Enhancing Monitoring Capability in Frade FPSO Using PI Tools

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Chevron

radix
Engineering and Software

About Chevron

- Chevron was one of the successor companies of Standard Oil Company.
- Nowadays, its global workforce consists of **64,700 employees**, including more than **3,200 service station employees.**
- Chevron's average net production at the end of 2014 was **2.5 million** oil barrels per day, with **74%** of that production ocurring outside the United States.
- Furthermore, Chevron has a global refining capacity of **1.9 million barrels per day.**
- OSI EA customer since 2011.

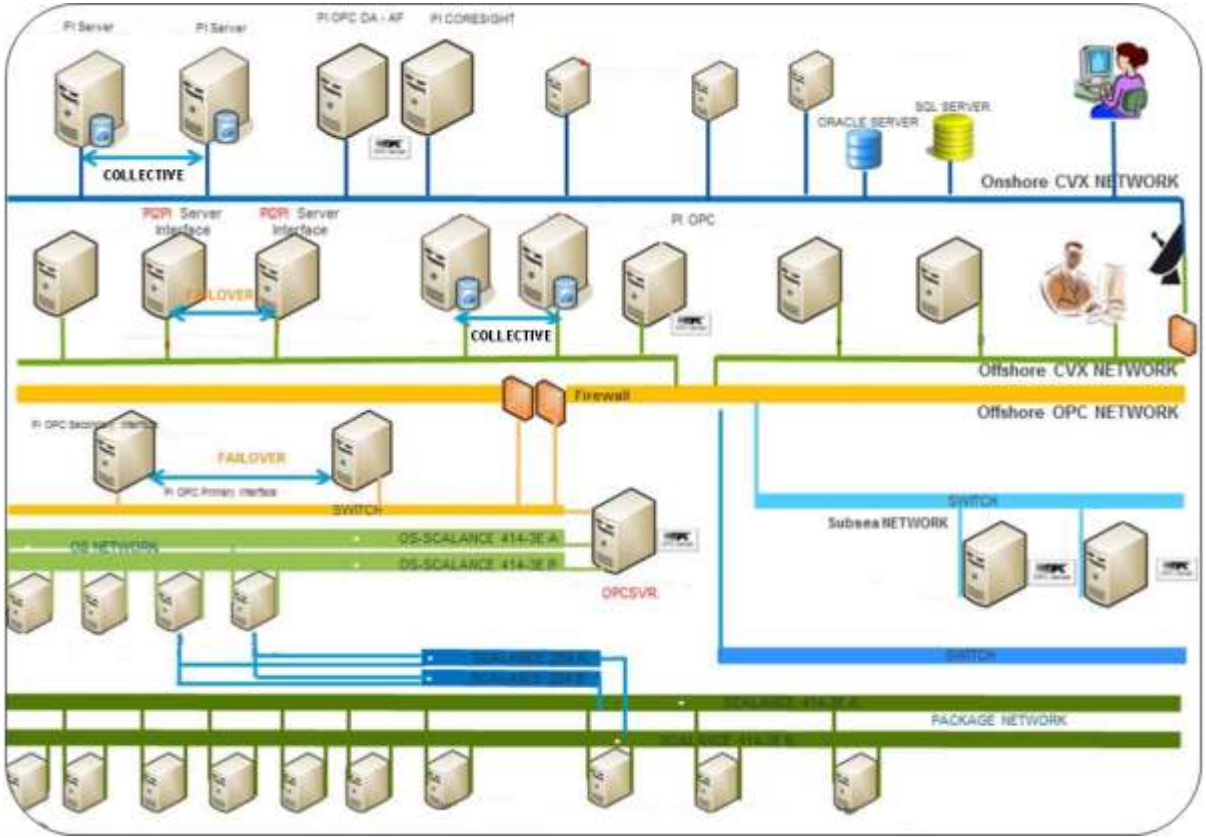
Chevron Brazil – Projects Overview

- Ceara CE-M-175: Chevron (50%) e Ecopetrol (50%)
- **Frade: Chevron (51%), Petrobras (30%), FJ (18%)**
- Papa-Terra: Chevron (37.5%), Petrobras (62.5%)
- Maromba: Chevron (30%) e Petrobras (70%)

Chevron's Frade Asset in Brazil

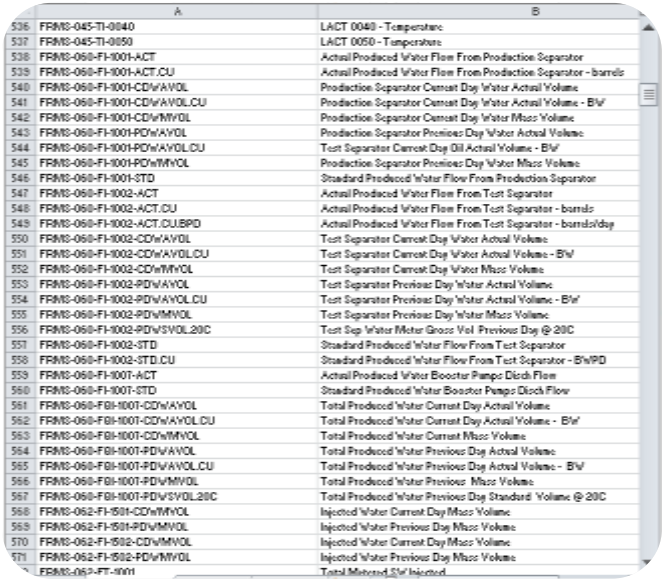
- Floating, Production, Storage and Offloading (FPSO) facility in Frade Field;
- Located 120km from the nearest Brazilian shoreline in the Northern of Campos Basin;
- It lies in water depths ranging from 900 to 1200 meters;
- Capable of storing - 1.5 million barrels of oil and processing of 100.000 bopd;
- Compressing and treating 106 MMscfd of gas and injecting 150.000 bwpd of water.

