“Monitoring Implementation for Measuring Points and Pipelines of PEMEX”

Presented by **Ruben Leo Robles**

Monitoring Implementation for Measuring Points and Pipelines

- *"The geographic dispersion together with lack of communication infrastructure, information systems, and storage outlets and ducts, hinders proper management of transmission and distribution processes by not having continuous and timely information in the administrative offices to allow decisions effectively. The PI System as an Integration and applications infrastructure enabled PEMEX to solve this problem".*

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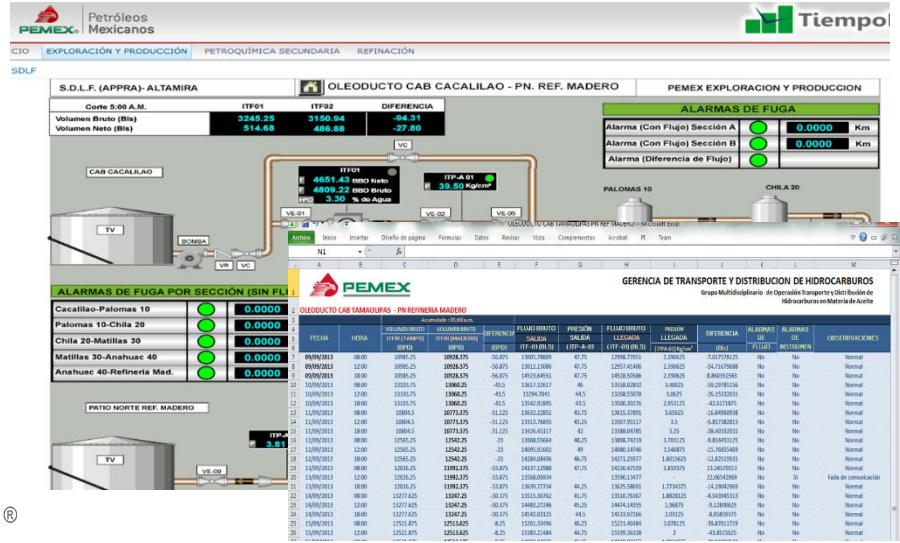
y Procesos del Negocio, DCTIPN. Pemex



Case

- Lack of a holistic view of pipeline information including missing and quality measurements
- Lack of tool support for the proper administration of the transport processes and distribution of hydrocarbons

Solution

- PI System as an integration applications infrastructure for PEMEX pipelines and associated meter stations.
- Integrate IT and decision support tools and applications to support real time information integration and exploitation

Results and Benefits

- Ability to gather pipeline information and perform quality check and approximate missing meter information
- Perform both reactive and proactive visualization and analytics to improve pipeline and logistics system performance including hydrocarbon loss

