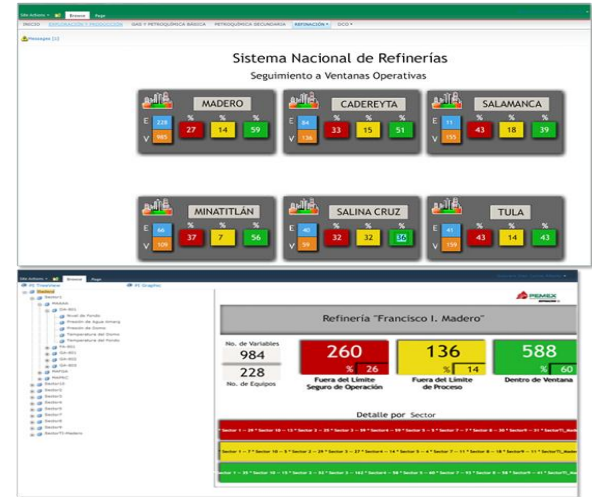


## Business Case

- Low performance in refinery utilization, reliability, and yield
- Inability to share best practices across refining division
- Inability to view entire PEMEX refining value chain in real-time

## Solution

- Expanded current PI System to provide integration & applications infrastructure elements
- Used PI AF and PI Coresight as foundational components
- PI to Pi that for PEMEX access



## Results and Benefits

- Single Operational Indicators for all PEMEX refining
- Consistent KPIs to support continuous improvement of efforts
- Improved yields, production, reliability, and safety of refineries

# The Road to Improving Operational Safety & Reliability

- Issues with **Rising Maintenance and Safety costs** – 30% Avoidable Errors
- December, 2014 – Scope definition
  - Establish the proper operation of the main equipment
  - Improve operational reliability.
  - Have a clear model definition for Refineries, Gas Plants and Petrochemicals Plants





# Challenges to implement a One PI strategy

- Monitoring in an **standardized** manner at all refineries so all displays of the status of critical process for all different levels of equipment are the same.
- Conduct analysis showing the percentage of time that critical equipment is inside and outside safe ranges to help **prioritize** the require corrective action
- **Visibility**. Show critical equipment which are constantly operating out of safe range and record why corrective actions have not been made to them or means to determine the cause of deviations
- To have an approved platform, that is **simple** to operate, which contains **uniform rules** across the organization to determine the progress in the implementation and improvement of the system, upgrading information coming to another systems.



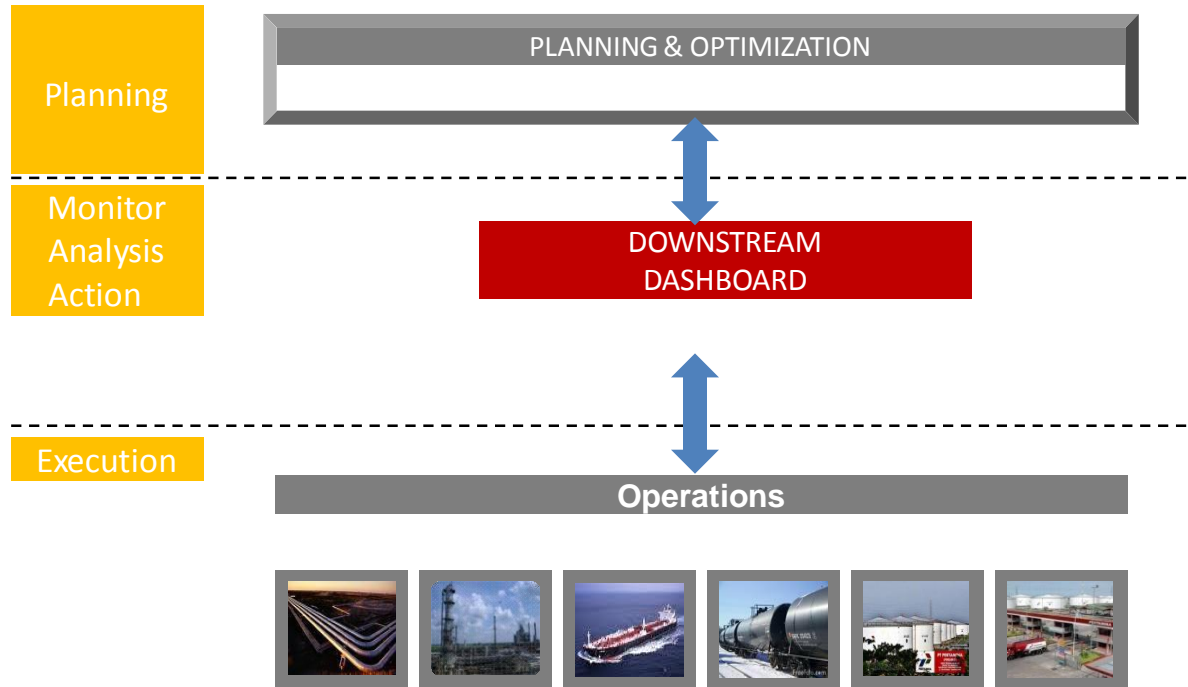
# Simple solution to standardize all KPI