Current Frade PI Data Architecture Diagram



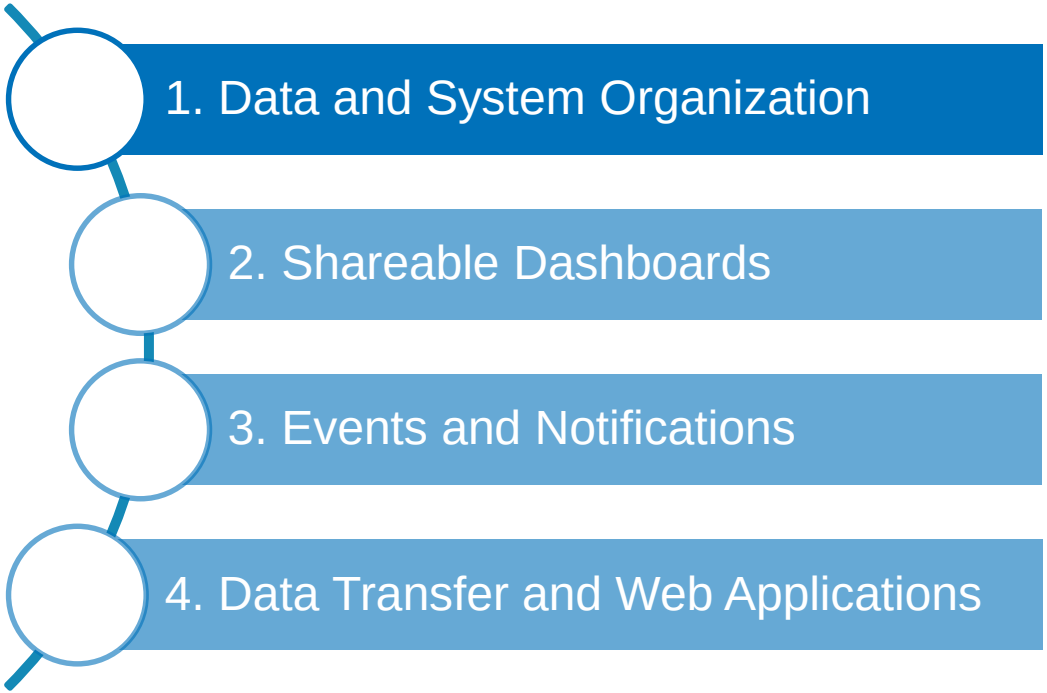
Frade's PI System Previous Scenario

- **6,000+** PI **tags** were **not structured**;
- Several **tags** were created in order **to convert units**;
- The **users created** their **dashboards on demand** and it was **not** readily **accessible** to **others**;
- The similar **equipment** present on dashboards **could not be easily replicated** as templates;
- The **maintenance** proved **hard** to achieve;
- **Sheets** were being employed to **perform calculations**;
- The variables **critical thresholds** did **not have** a **notification** system.



