Salt Dome

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Abstract

Salt dome expression is a general term which uses for salt ridges and stocks with folded covering layers. High dissolubility and low density in solid phase are the unique characteristics of salt. In areas which salt is found there are thick beds of salt under the Earth which are known as salt feeder layers.

Salt dome forms in salt domes classification

A) **Inactive salt domes:** salt domes in which the past up welled salt is eroded and at present it just contains surrounding diaper dipped layers.

B) **Active salt domes:** These salt domes have dome form and the rate of salt providing is higher than the rate of erosion.

C) **Dome structures:** This group is diapers in which they didn't come to the surface yet, but they folded upper rocks (Bosak et al. 1998).

In terms of form, salt domes are divided into following groups.

D) **Circular salt plug:** These domes are commonly found in Zagros. Generally these domes are surrounded by caldrons with dimension of 3 km or more.

A) **Linear salt plug:** These salt domes are located in zones or structures which highly effected by tectonic.

Effects of salt domes in erosion

When salt dome is coming up and it outcrops, due to inferred surface interruption and surface weakening in that part, we face faster and more extended erosion and for the same reason in surrounding areas of salt domes we face these domes' deposited sediments which effect clastic surface erosion and salinity of adjacent water and rivers.

Importance of salt domes structure in geology

Salt motion of Hormoz Formation which is began from early Cimmerian orogenic phase plays an important role in Persian Gulf sedimentary basin extended structures formation. Because of high pressure of sediments on source rock in deeper parts of subsurface sedimentary basin which inferred by salt motion, caused primary migration and occupied rock space and form the biggest gas and petroleum resources in the world.

Importance of salt domes structure in petroleum geology

Diaper oil trap is the result of ascending motion of sediments with lower gravity into upper layers. The majority o f diaper oil traps are formed by infiltration salt into upper layers.

Under the compaction clay materials may also come up. Salt gravity is 2.03 g/cm^3. In comparison with salt recently buried clays and sands have lower gravity in which with

increase in deep of burial they compressed and the number of inter- grain fragments decrease and eventually their gravity will increase.

Different types of oil trap which form as a result of salt domes

Salt dome cap oil trap: At the top of salt column, breccia cap of hard rock fragments which separated by salt are formed. If this breccia locates in suitable condition, it could be a good place for gas and oil accumulation.

Salt dome amplitude oil trap: Salt dome folds upper beds by the beginning of its motion and then it breaks them and dipped them in a direction against the salt column motion. In up dip these dipped layers end in salt column which is impermeable.

Super cap oil trap: If salt dome reaches to the earth surface it may fold upper beds inferred dome form anticlinal oil traps which located in anticlinal oil traps classification.

Stratigraphy oil traps: In a suitable source rock in which hydrocarbons can flow and a cap rock is located on it, a rupture in permeability in the direction of up dip is an important factor in the formation of stratigraphy oil trap.

Reef oil trap: nevertheless in recent reefs, coral reefs are dominant but in the past geological periods different organisms formed reefs, such as carbonate alges, bryozoans, sponges.

Gas preservation in salt domes

After well drilling in salt dome and dissolution of salt by water flooding and discharge of saline water the required space for gas preservation is inferred.

Salt domes in Iran

On the basis of Stocklin (1968 b) observations there are more than 200 salt domes in south of Iran and Persian Gulf. Oman, Persian Gulf, south of Iran and west of Lout (north of Kerman) belong to a unit sedimentary basin (Hormoz salt) which separated by further tectonic factors. The origin of all these salts is Hormoz series.

Surrounding inferred structures of salt domes

In general following structures are seen around the salt domes:

A) Normal fault with parallel network with horst and graben.
B) Oblique layers at the top of dome which form anticline.
C) Compact and tight strata in dome with vertical axial surface.
D) Change in layer thickness and dip.
E) Faulting in the form of different fault sets in different directions.
F) Lateral synclines which generally observed around the majority of salt domes in a way that their axis is parallel to salt dome wall.
G) Traces of refolding with faulting.

The age of Hormoz Formation

Lithological composition and order of 3 and 4 units of Hormoz Formation is similar to Mila and Alibak Formations in No. 1 well of Darang and Zard Kuh-e-bakhtiyari in Zagros which is reported by Ghavidel siraki.

Unit 2 is the continue of unit 1 or salt unit of Hormoz Formation. Existence of tuff iron oxide and black thin-bedded Limestones and salt pseudomorphs in unit 2 and evaporative characteristic of this unit stimulates this assumption that that this unit couldn't have an age older than Cambrian.

As result unit 1 is equivalent to Dezo series in which with the occurrence of alge fossils, the age of this unit is Lower Cambrian.

Effects of Hormoz salt dome in south of Iran

Salt dome outcrop in Zagros orogenic slight folded belt is a unique composition of exotic rocks which reached the earth surface from depth of 3-5 km by Hormoz evaporates in Late Precambrian.

Jahrum Formation

The name of this Formation is obtained from Jahrum Mountain in Fars and the type section of this Formation is measured in Tang-e-Ab in northern amplitude of Jahrum Mountain (James and Wynd 1965).

In the view point of lithology following parts are distinguishable:

Lower part (about 35 meters) involves massive brown Dolomites.

Middle part (161.5 meters) includes medium to thin-bedded Dolomites.

Upper part (287.7 meters) contains Dolomitic Limestones with too many microfossils.

Pabdeh Formation

The name of this Formation is obtained from Pabdeh Mountain in Khuzestan and its type section is measured in Tang-e- Pabdeh in south east of Pabdeh Mountain which is located in north of Lali oil field.

Thickness of this Formation in type section is 798.5 meters and from the top it contains:

Purple Shale (140 meters) includes Shales and Marns with thin-bedded Limestone.

Shales and Clay Limestones (74 meters)

Clay Limestones with Cherty nodules (42.6 meters)

Dark Shales with Lime layers at the base (82.3 meters)

Upper part of thin-bedded Limestones with an alternation of Shale (458.5 meters)

Asmari Formation

The name of this Formation is obtained from Asmari Mountain in Khuzestan. This mountain forms a compact and eroded anticline in which in its core Asmati Formation is outcropped. In terms of lithology it contains cream to brown Limestones which are clearly observable in outcrops with many joints and fractures. The age of Asmari Formation is Oligocene to Early Miocene.

Fars group

Because Fars group forms the cap rock of Asmari sources in south of Iran it is important in petroleum exploration. At first this name is used by Pilgrim (1965) in order to interpret the thick sequences of marine sediments, and then James and Wynd (1965) divided this group into three parts by studing of Fars group sediments in Masjed-Soleyman.

1) Lower Fars or Gachsaran Formation
2) Middle Fars or Mishan Formation
3) Upper Fars or Aghajari Formation

Razak Formation

The name of this formation is obtained from the name of Razak village in Fars and its type section is measured in northern amplitude of Heram Mountain in a distance of 40 km from the south east of Jahrum. Thickness of this Formation in type section is 804.7 meters and in the view point of lithology it involves red to green and brown Silty Marns with red layers of Silty Limestone.

Conclusion

1) Recognition of salt and its structure from main salt mass is useful for economic projects and material preservation in domes.

2) On the basis of motion Zagros salt domes are divided into three parts: Active, Sub active, Inactive. Salt motion in active domes may result in folding.

Halite chemical experiment results

Soluble salts percentage except NaCl	Insoluble salts percentage	NaCl percentage
%11.1	%1.9	%87

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