Process Variables  
and all KPI  
are presented &  
calculated  
in a standard  
way using PI AF

The screenshot displays the PI AF (Asset Framework) software interface. On the left, a hierarchical tree structure shows the organization of data, including sectors (Sector1 to Sector6) and various process variables like 'Presión de Descarga' and 'Temperatura de Sución'. The main window shows a table titled 'Presion de Sucion' with columns for Name and Value. The table lists several variables and their current values, such as 'Instantaneo' (42.46875) and 'Semaforo' (2). A 'Select Database' dialog box is open in the foreground, showing a list of databases available for selection, including 'AF\_Nacional' and 'AF\_Nacional'.

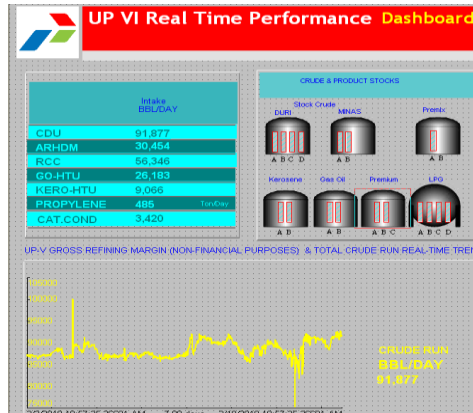
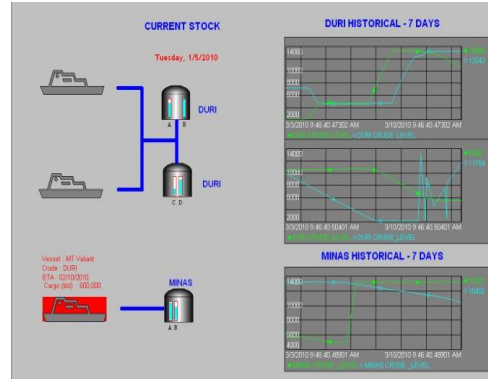
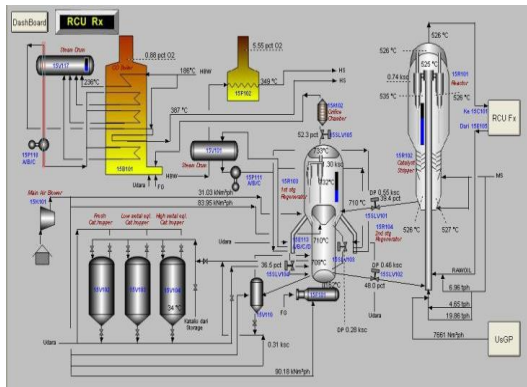
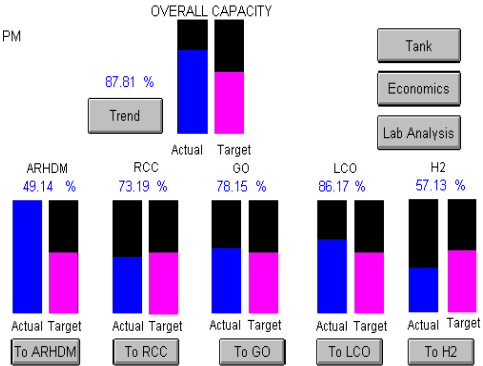
Name	Value
Instantaneo	42.46875
LSOI	38
LSOS	49
myPDI	<a href="http://tiemporeal.pemex.com:83/PREF/Madero/Ventanas0/Shared%20Documents/Variables.svg">http://tiemporeal.pemex.com:83/PREF/Madero/Ventanas0/Shared%20Documents/Variables.svg</a>
Nombre	
Semaforo	2
Tag (PI)	CYDIB.PI8090.PV
Unidades	KG/CM2G
Valor	2
VN	43.5
VOI	40.70000076
VOS	46.29999924