	A	B
536	FRMS-045-TI-0040	LACT 0040 - Temperature
537	FRMS-045-TI-0050	LACT 0050 - Temperature
538	FRMS-060-FI-1001-ACT	Actual Produced Water Flow From Production Separator
539	FRMS-060-FI-1001-ACT.CU	Actual Produced Water Flow From Production Separator - barrels
540	FRMS-060-FI-1001-CDWAVOL	Production Separator Current Day Water Actual Volume
541	FRMS-060-FI-1001-CDWAVOL.CU	Production Separator Current Day Water Actual Volume - BW
542	FRMS-060-FI-1001-CDWMVOL	Production Separator Current Day Water Mass Volume
543	FRMS-060-FI-1001-PDWAVOL	Production Separator Previous Day Water Actual Volume
544	FRMS-060-FI-1001-PDWAVOL.CU	Test Separator Current Day Oil Actual Volume - BW
545	FRMS-060-FI-1001-PDWMVOL	Production Separator Previous Day Water Mass Volume
546	FRMS-060-FI-1001-STD	Standard Produced Water Flow From Production Separator
547	FRMS-060-FI-1002-ACT	Actual Produced Water Flow From Test Separator
548	FRMS-060-FI-1002-ACT.CU	Actual Produced Water Flow From Test Separator - barrels
549	FRMS-060-FI-1002-ACT.CUBPD	Actual Produced Water Flow From Test Separator - barrels/day
550	FRMS-060-FI-1002-CDWAVOL	Test Separator Current Day Water Actual Volume
551	FRMS-060-FI-1002-CDWAVOL.CU	Test Separator Current Day Water Actual Volume - BW
552	FRMS-060-FI-1002-CDWMVOL	Test Separator Current Day Water Mass Volume
553	FRMS-060-FI-1002-PDWAVOL	Test Separator Previous Day Water Actual Volume
554	FRMS-060-FI-1002-PDWAVOL.CU	Test Separator Previous Day Water Actual Volume - BW
555	FRMS-060-FI-1002-PDWMVOL	Test Separator Previous Day Water Mass Volume
556	FRMS-060-FI-1002-PDWSVOL.20C	Test Sep Water Meter Gross Vol Previous Day @ 20C
557	FRMS-060-FI-1002-STD	Standard Produced Water Flow From Test Separator
558	FRMS-060-FI-1002-STD.CU	Standard Produced Water Flow From Test Separator - BWPD
559	FRMS-060-FI-1007-ACT	Actual Produced Water Booster Pumps Ditch Flow
560	FRMS-060-FI-1007-STD	Standard Produced Water Booster Pumps Ditch Flow
561	FRMS-060-FQI-1007-CDWAVOL	Total Produced Water Current Day Actual Volume
562	FRMS-060-FQI-1007-CDWAVOL.CU	Total Produced Water Current Day Actual Volume - BW
563	FRMS-060-FQI-1007-CDWMVOL	Total Produced Water Current Mass Volume
564	FRMS-060-FQI-1007-PDWAVOL	Total Produced Water Previous Day Actual Volume
565	FRMS-060-FQI-1007-PDWAVOL.CU	Total Produced Water Previous Day Actual Volume - BW
566	FRMS-060-FQI-1007-PDWMVOL	Total Produced Water Previous Mass Volume
567	FRMS-060-FQI-1007-PDWSVOL.20C	Total Produced Water Previous Day Standard Volume @ 20C
568	FRMS-062-FI-1501-CDWMVOL	Injected Water Current Day Mass Volume
569	FRMS-062-FI-1501-PDWMVOL	Injected Water Previous Day Mass Volume
570	FRMS-062-FI-1502-CDWMVOL	Injected Water Current Day Mass Volume
571	FRMS-062-FI-1502-PDWMVOL	Injected Water Previous Day Mass Volume
	FRMS-062-FT-1001	Total Metered SW Injected

The Project Comprises Four Main Sections



1. Data and System Organization: Description

CHALLENGE

Organize data in an asset-oriented fashion, create a more secure and user-friendly interface and expand the replication potential

SOLUTION

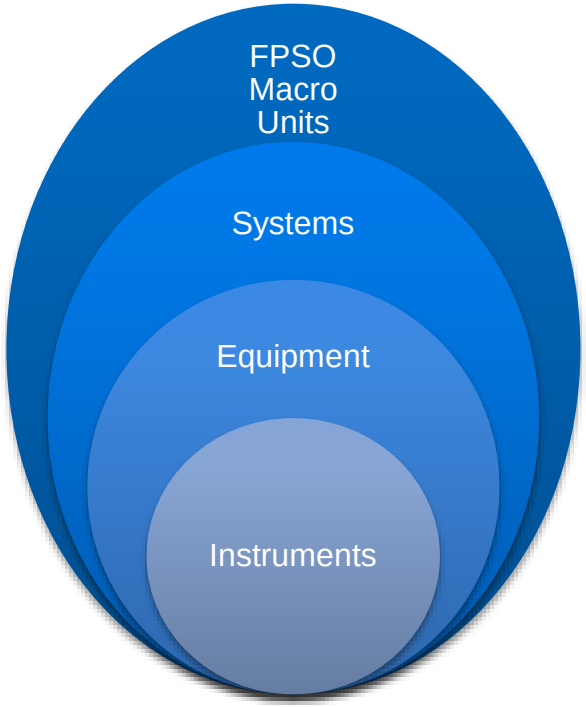
Installation and configuration of PI AF and creation of PI ProcessBook samples:

- All instrument tags inserted and ordered by equipment and systems;
- Creation of equipment templates;
- Rebuilt system security;
- Existing dashboards recreated on PI ProcessBook to show the novel tools provided by the PI AF.

