PEMEX
EXPLORACION Y PRODUCCION

Block Atún

EXECUTIVE SUMMARY

Asset Poza Rica-Altamira

PEMEX
EXPLORACION Y PRODUCCION

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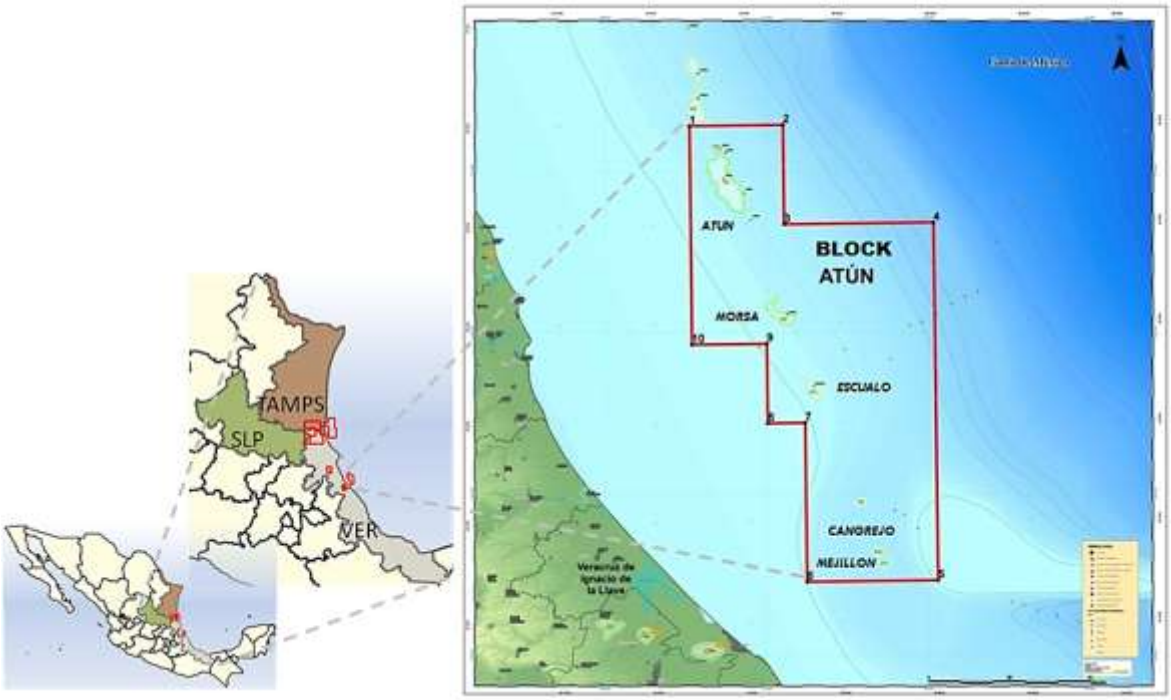
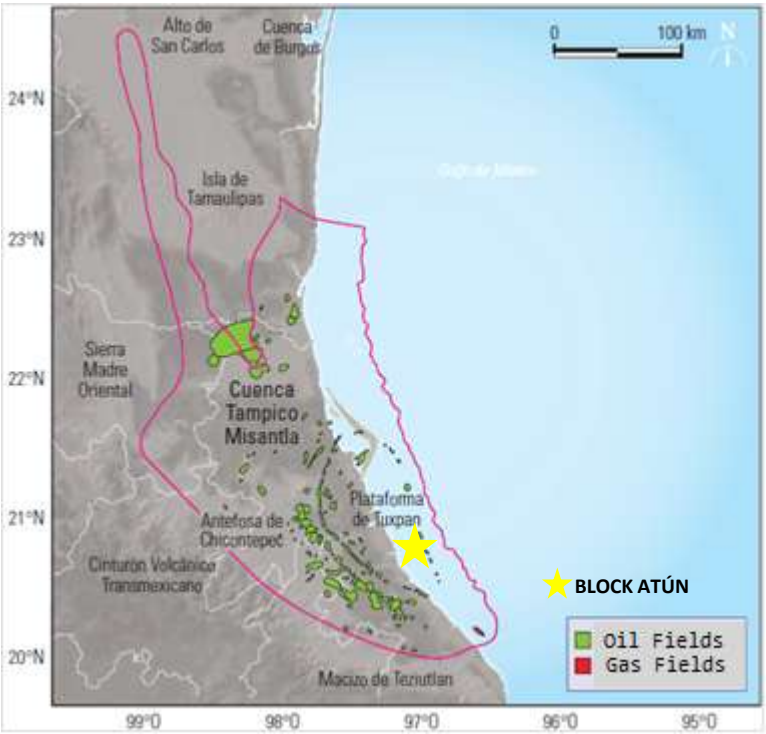
The offshore Atún block is located on the continental shelf in the territorial waters of the Golf of Mexico, in front of the northern coast of state of Veracruz, approximately 40 Km East-Southeast of the city of Tuxpan de Rodríguez Cano and at 15 Km North of the town of Tecolutla. Is Northern limit is the Bagre field and its it has area of 625 Km^2. Geologically is located in the eastern portion of the Tampico-Misantla Basin. In the block are the fields Atún, Cangrejo, Escualo, Mejillón and Morsa.