Content

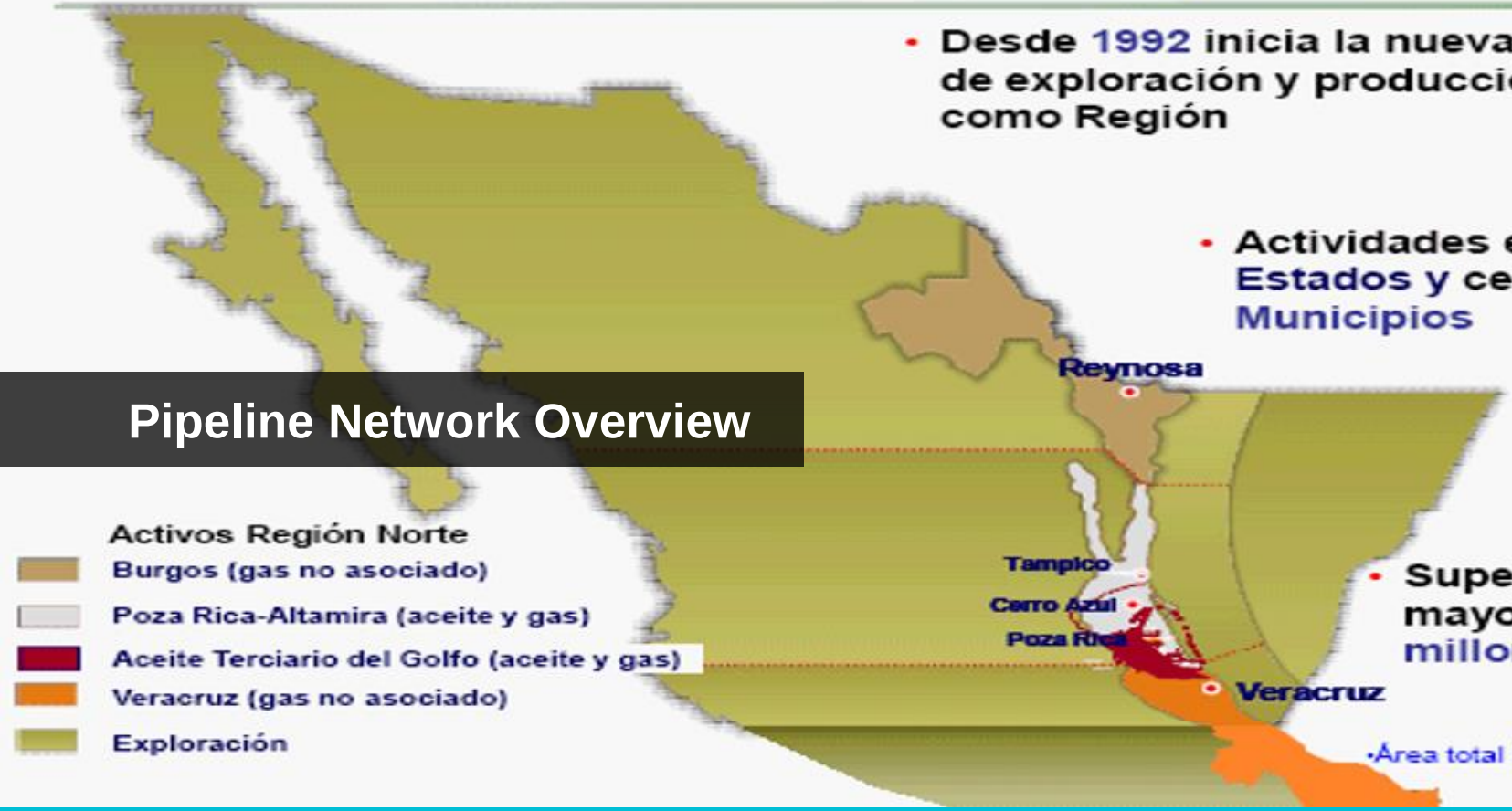
- Overview of pipeline network
- Strategy
- Implementation of the solution
- Benefits
- Conclusions

PEMEX
EXPLORACIÓN Y PRODUCCIÓN

La Región Norte de PEP

- Desde 1992 inicia la nueva visión de exploración y producción como Región
- Actividades en 10 Estados y cerca de 200 Municipios

Pipeline Network Overview



- Superficie mayor a 2 millones de km²

•Área total Papaloapan B: 15,765 Km²

Strategy

- The process management provides transmission and distribution strategy in the real-time monitoring of installations

Implementation of the Solution

Objective: To support the management of transportation and distribution processes, monitoring the operating performance of the installations in real time via the PI System platform.

Implementation of the Solution

- **9 Measurement points (6 of Oil and 3 of Gas):**
  - C.A.B. Poza Rica - Marfo
  - C.A.B. Poza Rica -Pozoleo
  - B.S. Arenque
  - B.S. Muro
  - B.S. Horcón
  - B.S. Álamo
  - C.P.G Poza Rica
  - C.P.G. Arenque
  - EPMG. Raudal
- **Variables**
  - Instantaneous flow (gross/ net)
  - Instant pressure
  - Instantaneous Differential Pressure
  - Instantaneous temperature
  - Flow Daily (gross/ net)
  - Average Temperature
  - Average pressure
  - Chromatography

Implementation of the Solution

- **3 Gasoline ducts and 6 Pipelines :**
  - 1 Gasoline duct E.C. Cuervito – C.M. Km. 19
  - 2 Gasoline duct Entronque Comitas – C.M. Km. 19
  - 3 Gasoline duct B.S. Monterrey – C.M. Km. 19
  - 4 Pipeline C.A.B. Tamaulipas – P.N. Ref. Madero
  - 5 Pipeline C.A.B. Cacalilao – P.N. Ref. Madero
  - 6 Pipeline C.A.B. Tajín 10” – C.A.B. Poza Rica 10”
  - 7 Pipeline C.A.B. Tajín 16" – C.A.B. Poza Rica 16”
  - 8 Pipeline B.S. Perdiz – E.M.C. Papan
  - 9 Pipeline B.S. Mata Pionche – V.S. Paso del Toro
- **Variables:**
  - Volumetric Flow (gross and net)
  - Pressure pipeline without pumping
  - Pressure pipeline with pumping
  - Total volumetric flow (gross and net)
  - Percentage of Water
  - Alarm and Leak Location
  - State of the measuring instruments