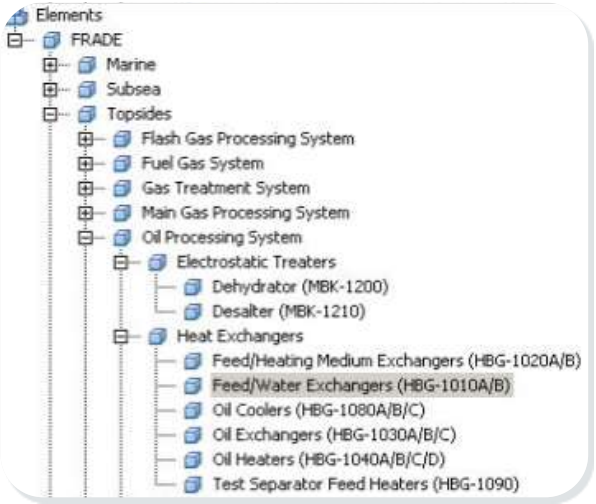
RESULTS

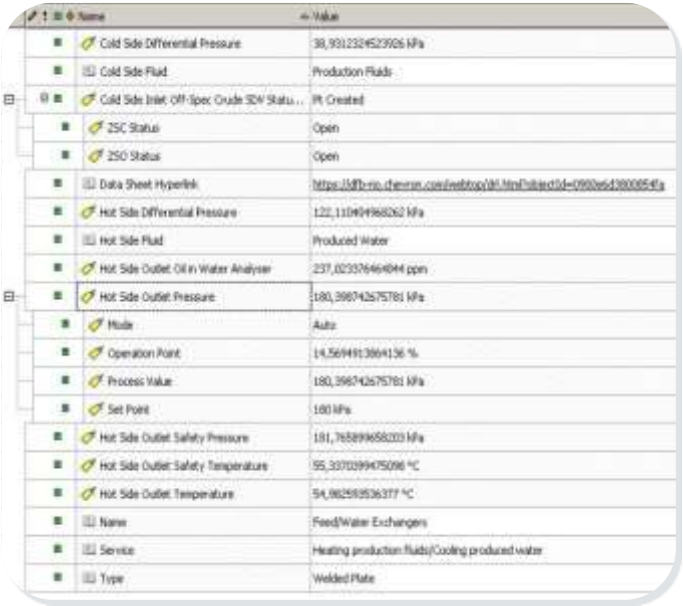
- Reduction of hours spent creating a new dashboard;
- A better structured data;
- More scalability;
- A complete overhaul of the existing tags was made, since it became easier to find errors and gaps;
- Support and maintenance has become more effective.

1. Data and System Organization: PI AF Tree Sample



PI AF





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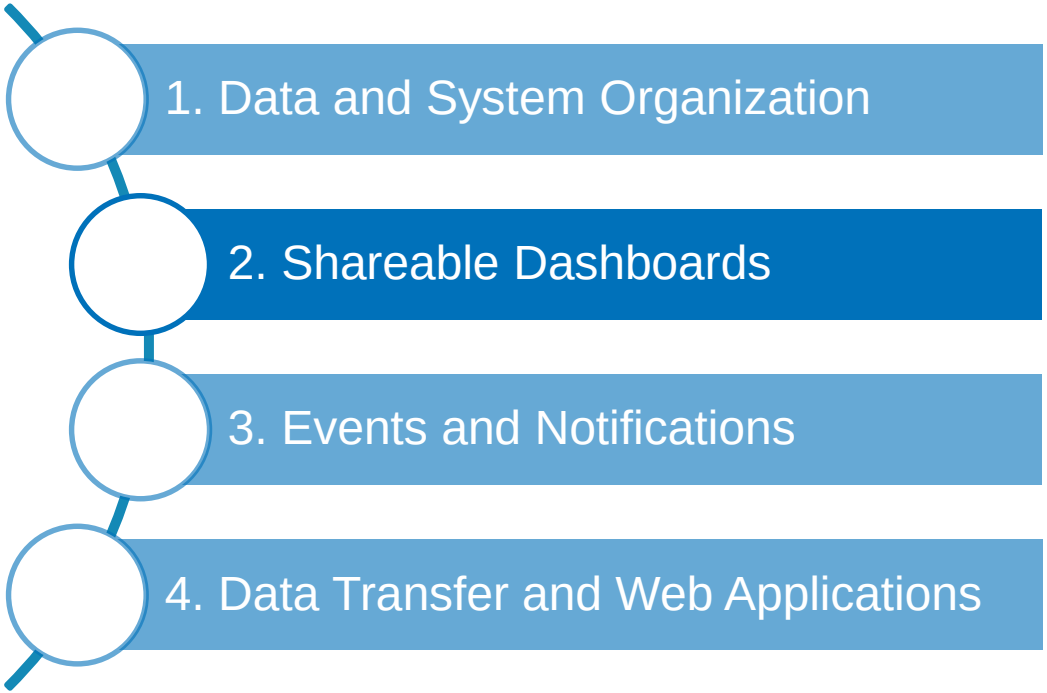


2. Shareable Dashboards: Description

CHALLENGE

Allow users to easily create and share their dashboards and permit a centralized management of its attributes

SOLUTION

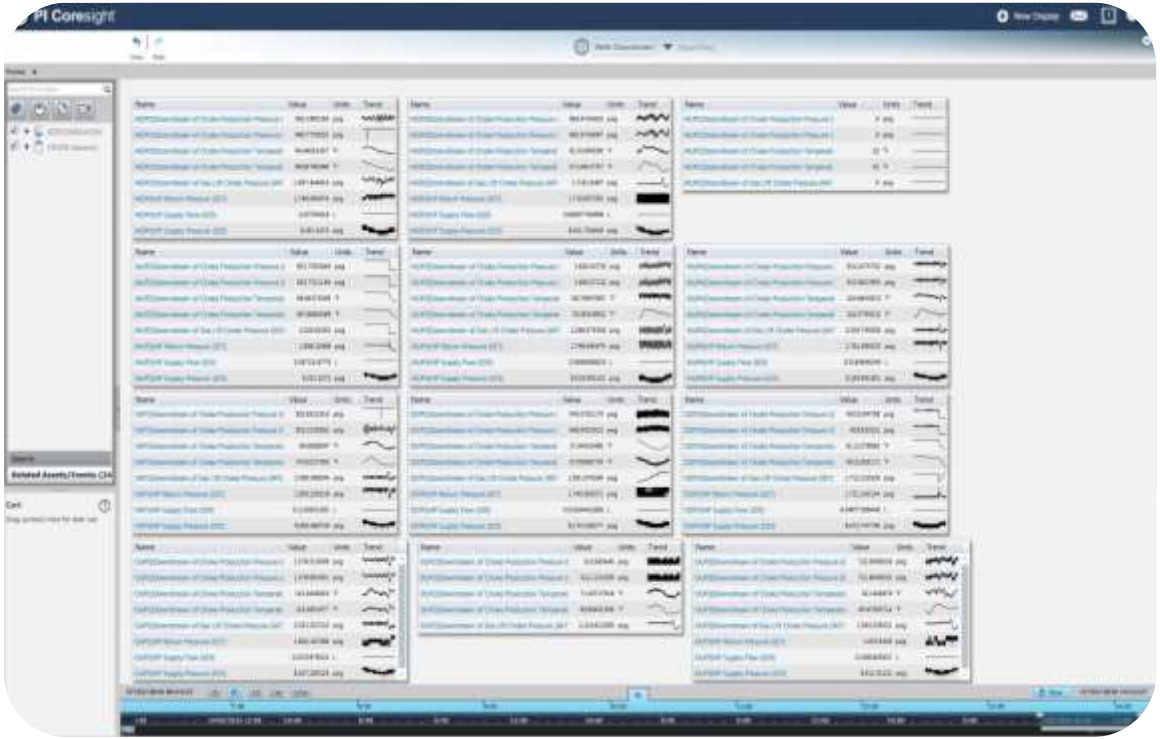
Installation and Configuration of PI Coresight and setting of new layout rules:

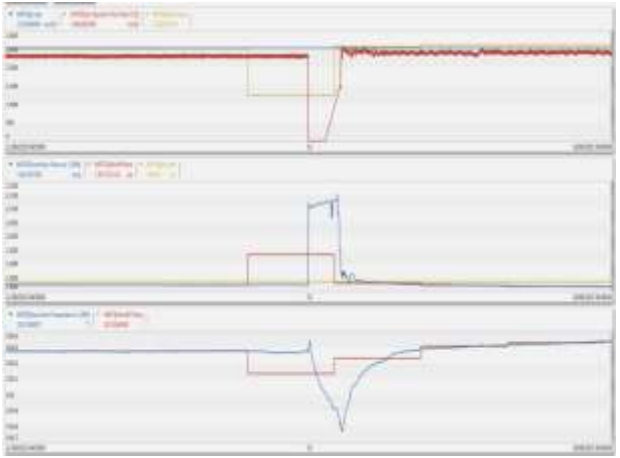
- Create new layout rules to standardize the dashboards appearance;
- Upload all useful PI ProcessBook dashboards on the new platform;
- Process for dashboard development.

RESULTS

- Optimization of development efforts;
- More integration between engineers;
- Dashboards with higher quality;
- New platforms can be used to monitor the desired variables (e.g. mobile phone and tablets).

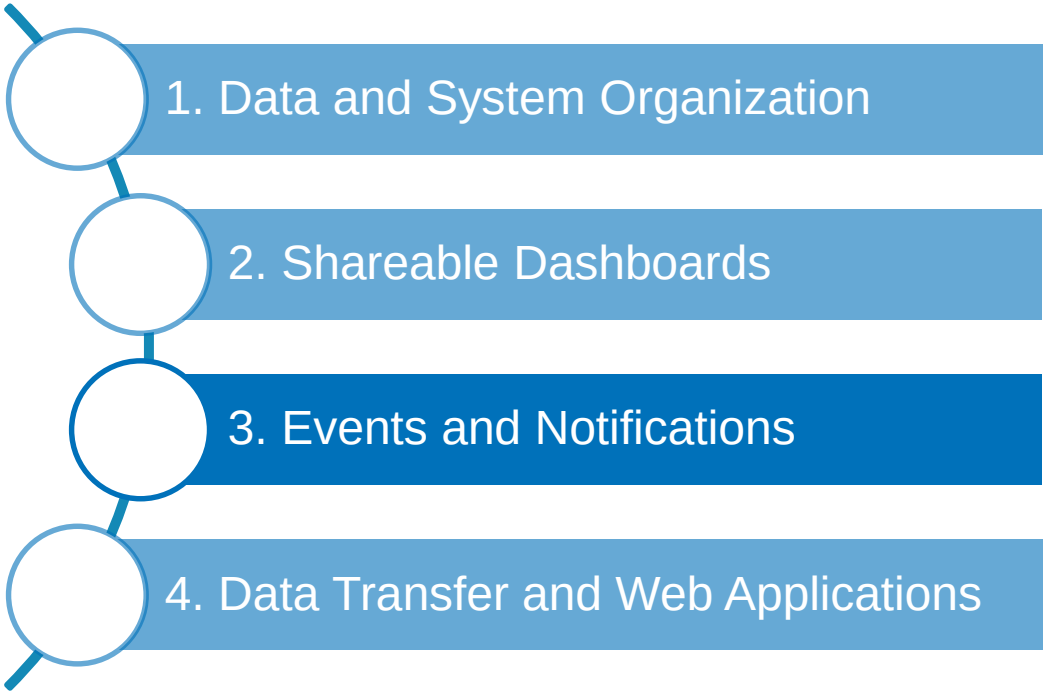
2. Shareable Dashboards: Sample





2. Shareable Dashboards: Topsides Process Monitoring

The Project Comprises Four Main Sections



3. Events and Notification: Description

CHALLENGE

Notify the employees about critical situations and perform calculations automatically.