Location of the Atún Block

The main producing formation is Middle Cretaceous El Abra formation which is made up of naturally fractured carbonates. The hydrocarbons are super-light crude, gas and condensate (45 to 53° API). Seventy two (72) wells have been drilled, with sixty six (66) plugged and abandoned, four (4) shut-in and two (2) operating. As of January 2011 the block has a cumulative production of 54.1 MMb of oil and 203.1 MMMcf of gas. The production driving system is natural flowing and the reservoir depth ranges from 2,711 to 3,171 m.

The Tampico-Misantla Basin is located west side of Mexico and includes the south end of the state of Tamaulipas, the central portion of the state of Veracruz, portions of the west side of the states of San Luis Potosi and Hidalgo, the north portion of the state of Puebla and the continental platform to the bathymetry of 200 meters.



Location of the Block Atun in the Tampico-Misantla Basin.

The crystalline basement is made up of igneous and metamorphic rocks ranging from the Permian to the Middle Jurassic. In stratigraphic column of the Tampico-Misantla Province the following tectonic sequences are recognized:

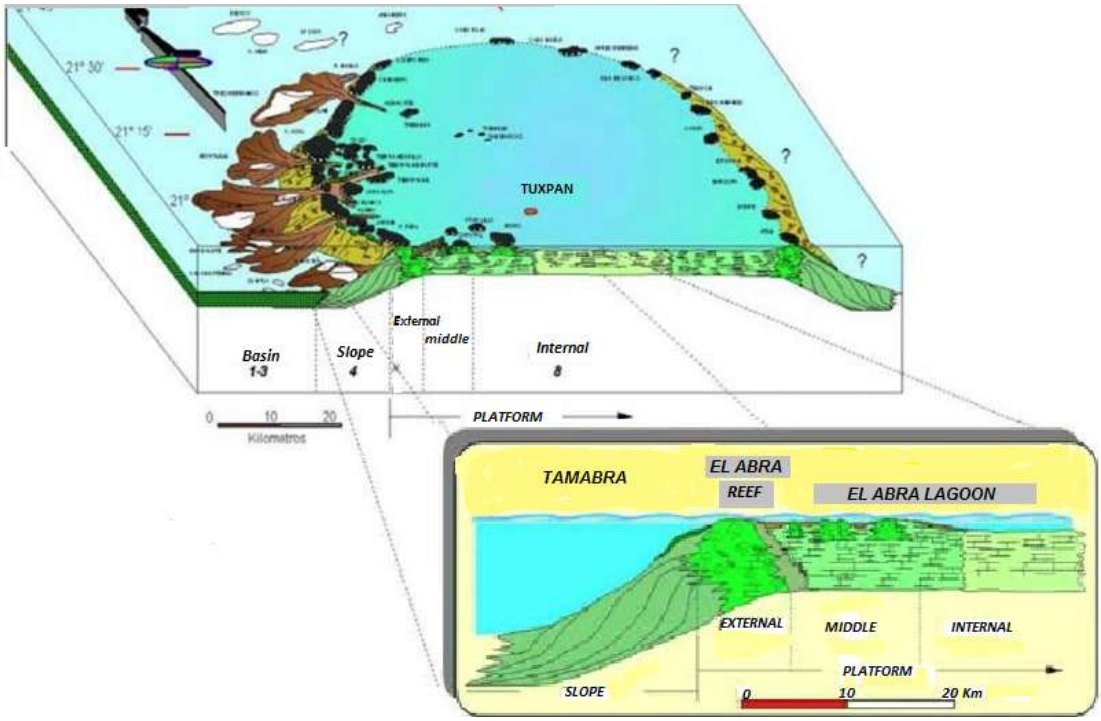
The first tectonic sequence (Synrift) begins in Triassic with the deposition over the basement of continental clastic rocks of alluvial and fluvial environments with some lava flows of the Huizachal Formation of the Late Triassic and Hettangian age. It is followed by a marine transgressive sequence of sandstones and shales of the Huayacocotla Formation during the Lower Jurassic Hettangian-Pliensbachian. In the Middle Jurassic the continental environments re-appear with the clastic rocks of the Cahuasas Formation. A new transgression allowed the deposition of oolitic limestone in the lower portion of the Huehuetepec Formation.