Implementation of the Solution

Identify Needs

- Installations and information to integrate
- Piping and instrumentation diagram
- Data dictionary of interface nodes

Management Stations and Gas Processing

Storage and Pumping

Batteries Separation

Pipeline and Measurement Points

Analyze

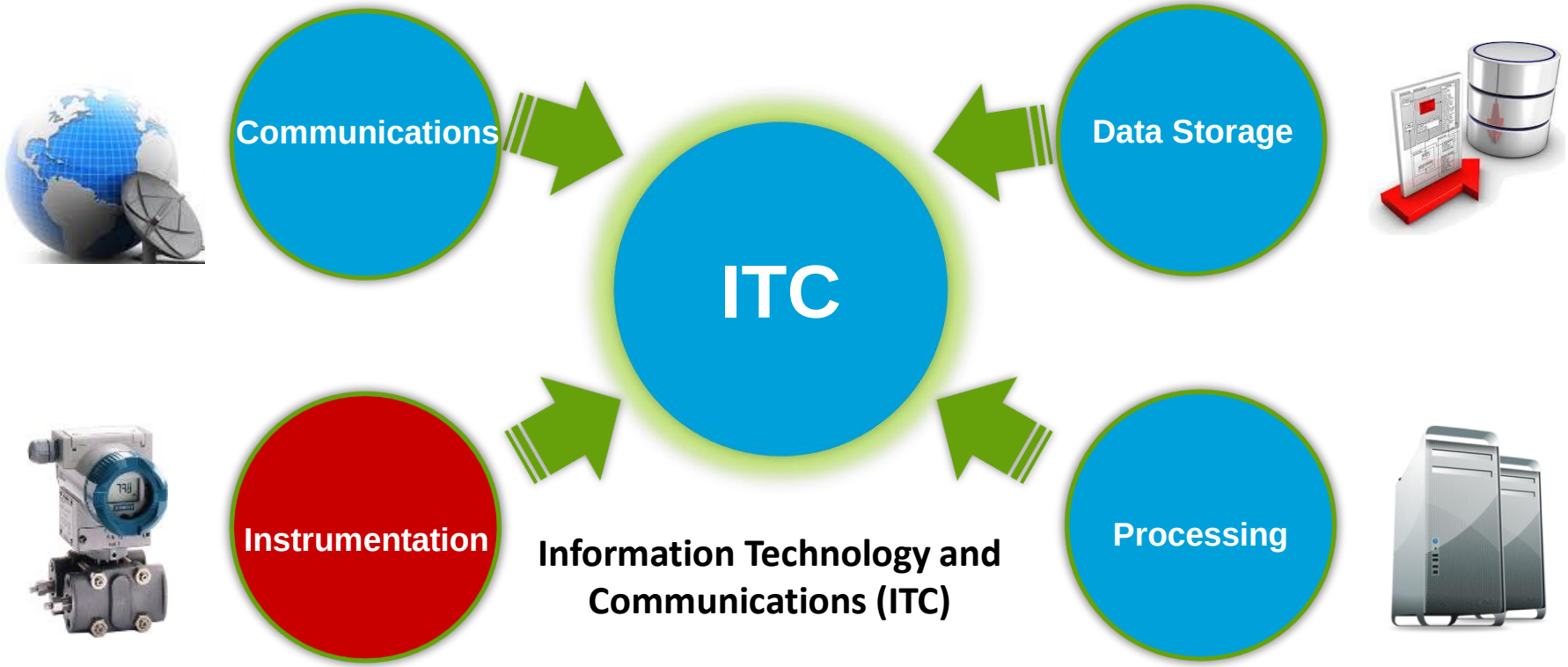
PI SYSTEM SERVER

- Interface for data acquisition
- Variables to integrate
- Exploiting Information

Designing

- Graphics
- Web Portal
- Reports
- Users Groups

Implementation of the Solution



Implementation of the Solution

INSTRUMENTATION (DATA SOURCES)

