



**PETROFED**

**Talk**

on

**"Gas Hydrates"**

on

*October 27, 2016 (Tuesday) at 1100 hrs.*

*Venue: Magnolia, India Habitat Centre, Lodhi Road New Delhi*

**Minutes of meeting and recommendations:**

**A TALK on Gas Hydrates was organized by Petrofed and Energy Think Tank on 27/10/2016 at India Habitat Centre, New Delhi. Eminent members of Energy Think Tank and invited participants from DGH, ONGC, OIL, GAIL and IOCL participated.**

1. PetroFed Director (E&P) welcomed the ETT members, speakers and participants for the above talk.
2. ETT Convenor gave a brief account of status of Gas Hydrate exploration in India.

The Studies related to Gas Hydrates were started in year 1995 and an Indian National Gas Hydrate Program was initiated in 1997.

- It was requested that the Speakers should keep focus on the following points:
  - a) What kind of efforts has been put up from year 1996 to 2016 towards Gas Hydrates?
  - b) Partners who are working towards the project and their level of participation by the Companies.
  - c) The budget which has already been spent and budget estimates for further development
  - d) What is the present state and future hope for the country towards natural gas production from Gas Hydrates.

3. **Gas Hydrates in India & The National Gas Hydrate Program (NGHP 1999 to 2005)**

## **Dr.Avinash Chandra**

The first session was by Dr. Avinash Chandra, former DG, DGH and Member ETT and the following points were highlighted during his session:

- a) Introduction on gas hydrates
- b) As gas hydrate is a compact source of natural gas instead of a diffused field (i.e. 01 m<sup>3</sup> of hydrates can yield 160-180 m<sup>3</sup> of natural gas), it can act as a commercial production source of natural gas.
- c) Gas Hydrate in India started under Indian National Gas Hydrate Program (NGHP) initiated in 1997. Post 2000, All organizations started working with a common goal under coordination by DG, DGH as Technical Coordinator of NGHP
- d) He mentioned that even if taking the most conservative figure of reserves and 01% of which is produced from sand rich deposit can last for as long as 189 years (considering consumption of recent years) and can last for around 104 years considering future demands of the country.
- e) India joined a program along with USA and Japan in Canada
- f) During the session, it was mentioned that why KG basin is so important for India. IT was stated in the current scheme Gas Hydrates production is only possible from sand rich field. Considering the geological position of KG basin where rivers are meeting the ocean and bringing in sand and sand channels being formed, it forms one of the most important areas for discovery.

## **4. Gas Hydrate Technology & Developments**

### **Dr.Pushpendra Kumar**

The second session was by Dr.Pushpendra Kumar, GM (Chem), Head-Gas Hydrate Research & Technology Centre (GHRTC) from ONGC and the following points were highlighted during his session:

- a) Gas hydrates have huge energy potential, several times higher than the conventional gas resources and in view of this, USA, Japan, India, Canada, Korea, China and many more countries have embarked upon National Gas Hydrate Programs and have made substantial progress in this area.
- b) It is now known to the world that the natural gas production potential from Gas Hydrates is much more than natural gas production put together from all other resources.
- c) Pilot production tests in Canada, USA and Japan have demonstrated that the existing technologies can be leveraged for gas production from gas hydrate reservoirs. However, the refinement and the scaling up are required to establish the commerciality of gas hydrates. There are no technological challenges which are insurmountable. The commercialisation of gas hydrates is on the verge now.
- d) India has also made commendable progress in the area of gas hydrates with the discovery of producible gas hydrates in KG deep offshore area during NGHP-02. The resources appear to be huge and have potential not only to

meet the demand supply gap but also can make India an exporter of natural gas, after the hydrates are exploited on large scale.