Sandy limestones and shaly bioclastic rocks of the Tepexic Formation were deposited over these formations in the Callovian age. It was followed by the deposition of deep water shaly and carbonate limestones of the Santiago Formation when the maximum transgression was reached during the Oxfordian age. Around of highs of the basement, carbonate ramps developed and, in their internal side, were deposited the shaly-sandy limestones of the San Pedro Formation and the oolitic limestones of the San Andres Formation together with their lateral equivalents of the Chipoco Formation and basin sediments of the Taman Formation. These facies reached their maximum development during the Kimmeridgian age covering the Tampico-Misantla basin, mainly during the second sea-level lowering. In certain zones it can be observed the abrupt change of the Santiago Formation to the Chipoco or San Andres Formation.

The shaly and carbonate limestones of the Pimienta Formation covered regionally the formations Taman, Chipoco and San Andres during the Tithonian. Toward the end of the Jurassic a thin packet of clastic rocks are deposited over the Pimienta Formation. These sediments make up the La Casita Formation and their source is the erosion of exposed portions of the crystalline basement.

The second tectonic sequence (Passive Continental Margin) begins with the deposition of oolitic and bioclastic limestones of lower member of the Tamaulipas Formation of the Berriasian-Valanginiano age. Towards the area of Tuxpan, however, there was the development of a reef represented by the limestones of the El Abra Formation bordered by slope sediments of the Tamabra Formation.

Towards the end of the Cenomanian this platform has an extended surface exposure. With the following transgression, the shallow-water carbonate sedimentation is re-established with the relative rise of the sea level. The pelagic carbonate limestones of the Agua Nueva Formation of Turonian age are deposited over the formations El Abra, Tamabra and Upper Tamaulipas.



Depositional Model Middle Cretaceous (Albian-Cenomanian)

Later shaly limestones with intercalations of bentonite of the San Felipe Formation were deposited followed by marl, shaly limestones and calcareous shales of the Mendez Formation mark the end of the Passive Continental Margin tectonic sequence.

The third tectonic sequence (Foreland Basin) is characterized by a change from carbonate to terrigenous sedimentation. The terrigenous sediments were defined by López-Ramos (1956) as being part of the Tampico-Misantla Basin.

The bathymetric profile had the tendency to be of a ramp, with relatively narrow zones, and in which the costal systems changed to a prodeltaic or slope zone with predominant transport of sediments by turbidity currents, flows of waste rock and landslides.

List of formation abbreviations:

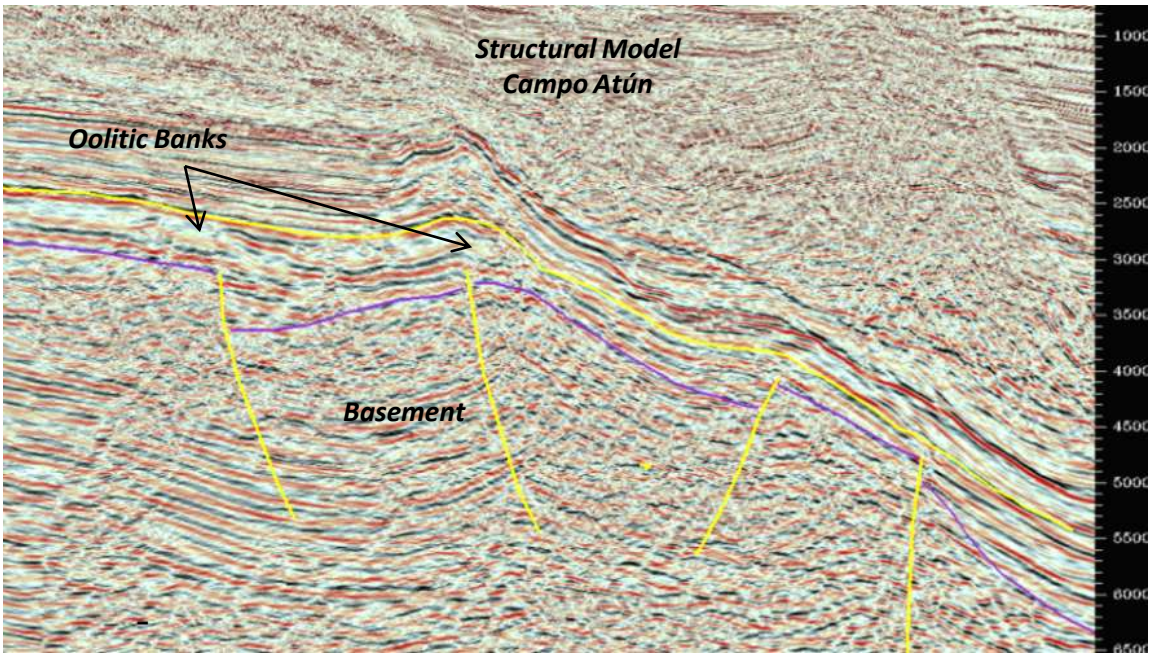
Mendez	*Kmendez*
San Felipe	*Ksf*
Agua Nueva	*Kan*
Upper Tamaulipas	*Kts*
Lower Tamaulipas	*Kti*
Upper Jurassic	*Js*
Upper Jurassic San Andres	*Jsa*

The geological column from the bottom to top, begins with the Paleozoic crystalline basement overlaid by Jurassic and Lower Cretaceous calcareous rocks. These in turn were overlaid by sediments from the border of the Middle Cretaceous platform (reefs of the El Abra Formation) that change facies laterally towards the slope (Tamabra Formation) and towards the interior of the of the platform (post-reef facies.) These same sediments overlay the Upper Cretaceous rocks towards the interior of the platform. A clear discordance can be noted in the reef growth zones that set the contact of the Middle Cretaceous with the clastic sediments of the Tertiary and which make up the remaining of the geological column till the Quaternary period.

Structurally the border of the carbonate rocks platform is characterized by major gravity-induced listric faults that cut the Tertiary sediments dipping towards the basin and joining in a main level (shaly interval of the Basal Tertiary.)

The area reservoirs are a combination of structural and stratigraphic traps developed in the high of the block. The area is covered completely by 3D seismic acquired in September 2002 and processed in November 2002 (Post-Stack Migration.) In May 2005 the seismic data went through a Pre-Stack Migration processing.

Normal faults affecting the basement can be observed; some cut all the carbonate section while others are the seal for the Tamaulipas Formation. However, the regional integration suggests that the distribution of the carbonate platform is governed by faults and basement high blocks.



Seismic-structural Section

EXPLORATION & DEVELOPMENT HISTORY

The field was discovered in 1966 with the well Atún-1. Production was started in 1968 and around 1973 maximum production is reached with almost 30,000 bpd of oil. Later production declined steeply and the field production became marginal. The main causes for the steep production decline were: the high rates of initial exploitation, a high permeability associated with a dual porosity system (vugs and fractures) and powerful associated aquifer. The crude type is super-light of 45 a 53° API. The reservoir pressure varies between 285 a 293 Kg/cm^2.

Exploratory wells were drilled during field development. They were delineation wells (searching for addition accumulations) or well searching for other reservoirs.