Pipeline

Flow Meters and Pressure Transmitters

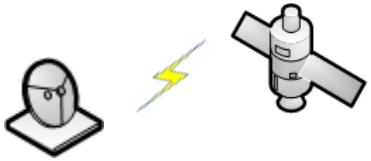
Points of Measurement

Flow Computer

TELECOMMUNICATIONS

Radio Link

PEMEX Data Network



Satellite Link

IT PEMEX

Regional Center for Data Processing

PI System Server

Interfaces Server

Web Server, Real Time

EXPLOITATION OF INFORMATION

Executive users

- Real time monitoring
- Reports

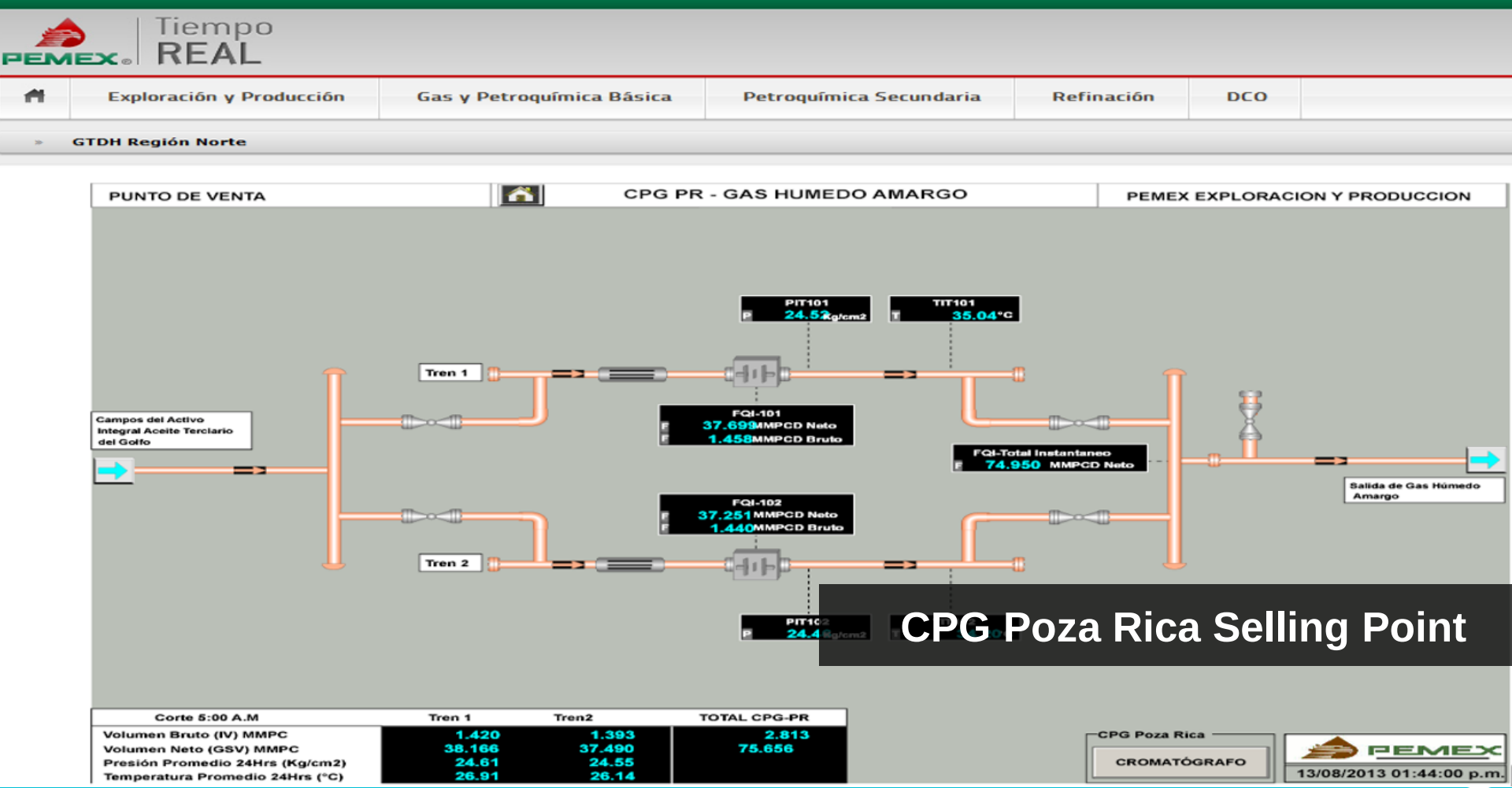
Results

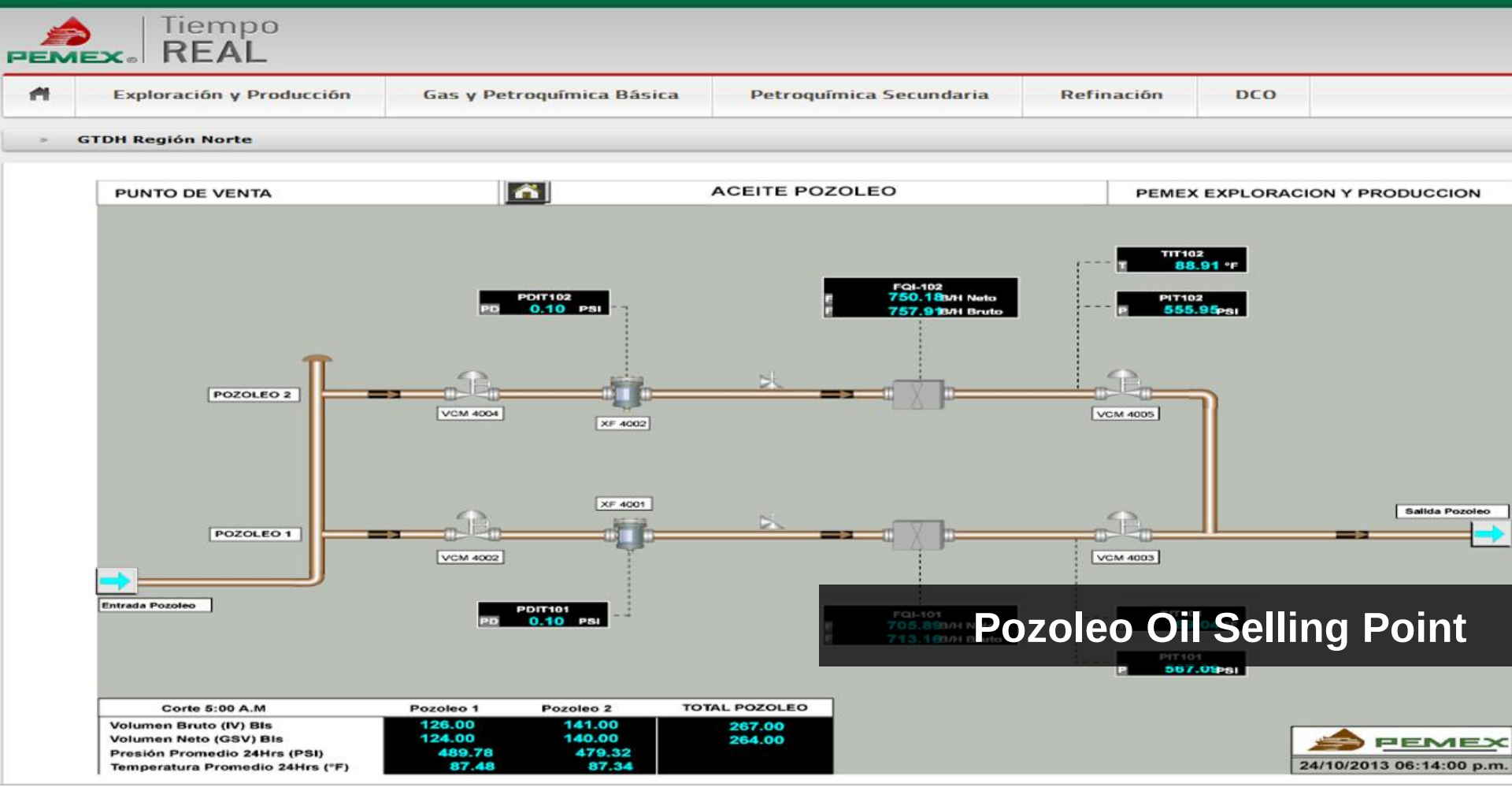
Measuring Points	
Instantaneous flow (gross / net).	53
Instant pressure.	20
Instantaneous Differential Pressure.	8
Instantaneous temperature.	18
Flow Daily (gross / net).	68
Average Temperature.	21
Average pressure.	19
Chromatography.	96

