O6-1 CONTRIBUTIONS TO THE OIL GENESIS STUDY IN THE CONTINENTAL SHELF AREA OF THE BLACK SEA

P.NECULAE [1], V. STANESCU [2] and C.PENE
[1] S.N.P. Petrom S.A., Cal. Victoriei 109 Bucharest, Romania
[2] University of Bucharest, Romania

Abstract

Many oil accumulations have been discovered in the Romanian Shelf of the Black Sea. In Cretacious and Eocene layers from the Histrya Basin. Oil composition and organic depreciation scale of the formations, suggest genetics relation between these oils and Mezozoics and Oligocenes rocks.

Introduction

Histrya Depression is a structural mini-unit of the Romanian Shelf of the Black Sea. Situated in the sub-sea extension of the Oligocen in the North part of Dobrogea Region. She is limited in the North and South by two fractures NV-SE orientated both continuing in aquatorial area to the known fracture on Dubrogea land. The two fractures are Heracleea in the North and the extension of the fault Peceneaga-Camena in the South.Between these fractures, the Basin is sinking in the internal part of the aquatoriu.

The filling material of the Depression is made by the Mezozoic, Neozoic and Quaternar deposits, from Triasic up to these days. In this area, to deep depth, Paleozoic deposits could be present.

In Histrya Depression has been discovered until now (in Albiene, Upper Cretacious and Eocene deposits), three structures with oil and gas accumulations, currently being in production. In one of the structure, the Pontiene deposits had gas in non- commercial acculumation.

The existence of such oil and gas accumulations needs explications concerning the hydrocarbon generation, rock source, migration mechanism and their concentrations. These conclusions are useful for the activity in the future exploration of this sedimentary Basin.

The Data Used for the Study of Oil Genesis

Generaly, Oil genesis could be study using many ways and methods. In this document, the Oil genesis has been study on two idicators:

1/fractional composition of oil in uncovered accumulations;

2/evolution of the organic maturation in post-Paleozoic sediments.

As a conclusion, the results of the analyses at the oil samples has been studied as well as the profiles of some representatives wells in the Basin and the data concerning the temperature measurement in the wells. Processing of such information and correlation of the results lead to a Oleogenetic Model of this Sedimentary Basin.

The Analyse of Chemical Data and Their Interpretation

17 Analyse Sheets for density and fractional composition of the oil samples from the Albiene reservoirs (6) Upper Cretacious (5) and Eocene (6)(Table 10 has been used for this Study.

a) Oil in the Albinea reservoirs is normal as density (0.843-0.855), poor in gasoline (20-26.3% gasoline)

Diesel fuel and mazout represents high proportions (63.5-78.6), so the oil is close to “nefteno-flavour” type, suggestion the source of the Albian oil from previous marine oil reach in fats, algae and bacterium, incorporated in a Pelitic sediment without oxygen.

b) Oil in Upper Cretacious reservoirs (Touronien-Senonien) it’s a normal oil concerning the density (0.844-0.854). The contain in gasoline is poor (11.90-20.50), exceptionaly reaching 30%. The lamp-gas is poor represented (under 10%) and Diesel fuel and mazout represent together (51.15-80.55), with the biggest percentage for mazout.

This oil, as the oil in Albian is a “nefteno- flavour “, with a poor content in wax. The conclusion is that both Cretacious oils have the same source.

c) Oil in Eocene reservoirs is diversified. As density, the samples shown a very light oil(condensates),

some of the samples shown normal oil and one sample heavy oil, prevailed from the same well shows different types of oil. (Table 1).

Oil with normal density has the fractional composition similar with the oils from Cretacious, with a low content in gasoline (12-15%), but high in heavy fractions (70-78%), suggesting their common origin.

The light oil is containing a big amount of gasoline (76.56-78%), a little Diesel fuel (up to 13.70%) and mazout(1%). This kind of oil is placed in the upper part of the Eocene reservoir, on top of the reservoir containing normal oil. At the first look, such an arrangement could be the result of the hydrocarbons segregation based on density, but could be possible to be the result of a normal condensation, in the Upper Eocene reservoirs, of some petroleum vapours, migrated from high depth.

The heavy oil contains a little amount of gasoline (8.80%), but a big amount of mazout (52%). The lamp-gas fraction is very persistent (39.2%), and the Diesel fuel is absent. This oil is, very different from the oil in Cretaceous in the same structure.

Remark; (1) and (2) samples from the same well. The heavy oil is placed in shallow layers (1040-1070m) above the Cretaceous layers containing normal oil. The explanations that could be given for the origin of the Eocene heavy oil can be different. One of them is the generation of the heavy oil in a source rock, new entered in the oil window, from which he migrated in the Eocene reservoir. This source could be Oligocene or even Eocene. Other explanation is considering that the heavy oil in Eocene is a deteriorated oil in depth conditions under the action of hydrochemical and biochemical factors.

The conclusion is that the fractured composition of the Cretacious and Eocen oil in Histrya Depression suggest the existence of many hydrocarbons sources, at least two, one over –matured, which produce the condensate (dew oil) , and other mature, which produced the normal oil and one at the beginning of the window oil, producing heavy oil.

Organic Maturation

The rocks, possible oil producer, have a large repartition in Histrya Depression, from Triasic up to Neogen. They are represented by clays and clay shale (Liasic, Dogger,Neocomian, Oligocen, Sarmatian, Pontian) or lime-stone(Triasic, Malme, Upper Cretaceous), but not all these rocks have good generation properties such as: volume, organic contain, thermal history.