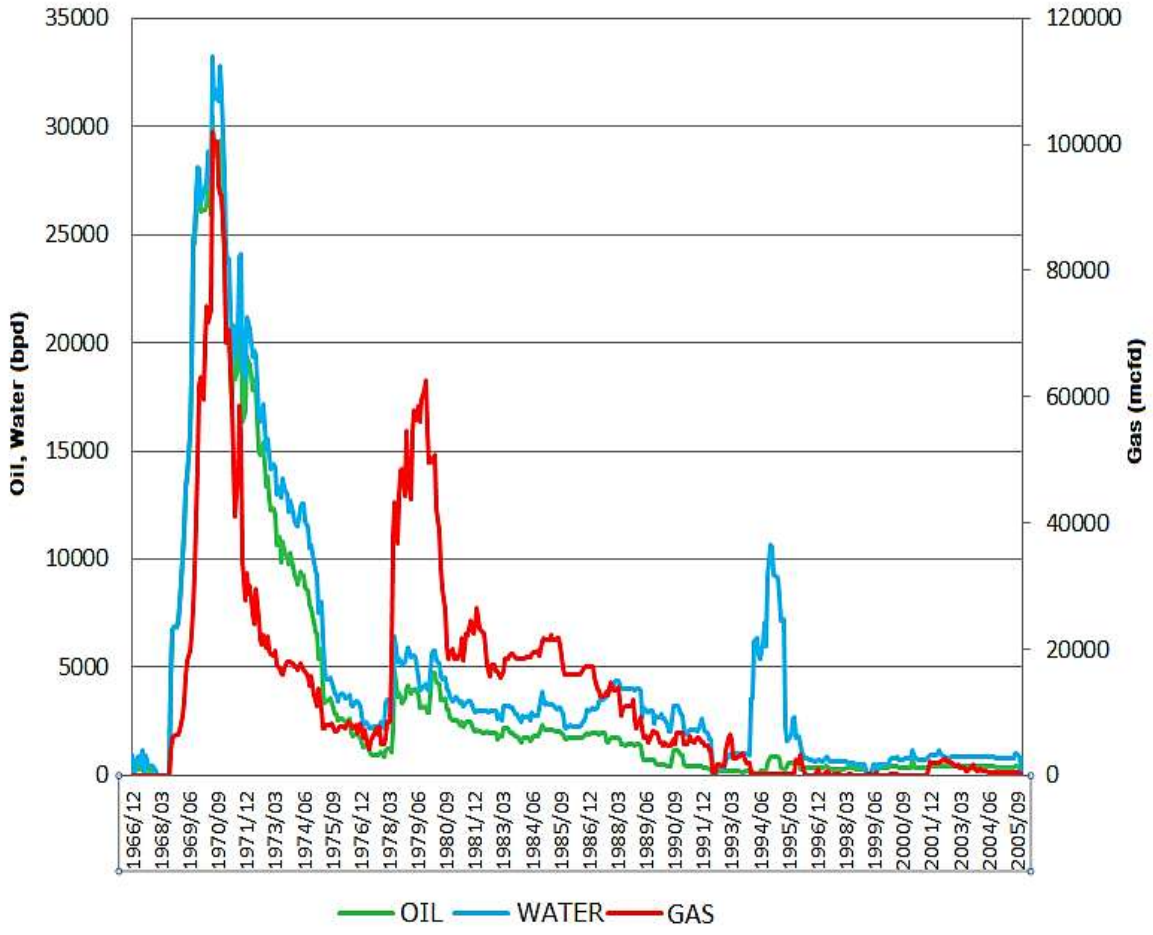
The seismic 3D survey Lankahuasa Norte, acquired in 2002, helped define more correctly the reservoirs of the Offshore Golden Lane.

Currently there are two well operating in the Atún Field (wells Atún 32 and Atún 54).

PRODUCTION BY FIELD AND RESERVES

Production in the Atún block is associated with the fields: Atún, Cangrejo, Escualo, Mejillón and Morsa. In 1968 exploitation begun with well Atún-3, reaching a maximum production of 30.47 Mb and 101.8 MMcf in June 1970. As of January 2011 the block has a cumulative production of 54.1 MMb of oil and 203.1 MMMcf of gas.

The breakdown of the production per field is: Field Atún has cumulative production of 40.7 MMb (oil) and 197.6 MMMcf (gas). Field Escualo has cumulative production of 1.9 MMb (oil) and 0.9 MMMcf (gas). Field Morsa has cumulative production of 11.5 MMb (oil) and 4.6 MMMcf (gas). The well Mejillón-1 has original oil-in-place 2P of 40.1 MMb (oil) and 108.2 MMMcf (gas) and remaining reserves 2P of 1.6 MMb of oil and 46.4 MMMcf of gas.