Pipelines	
Volumetric Flow (gross and net).	300
Pressure pipeline without pumping.	26
Pressure pipeline with pumping.	42
Total volumetric flow (gross and net).	33
Percentage of Water.	69
Alarm and Leak Location.	58
State of the measuring instruments.	58

303 Integrated process variables.
15 Deployed Graphics Processing.
30 web users.

586 Integrated process variables.
28 Deployed Graphics Processing.
10 web users.





PEMEX Tiempo REAL

Exploración y Producción | Gas y Petroquímica Básica | Petroquímica Secundaria | Refinación | DCO

GTDH Región Norte

CPG POZA RICA | Análisis Cromatográfico de Gas Húmedo Dulce | PROCESO

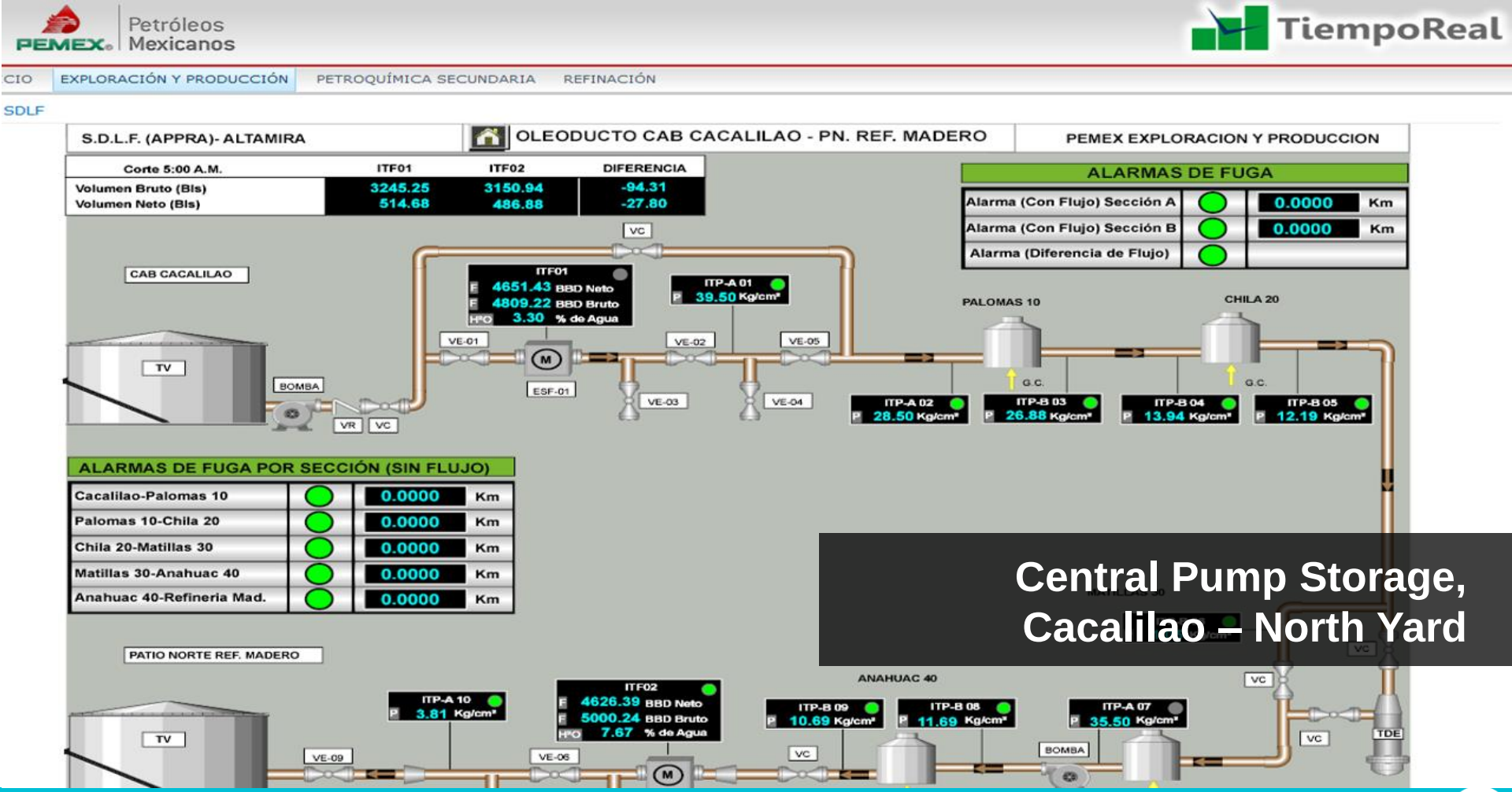
CROMATÓGRAFO DE GAS | CTDH POZA RICA

CROMATÓGRAFO DE GAS HÚMEDO DULCE

Punto de Venta CPG Poza Rica

Metano / Nitrógeno	86.7827	Mol %
Nitrógeno / Dióxido de Carbono	0.6256	Mol %
Dióxido de Carbono / Sulfuro de Hidrógeno	0.6971	Mol %
Etano / Agua	5.7587	Mol %
Propano / Helio	3.3307	Mol %
Agua / Metano	0.0000	Mol %
Sulfuro de Hidrógeno / Etano	0.0000	Mol %
Hidrógeno / Propano	0.0000	Mol %
Monóxido de Carbono / n-Butano	0.0000	Mol %
Oxígeno / i-Butano	0.0000	Mol %
	0.4534	Mol %
	1.1310	Mol %
	0.3181	Mol %
	0.4284	Mol %
	0.4744	Mol %
	0.0000	Mol %

Wet Sweet Gas Chromatography Monitoring



Central Pump Storage, Cacalilao – North Yard

OLEODUCTO CAB TAMAULIPAS PN REF MADERO - Microsoft Excel

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N1

PEMEX

GERENCIA DE TRANSPORTE Y DISTRIBUCION DE HIDROCARBUROS

Grupo Multidisciplinario de Operación Transporte y Distribución de Hidrocarburos en Materia de Aceite

OLEODUCTO CAB TAMAULIPAS - PN REFINERIA MADERO

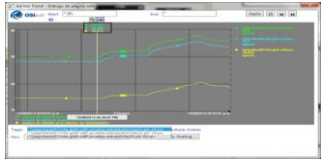
FECHA	HORA	Acumulado : 05:00 a.m. VOLUMEN BRUTO ITF01 (TAMPS) (BPD)	VOLUMEN BRUTO ITF01 (MADERO) (BPD)	DIFERENCIA (BPD)	FLUJO BRUTO SALIDA ITF-01 (BLS)	PRESIÓN SALIDA (ITP-A-01	FLUJO BRUTO LLEGADA (ITF-01) (BLS)	PRESIÓN LLEGADA (ITPA-01) Kg/cm²	DIFERENCIA (Bls)	ALARMAS DE FLUJO	ALARMAS DE INSTRUMEN	OBSERBVACIONES
09/09/2013	08:00	10985.25	10928.375	-56.875	13005.78809	47.75	12998.77051	2.390625	-7.017578125	No	No	Normal
