Design of a Gun Barrel Tank for Heavy Oil-Water Dehydration

Oil Engineer Challenges
PRESENTATION TOPICS

• Pemex: Organization and Activities

• Problem Description:
  
  Is possible D&D heavy crude oil in a Gun Barrel?

• Methodology:
  
  Unique Development of Thermophysics model from PVT’S analysis to plug and play on CFX (applied research).

• Goals.
• Conclusion and next steps.
PEMEX: ORGANIZATION AND ACTIVITIES

They are four subsidiary bodies and besides there’s another one Pemex International, they have been organized to carry out exploitation, production, processing and sale of hydrocarbons and their derivatives.
DOS BOCAS MARITIME TERMINAL

Pemex has implemented a technological improvement, with the incorporation of a dehydration and desalting system of Maya oil in Dos Bocas Maritime Terminal by means of storage tanks of 500 TB converted into Gun Barrel.

This project was developed in Dos Bocas Maritime Terminal located in Ranchería El Limón S/N Paraíso, Tabasco, México.
SUBSTANTIAL ACTIVITIES IN THE DOS BOCAS MARITIME TERMINAL.

- **Oil Reception**
- **Oil Stabilization**
- **Dehydration and Desalting**
- **House of pumps**
- **Storage**
- **National**
- **Exportation**
- **DPF**
- **Gas Compression**
- **CPG Cactus**
- **Effluent treatment**
- **Injection to wells**
- **Electric generation**
- **Electric power for operation of the Dos Bocas**

- **Blend gas-oil**
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?

Gráfica 1. Porcentaje de agua en el crudo maya recibido en TMDB

% Water

Gráfica 2. Contenido de sal en el crudo maya recibido en TMDB, LMB

SALT PTB
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?

What can we do?

- Stimulate wells
- Electrostatic Vessel
- Nothing to do
- Gun Barrel
- Close Production
- Forecast
- Water treatment

...but which one is first?
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?

PROJECT EJECUTION

Gun Barrel

Energy & Mass Balance. → P & IDs → Detailed Design → Requisition → Procurement and Building → Operation

Project Management

Deliverables Management

4 months → 5 months → 6 months → 3 days

Electrostatic Vessel

Energy & Mass Balance. → P & IDs → Detailed Design → Requisition → Procurement and Building → Operation

Project Management

Deliverables Management

4 months → 5 months → 14 months → 1 month
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?

Heat Oil

Tank Conversion

Water Treatment

Pipeline Subsea

Oil Dehydration & Desalting
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?

DEHYDRATION AND DESALTING IN THE DOS BOCAS

**Heating options**

**Advantages and benefits**

1. Avoid the shipment of 130,000 Tons CO₂ annual.
2. 5 MMFCD approx. of natural gas not burned.
3. Reduces the temperature of waste correspondents’ gases to the atmosphere, diminishing the GLOBAL HEATING.
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?

PROJECT IN CERTIFIED EMMISION REDUCTION (CER’s)
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?

In the **Gun-Barrel tanks** the feeding hydrated oil is carried out for the bottom through a **distributor**.

Conventional hydraulic efficiency in GB 1-21%, best 65-80% (distributor).
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?

In the **Gun-Barrel tanks**, the associated water in the oil enters in contact with the interface, in order to the water drops have coalescence and fall them out, the outputs of dehydrated oil are on the top and the water is drained in the bottom.
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?

By mean ANSYS-CFD simulation it was determined that the Gun-Barrel tank with 500 TB capacity operates with flows of 450-750 TBD of oil, this is possible reaching quality with values inside the contractual requirements of 0.5% vol. of water and 50 PTB of salt maximum.
IS POSSIBLE D&D HEAVY CRUDE OIL IN A GUN BARREL?

Internal Gun Barrel tanks Patent Design
GOALS

✓ Unique system D&D on line for 600 TBD heavy oil.

✓ Permanence in the global market offering quality oil.

✓ Construction record time.

✓ $350 Millions USD by year Penalties off.
CONCLUSION AND NEXT STEPS

✓ The project expectations were complete covered by the good design distributor with ANSYS-CFD.

✓ The prediction by ANSYS simulation between the real behavior is also the same because the desviation was 1%.

✓ The great real results about this system have broken paradigms, so much that Pemex is now constructing an additional system.