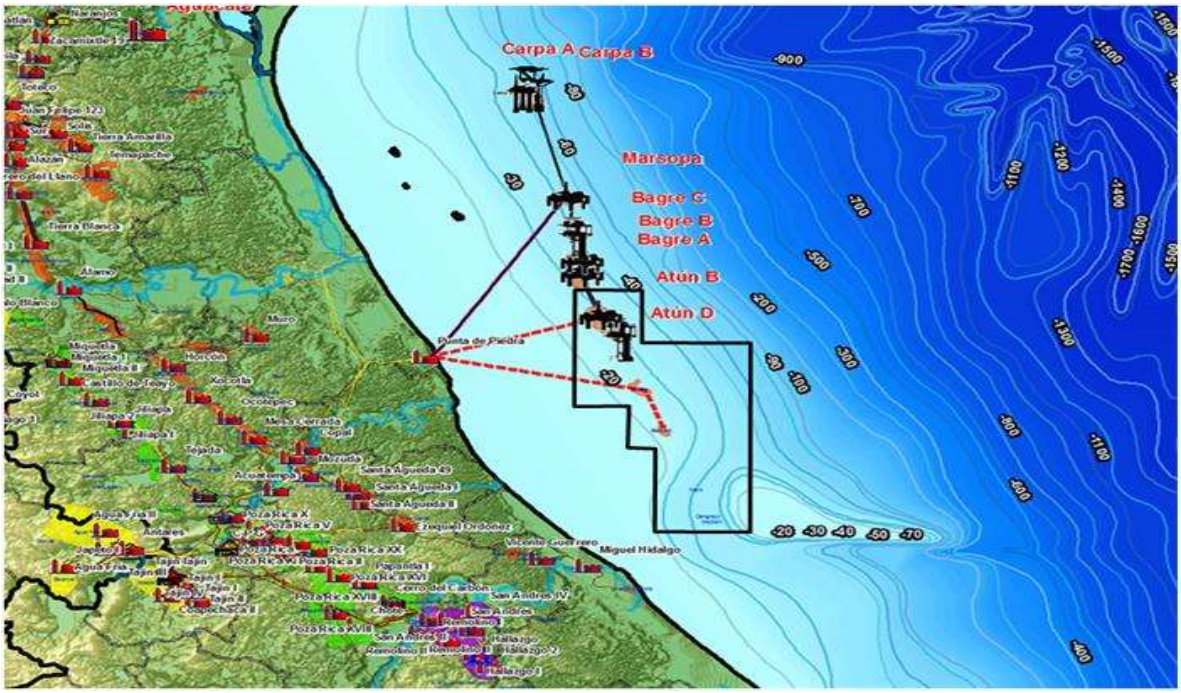
Production History Graph - Block Atún

The reserves of the Atún block are the sum of the reserves of the fields Atún and Mejillón. The block has proved reserves of 9.2 MMboe, probable reserves of 13.4 MMboe and possible reserves of 3.7 MMboe for a total of 26.3 MMboe of 3P reserves (as of January 2011.)

Number of wells	Plays	Hydrocarbon Type	Density (°API)	Reserves (MMboe)			GOR (m^3/m^3)
				1P	2P	3P	
72	El Abra	Light Crude/Gas and Condensate	43-53	9.2	22.6	26.3	1383

Reserves of the Atún Block in Millions of barrels of oil equivalent (MMboe).

The Atun block has two offshore platforms: Atún-B (octopod) and Atún-D (tetrapod).



Facilities infraestructura of the Offshore Golden Lane

Platform Atún B
(Operating) 12 conductors

Platform Atún D
(new, not operating) 3 conductors
(Atún-101 pending recovery)

The production of the Atún-B platform flows into an oil-gas pipeline of 6'' Ø x 0.33 Km. It joins the underwater oil-gas pipeline of 12'' Ø x 13 Km that connects Atún-D platform to Bagre-A platform. Flow continues from Bagre-A platform to Marsopa platform through an oil-gas pipeline of 16'' Ø x 14 Km. Finally it is sent from Marsopa to the Punta de Piedra Separation Battery via a 20'' Ø x 33 Km oil-gas pipeline.

Currently the Atún-D is not operating waiting for the arrival of a jackup rig for the completion of well Atún-101.

The Atún-D platform connects to the Bagre-A platform via an oil-gas pipeline of 12'' Ø x 13 Km continuing the same flow of the Atún-B platform .

Drilling Parameters

Depth:	2,700 to 2,900 vertical meters (tvd) and 3,000-3,400 total depth (td)
Inclinations:	Open holes (when applicable to determine water/oil contact OWC) and horizontal wells with section of approximately 120 to 140 meters

Mud Density:	Casing of 30" kneeling on the production platform
First Stage:	1.06-1.20 gr/cm³; water-based
Second Stage:	1.20-1.35 gr/cm³; oil-based
Third Stage:	1.35-1.45 gr/cm³; oil-based
Fourth Stage:	1.03-1.06 gr/cm³; water-based, open-hole
Objective:	Middle Cretaceous El Abra formation

Drilling Problems:

Differential (pressure) sticking and trapping of drilling string due to early detection of the top of the El Abra formation. Well control because o gas kicks or outbreaks.
Circulation loss during the drilling of the El Abra formation because of naturally fractured limestone. Presence of hydrogen sulfide H_2S.