SOLUTION

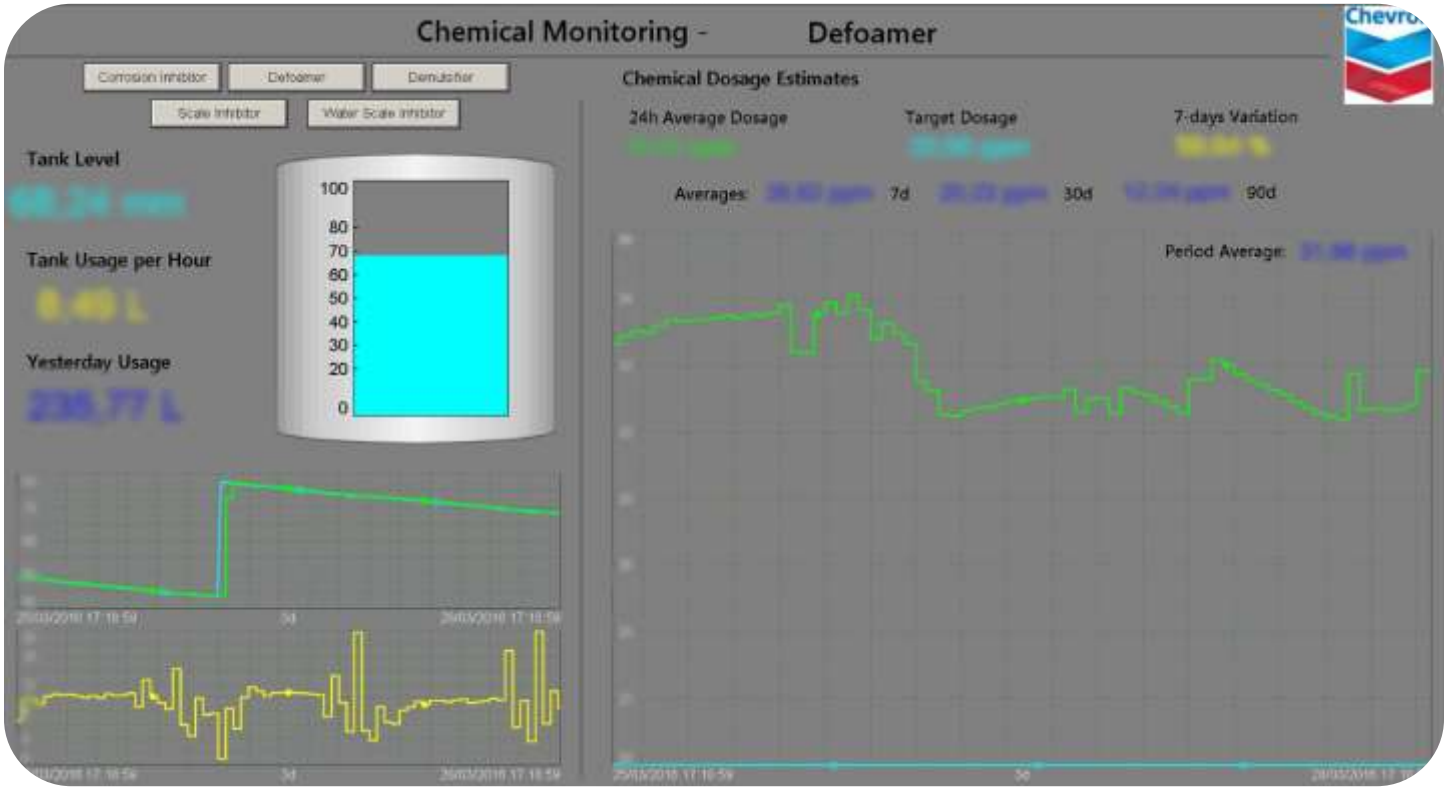
Installation and configuration of PI Event Frames, PI Notifications and PI Asset Analytics:

- Possibility of inserting critical variable thresholds on PI AF;
- PI Notifications association with PI Server database using the PI AF structure;
- Creation of sample events to show the PI Event Frames potential.

RESULTS

- Increase in system surveillance, especially for the onshore team;
- A chemical injection monitoring dashboard will capture tanks refill events;
- Events are being tested to capture and monitor valves closing and opening duration.