09/09/2013	12:00	10985.25	10928.375	-56.875	13012.13086	47.75	12957.41406	2.390625	-54.71679688	No	No	Normal
09/09/2013	18:00	10985.25	10928.375	-56.875	14519.64551	47.75	14528.50586	2.390625	8.860351563	No	No	Normal
10/09/2013	08:00	13103.75	13060.25	-43.5	13617.32617	46	13558.02832	3.40625	-59.29785156	No	No	Normal
10/09/2013	12:00	13103.75	13060.25	-43.5	13294.7041	44.5	13268.55078	3.0625	-26.15332031	No	No	Normal
10/09/2013	18:00	13103.75	13060.25	-43.5	13542.91895	43.5	13500.30176	2.953125	-42.6171875	No	No	Normal
11/09/2013	08:00	10804.5	10773.375	-31.125	13632.22852	43.75	13615.37891	3.65625	-16.84960938	No	No	Normal
11/09/2013	12:00	10804.5	10773.375	-31.125	13313.76855	43.25	13307.95117	3.5	-5.817382813	No	No	Normal
11/09/2013	18:00	10804.5	10773.375	-31.125	13426.45117	42	13388.04785	3.25	-38.40332031	No	No	Normal
12/09/2013	08:00	12565.25	12542.25	-23	13908.55664	48.25	13898.74219	3.703125	-9.814453125	No	No	Normal
12/09/2013	12:00	12565.25	12542.25	-23	14095.91602	49	14080.14746	3.546875	-15.76855469	No	No	Normal
12/09/2013	18:00	12565.25	12542.25	-23	14284.08496	46.75	14271.29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13/09/2013	08:00	12026.25	11992.375	-33.875	14137.12988	47.75	14150.47559	1.859375	13.34570313	No	No	Normal
13/09/2013	12:00	12026.25	11992.375	-33.875	13568.06934	-	13590.13477	-	22.06542969	No	SI	[illegible]
13/09/2013	18:00	12026.25	11992.375	-33.875	13639.77734	44.25	13625.58691	1.7734375	-14.19042969	No	No	Normal
14/09/2013	08:00	13277.625	13247.25	-30.375	13515.30762	41.75	13510.76367	1.8828125	-4.543945313	No	No	Normal
14/09/2013	12:00	13277.625	13247.25	-30.375	14483.27246	45.25	14474.14355	1.96875	-9.12890625	No	No	Normal
14/09/2013	18:00	13277.625	13247.25	-30.375	14542.03125	44.5	14533.97266	2.03125	-8.05859375	No	No	Normal
15/09/2013	08:00	12521.875	12513.625	-8.25	15261.33496	46.25	15221.46484	2.078125	-39.87011719	No	No	Normal
15/09/2013	12:00	12521.875	12513.625	-8.25	15383.21484	44.75	15339.36328	2	-43.8515625	No	No	Normal