Drilling Practices:

When installing the production platform there is a 30" kneeling pipe at approximately 150 meters. The first stage is drilled with a water-based mud of 1.06 to 1.20 gr/cm^3 to about 600 m to enhance the fracture gradient and mechanical integrity of the well. This stage is drilled with a 17-1/2" bit. Casing of 13-3/8" is lowered and cemented and is used to install surface connections.

In the second stage a 12-1/4” wellbore is drilled with oil-base mud with density ranging from 1.20 a 1.35 gr/cm^3 till the depth of the about 1,700 to 1,800 meters to lower and cement casing of 9-5/8”. These first two stages show normal pore pressure; when abnormal densities show up it is because of the control of stability of the shales and not because the pressure gradient requires it.

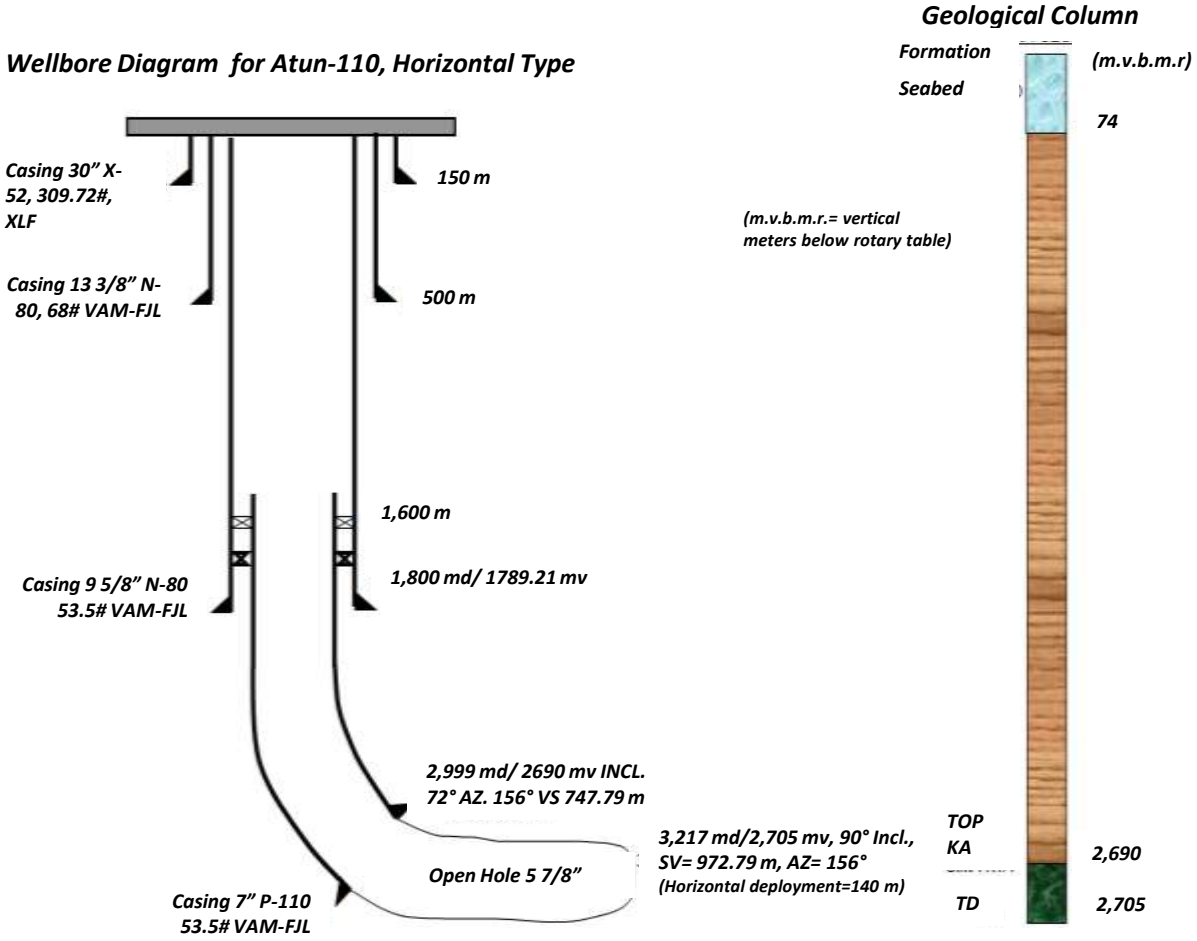
In the third stage a 8-1/2” wellbore is drilled and casing of 7” is lowered and cemented on top of the El Abra formation. Samples are required to be taken during drilling with the assistance of an on-site geologist and sometimes using logging while drilling (LWD) tools. This allows to correlate the top of the El Abra formation and avoid circulation losses or or gas kicks.