3. Events and Notification: Chemical Storage Monitoring Sample



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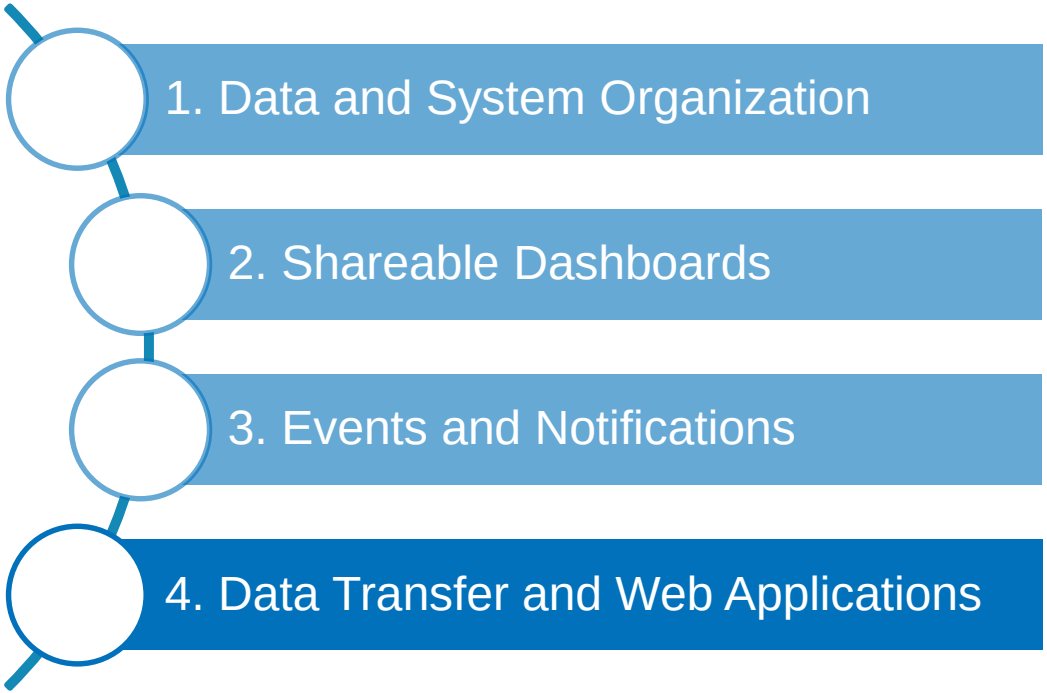


4. Data Transfer and Web Applications: Description

CHALLENGE

Fasten onshore/offshore interface data transfer and create new tools for the web application

SOLUTION

Installation and configuration of PI Web API and integration with other web technologies:

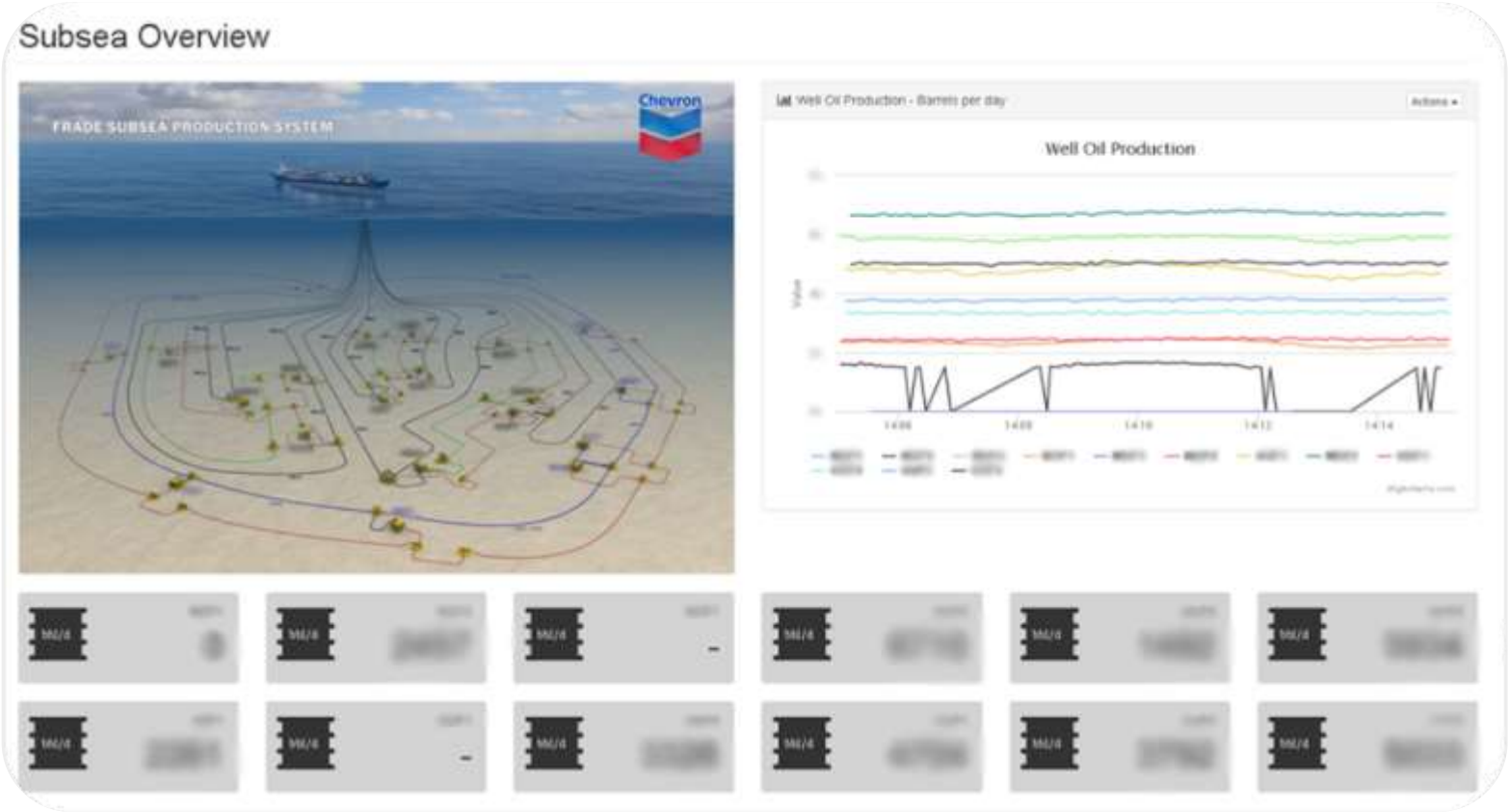
Conjoined work between PI Web API, PI AF and other tools, such as .NET Web Application, HTML5 and JavaScript.