For the analis of the organic maturation, a simple geologic Model of the Histrya Depression has been designed, showing that in Mezozoic and Neozoic, submergence and sedimentation had two important interrupting moments, one at the beginning of Paleogen and the other at the beginning of Neogen.

Based on this Model the sinking diagram for the statygraphic sequences in thermo-temporal co-ordinateshas been projected (Fig.1), diagram on which the organic maturation index have been calculated for each stratigraphic division possible oil generated.

Geothermal gradient has been considered normal for the present and past time. Incase we agree threshold limits between the major organic depreciation stages proposed by Lopatin, Waples (up to 16 is an immature stage; between 16-160 its middle mature and over 160 organic material is overmatured) we could mention that in Histrya Depression, clays and Triasic/Jurasic limestone are overmatured, the Cretaceous and Paleogen(Oligocen) ones are in the mature stage and the Neogene ones are imature. The maturation of a sequence is increasing from West to East, in the direction of the formations sinking.

Results Interpretation and Conclusions

Geological and chemical data available for this study suggests that the Albian, Senonian-Turonian reservoirs and some of the Eocene have been supplied with normal oil, produced by the Cretacious sequences or older, which presently are in the mature or overmature stage, migrated from the rock source before to became overmature.

The normal oil in Eocene could be genetically linked of the clay bed deeper in Oligocene. Some of the Eocene reservoirs have been supplied with overmaturated hydrocarbonic gases, generated in deep Mezozoic sequences, which condensed at the pressure and temperature quite small in Eocene.

For the heavy oil in some Eocene layers, could admit its origin in Oligocene clays, poor maturated, but is difficult to explain the migration of oil rich in hydrocarbons with high polarity. This oil could be the result of “in situ” depreciation hydro-bichemically processes of a normal oil.

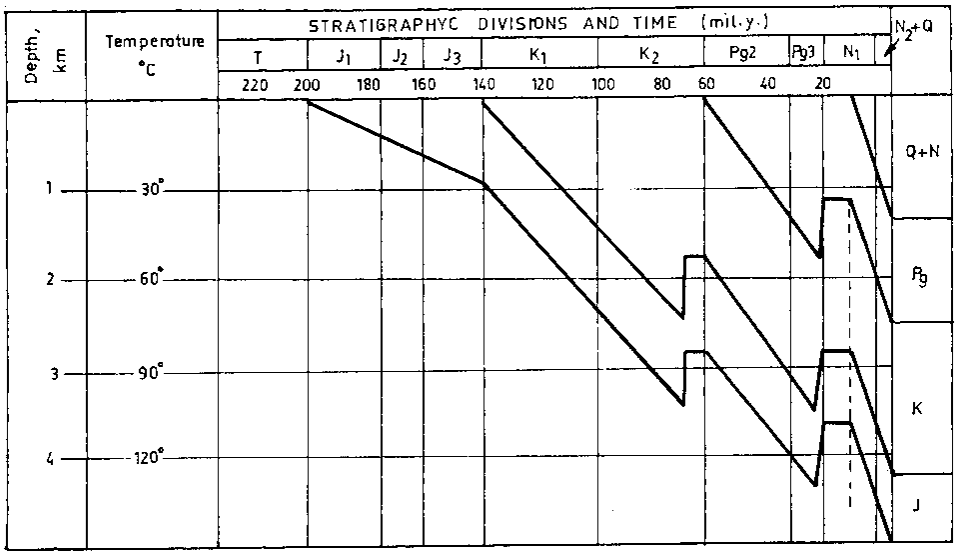

Fig.1. Burial curves of the postpaleozoic formations (Histria Basin)

Table1. Oil fraction composition in Hystria basin

Reservoir Age	Sample no.	Density	Fractions %				Average dept h/m
			Gasoline	Lamp oil	Diesel	Fuel oil	
EOCENE	17	0.921	8.80	39.20	0.00	52.00	1057
	16	0.868	15.50	13.50	21.10	48.90	2386(1)
	15	0.843	12.00	9.00	55.00	23.00	1969(2)
	14	0.774	51.50	18.50	27.50	2.50	2260(1)
	13	0.752	76.56	8.74	13.70	0.00	1495
	12	0.725	78.00	10.00	11.00	0.00	1700(2)
UPER	11	0.854	11.90	6.55	25.87	54.68	
CRETACEOUS	10	0.847	11.60	6.15	30.53	47.70	
	9	0.818	31.80	13.80	20.40	34.00	
	8	0.849	12.77	9.11	32.06	45.86	
	7	0.844	20.50	27.35	13.95	37.20	
ALBIAN	6	0.844	26.30	10.20	24.50	39.00	
	5	0.843	20.50	14.50	28.00	37.00	
	4	0.846	15.80	7.10	26.63	49.35	
	3	0.845	12.48	7.54	28.95	49.61	
	2	0.843	19.90	6.20	23.60	49.30	
	1	0.855	20.40	8.15	26.80	44.65	

References

Bordenave M.L.1993. Applied petroleum geochemistry. Edit.Technip, Paris.

Lopatin N.V.1971. Temperaturai gheologhiceskoe vremiia kak faktori uglezikatii.Izv. Akod Nauk SSSR, ser.gheoli, 3.

Perrodon A. 1985. Dynamics of oil and gas accumulations.Bull centr.Rech. Expl.-Prod.ELF Aquitaine,Mem 5.