In more recent wells drilled in similar fields, the technique of drilling with liner (DWL) has been used. It allows the liner at the bottom of the hole and when facing fluid losses it is cemented and then extended to the surface.

The fourth and final stage is drilled using a water-base (brine) with density of 1.03 to 1.06 gr/cm^3; a pilot hole of 6” or 6-1/8” is drilled until the water/oil contact (OWC) is found and then the depth to drill horizontally is determined. The pilot wellbore is plugged and the side-track is performed at 7” drilling pad level.

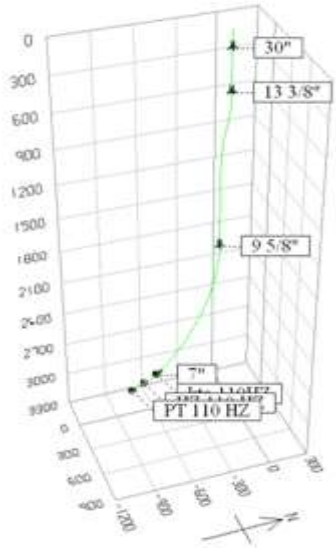
If necessary, depending on the drilling scenario, an open hole of 6 or 6 1/8” is drilled in the producing zone; alternatively casing of 4 ½” Premium-Connection is installed in the producing zone.

The completion is done using a simple non-selective tool with packer in a 7” casing to produce through tubing of 2-7/8”. The valve tree at the wellhead is of 13 3/8” x 9 5/8” x 7” x 2 7/16” 5,000 lb/in^2.

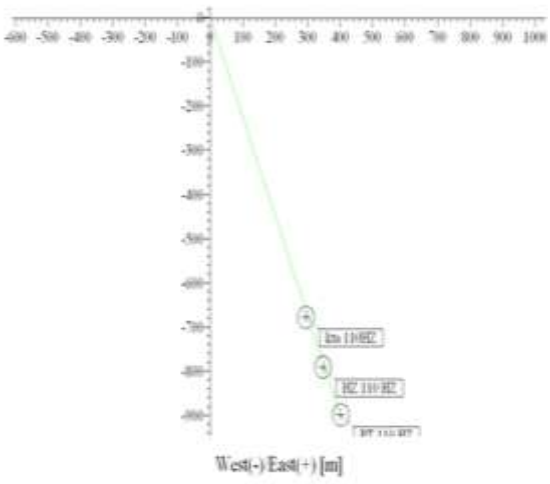


Well bore Diagram and Geological Column

The directional control of the wells demands medium-to-high dog-leg severity avoiding very prolonged tortuosity (2.5 a 3.5 - 7°/30 meters) since inclinations of 75° (seating point of the 7" casing pipe) and 90° are reached in the producing zone. Likewise strict control must be maintained on the cleanness of the wellbore to avoid settling of the cuttings in a bed (cutting bed)



Plan #1 (Well Atún – 110 H)



Directional Data for well Atún – 110 H

MD (meter)	Inclination (degrees)	Azimuth (degree)	TVD (meters)	N-S (meter)	E-W (m)	Vertical Section (m)	Dogleg (degrees/ 30 meters)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
150.00	0.00	0.00	150.00	0.00	0.00	0.00	0.000
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.000
530.00	0.00	0.00	530.00	0.00	0.00	0.00	0.000
770.00	18.00	156.00	766.07	-34.16	15.21	37.39	2.250
830.00	18.00	156.00	823.13	-51.10	22.75	55.94	0.000
1,070.00	0.00	0.00	1,059.21	-85.25	37.96	93.32	2.250
1,800.00	0.00	0.00	1,789.21	-85.25	37.96	93.32	0.000
2,990.22	72.00	156.00	2,690.00	-683.14	304.15	747.79	1.815
2,999.93	72.00	156.00	2,693.00	-691.57	307.91	757.02	0.000
3,076.95	90.00	156.00	2,705.00	-760.79	338.72	832.79	7.011
3,216.95	90.00	156.00	2,705.00	-888.69	395.66	972.79	0.000

Directional Control

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