RESULTS

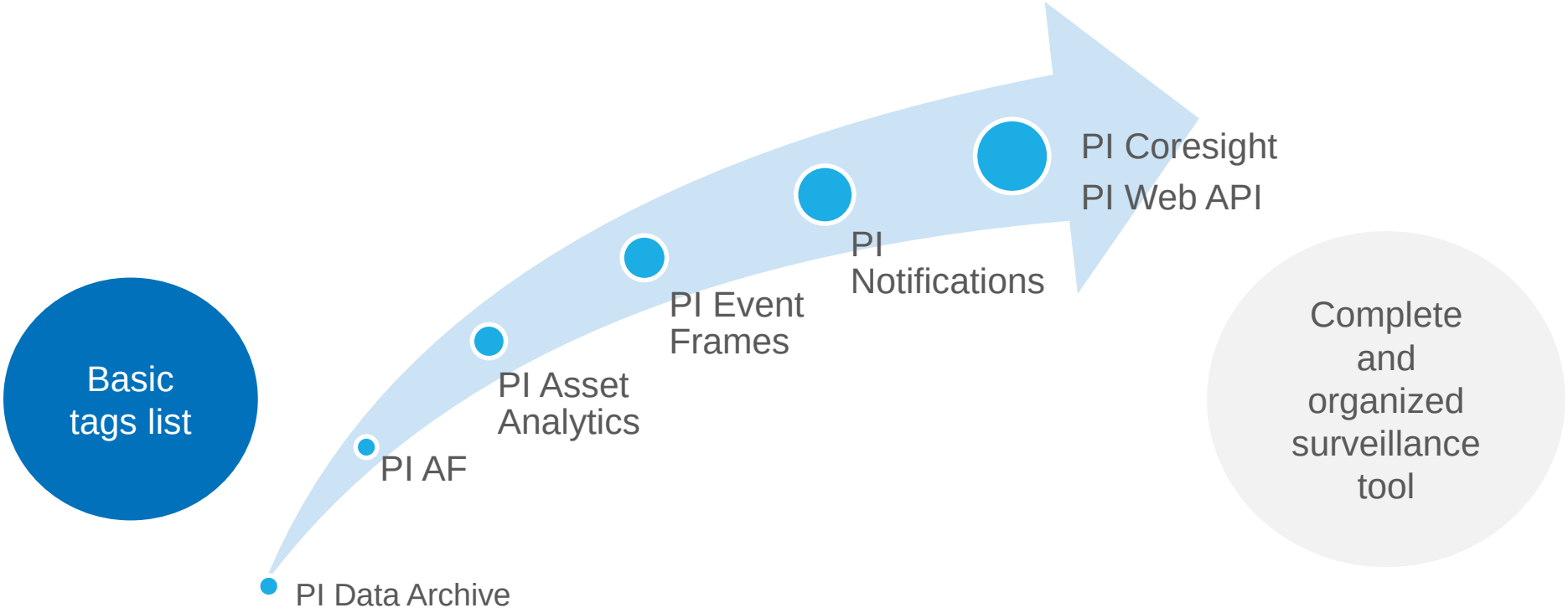
The development of prototype application proved the following results:

- Faster loading time regarding web applications, essential to the offshore team;
- Better usability with custom menus and navigation between dashboards.

4. Data Transfer and Web Applications: Sample



Lessons Learned: The PI Tools Can Be Powerful



Next Steps and Future Plans

- Build all remaining useful dashboards on PI Coresight and PI Web API;
- Create all tags that are not yet present on PI Server;
- Design and implement further demands of web applications;
- Train PI users in order to show the new available tools and their usefulness;
- Shift all surveillance applications to the PI System tools.

Enhancing Monitoring Capability in Frade FPSO Using PI Tools

COMPANY and GOAL

One of the world's leading oil producer wanted to **improve its Frade FPSO monitoring capability and information quality through the PI System.**

CHALLENGE

Instrument tags not structured and faulty, lack of surveillance, dashboard management and collaboration

- Errors and gaps in tags;
- Lack of shared solutions;
- No ways to notify important events;
- No centered management of dashboards.

SOLUTION

Used PI AF, PI Event Frames, PI Notifications, PI Coresight and PI Web API to completely overhaul the PI System capabilities

- Key users' demands were gathered and implemented;
- Use of programming languages and other technologies to provide a friendly user interface.

RESULTS

Reduced in 50% the development efforts and duplicated tasks, optimized system maintenance and scalability

- Increase offshore Data Quality on 90%;
- Increase the collaboration between office and offshore through one application platform (PI System);
- 5% lower consumption of chemicals, which represents $15,000/month.

Contact Information

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Project Engineer

Questions

- Please wait for the **microphone** before asking your questions
- State your **name & company**

Gracias ありがとう
Merci Danke
Thank You
Спасибо 谢谢
감사합니다 Obrigado