Information for Better Decision Making

Benefits

Monitoring real-time operating information is a tool that gives the ability of analysis, evaluation and decision making. Some benefits are mentioned as follows:

- Ability to monitor interruptions or pumping rhythms, instantaneous flows and production volumes.
- Use of the information in the form of historical production reports and statistical analysis for process operating conditions.
- Preemptively react to unwanted events.
- Ability to monitor possible leakage events and their location through site in real time.



Conclusion

The real-time monitoring information from operating variables, measuring points, and pipelines through the PI System supports the proper management of transmission and distribution processes, allowing monitoring the operating performance of facilities paying attention to the following critical events that can occur:

- Pressure drop
- Repressing out in inputs or outputs (high pressure)
- Difference production
- Stop unscheduled equipment

To Ponder

- "Enterprises use ITC, not just to improve what they already do, but to generate new knowledge."
- "In a situation of continuous improvement, the enterprises should make the right decisions about optimizing through ITC."
- "The ITCs can be used by all industry to achieve the fundamental objectives defined by the mission and vision."
- "We rely on ITC tools, the challenge is being creative and efficient so that the results are growth and strength of the industry using them."

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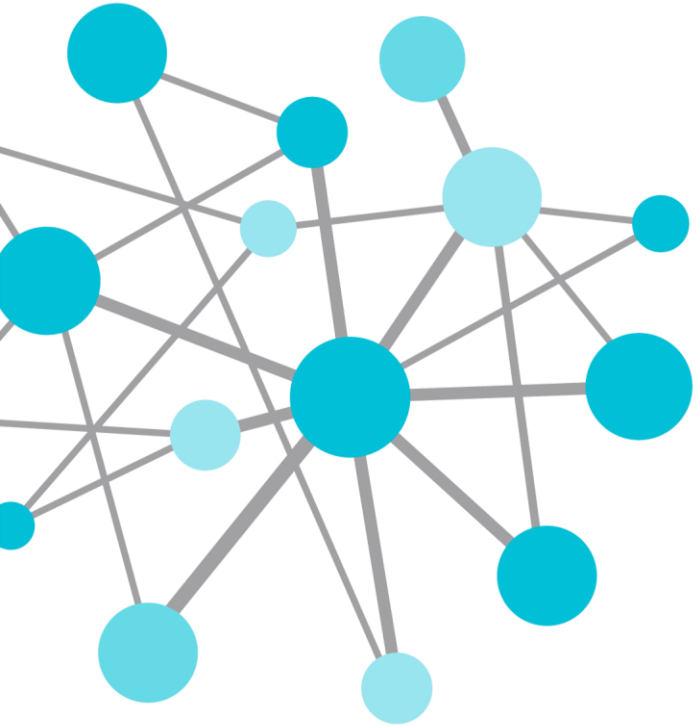
Administrador Plataforma PI System

Dirección Corporativa de Tecnología de Información y Procesos del Negocio



THANK YOU

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