# INTEGRATED DOWNSTREAM DASHBOARD



# Refinery Operations

21 PM



## Objective

- Real time monitoring refinery operations

## Features

- Plan vs Actual Production
- Stock levels of crude and finished products
- Detail DCS level view
- Refinery Problem EWS

# Example – PEMEX Refinery Energy KPI Display



## PEMEX Refinery Energy Performance

### Fuel Gas

	Cadereyta			Madero			Minatitlan			Salamanca			Salina Cruz			Tula	
	Fuel Gas	KPI		Fuel Gas	KPI		Fuel Gas	KPI		Fuel Gas	KPI		Fuel Gas	KPI		Fuel Gas	KPI
Atmospheric Distillate	51,793		360	224,972	6,280		134,225		1,420	68,806		705	64,844		178	56,494	324
Catalytic Cracking	278,199		1,935	58,958	1,644		115,170		621	105,801		290	233,786		1,695	48,949	180
Coking	63,198		640	313,243	4,371		369,317		1,993	152,723		419	158,108		573	112,668	667
Naphtha Reforming	399,678		1,390	201,529	2,810		355,541		1,880	114,363		585	257,313		738	111,692	810
Vacuum Distillation	268,052		2,718	64,796	1,808		268,052		1,447	47,502		130	116,704		670	95,232	691
Grand Total	1,060,919		1,405	863,497	3,442		1,242,304		1,540	489,195		452	830,754		738	425,036	534

### Electric Power

	Cadereyta			Madero			Minatitlan			Salamanca			Salina Cruz			Tula	
	Power	KPI		Power	KPI		Power	KPI		Power	KPI		Power	KPI		Power	KPI
Alkylation	47,596		166	40,324	204		26,642		141	49,667		254	31,515		90	36,495	108
Atmospheric Distillate	19,646		137	17,576	491		12,693		134	46,605	478		21,618		59	17,465	100
Hydrosulfurization	19,640		137	15,497	433		14,461		78	34,161		94	18,606		135	10,306	38
Isomerization	68,325		346	36,169	505		29,858		81	25,078		34	26,840		97	34,935	103
Naphtha Reforming	17,571		122	15,502	433		17,568		186	17,571		180	19,649		113	17,568	127
Vacuum Distillation	17,571		178	15,803	441		18,404		99	17,463		48	30,017		172	19,644	142
Viscosity Reduction	41,429		420	27,836	295		23,793		244	18,398		51	36,240		263	34,167	126
Grand Total	231,778		224	168,707	390		143,418		132	208,944		159	184,485		124	170,579	106

### Steam

	Cadereyta			Madero			Minatitlan			Salamanca			Salina Cruz			Tula	
	Steam	KPI		Steam	KPI		Steam	KPI		Steam	KPI		Steam	KPI		Steam	KPI
Catalytic Cracking	83,054		578	5,411	150		78,735		425	31,168		86	50,343		365	30,968	114
Hydrosulfurization	83,147		578	39,974	1,115		130,631		705	61,698		169	83,107		603	87,594	323
Isomerization	65,913		668	22,777	635		22,517		122	87,419		240	66,069		479		
Naphtha Reforming	48,691		339	117,843	3,289		97,717		1,034	48,640		498	100,362		576	61,674	447
Grand Total	280,805		541	186,004	1,298		329,601		571	228,925		248	299,880		506	180,236	295

Month

1 2 3 4 10 11 12

# Results



This project has allowed us to **explore new solutions**, ways to attack a problem in a **holistic way**, looking at all the possible angles that **make life easier for operations** personnel and has resulted in:

- **Doubling the percentage** of process variables "**green**" in less than 3 weeks of operation
- Building a system to **monitor** process conditions of over **2,600 variables**
- A solution **capable of monitoring** process variables from operations, quality, power generation and any **other areas** to come in the future
- A **certified, simple, easy ability** to transport and adapt to other production processes



# Next Steps.....



**While we have achieved significant benefits we still have goals to achieve:**

- **Strengthen the use of the solution** through internal marketing, video conferences and constantly monitor the operating windows on field in conjunction with the business area.
- **Improve the quality of information** contained in the model (operating limits, setpoints, text descriptions).
- **Quantify the benefits.**
- **Increase the functionality** of the solution integrating some additional graphics detail pages, setting response times and some other improvements to the navigation between the different pages.
- **Replicate this solution** to all Upstream assets, pumping stations, storage and distribution stations and generally to all centers where there Pemex processes require monitoring and control.

# Javier Barella

- [jbarella@osisoft.com](mailto:jbarella@osisoft.com)
- SAM
- OSIsoft, LLC



Brought to you by  **OSIsoft.**