- e) Various methodology for extracting Gas Hydrates were discussed which include:
  - o Change in thermodynamics of temperature and pressure, either reducing the pressure or increase the temperature which will lead to production of natural gas from the hydrate
  - o Injection of chemicals leading to shift in thermodynamic boundaries and hence production of natural gas from gas hydrates
  - o Another way of production of natural gas from gas hydrates includes injection of CO<sub>2</sub> which will replace the natural gas hydrate. CO<sub>2</sub> has a property of forming a gas hydrate more readily as compared to natural gas which can lead to such replacement more easily.
  - o Depressurization was also done for producing the gas and out of the methods mentioned above this was the best method for natural gas production.
  - o However the same was not commercialized in Canada because they already have surplus gas and huge resources of hydro power are available with them.
  - o US is currently pursuing on this for production of natural gas
  - o In 2012 US in association with Conoco Philips produced natural gas by injecting CO<sub>2</sub>, however it was observed that by injection of CO<sub>2</sub> substitution is only to the order of 25-30% so a mixture of 23% of CO<sub>2</sub> and 77% of N<sub>2</sub> was injected which increased the level of substitution. However the same is not economical for offshore regions as transportation of CO<sub>2</sub> to the place along with gas separation (CO<sub>2</sub> and N<sub>2</sub>) can become expensive.
  - o Considering cost aspect, depressurization is most cost effective.
- f) In Korea the execution of Long term Plan for Gas Hydrate is likely to start in 2018.
- g) A detailed list of participating companies in the Gas Hydrate programme in Korea was provided.
- h) China till date has not been able to get success on finding the gas hydrate reserves
- i) Global Efforts are being made for commercialization of Gas Hydrates as an Energy Resource
- j) Economics for production of gas hydrate in India would be much cheaper than importing gas from abroad.

## **5. Gas Hydrates, A potential energy source of 21<sup>st</sup> century**

**Shri Sunil Kumar Singh**

The third session was by Shri Sunil Kumar Singh, HOD (Alternate Energy), DGH and the following points were highlighted during his session:

- a) The introduction was with the historical development of Gas Hydrates in world along with major advancement which happened in Canada & Alaska.
- b) The session covered a comparison between different modes of extraction of gas hydrates like depressurization and thermal stimulation

- c) Developments along depressurization technique was presented along with its effectiveness and environmental impact
- d) Success story of Japan's operation was mentioned with a gas production of 20,000 m<sup>3</sup>/day with severe sand production on 7<sup>th</sup> day.
- e) Way forward for development of Gas Hydrate rich areas:
  - Evaluate long term behaviour of gas hydrate resources : one to few month production test under offshore condition and one year continuous flow at on-shore site
  - Overcoming technical challenges like sand control, water separation etc
  - Development of offshore production systems to be based on met-ocean conditions

### **Open House (Q&A)**

The session was followed by Open House:

Q. The house enquired for the estimated timeline for Gas Hydrate production in India

A. At present Government of India is waiting for results of Japan and once they are obtained, Expedition 03 will be taken up i.e. after 2017. Government has suggested that instead of one well testing, India should opt for two production wells testing and the technical advancement that has been done by Japan regarding minimizing sand production can be adopted by India.

- The house suggested that since ONGC has done plenty of R&D work, the focus should be on production. And since ONGC and participating industry partners have done much work on it, the field /part of the field should be offered to them on nomination basis for development.

Q. Japan has been carrying out gas hydrate exploration since 2000 onwards, once Japan's result is out, how long it would take for the gas to be commercialised?

A. Till now production volume of 20,000 m<sup>3</sup>/day has been achieved and such volume will not be able to make it marketable. Sand production problem still exist.

Q. Timeline to commercialise the KG find?

A. If the field is given on nomination to ONGC then the timeline would be 03-05 years ONGC has already submitted a plan for commercial production and can possibly be achieved by 2020.

A vote of thanks was given to all Speakers and participants from different organizations who participated in the discussion.

The participants from different organizations conveyed thanks profusely for the informative session on Gas Hydrates and good work done so far.

### **Suggestions /Recommendations**

- 1) The opinion regarding Japan’s testing of few days to be the reference point for India was viewed to be a short period and longer duration test should be carried out in India.
- 2) Pilot production testing should be carried out at the earliest in order to test the technologies for sustained production and to arrive at the techno-economics.
- 3) It was also suggested that the service companies who have worked for Japan should be hired by us to do similar work which will surely help in expediting the activities as most of the data / information will be with such companies.
- 4) Since India needs to pursue its gas hydrate program much more aggressively, a special purpose company /commission /authority may be formed with shareholding from ONGC/OIL/GAIL and they should be given license for developing and exploiting the gas hydrates initially. Once the technology and processes are established, other prospective areas may be opened for other players.
- 5) A Joint Venture organization named “Gas Hydrate Exploration and Production Company Limited” with participation of NOCs like ONGC, OIL, GAIL and IOC should be established for undertaking gas hydrate related E&P work under MOPNG. The new organization formed for only Gas Hydrates E&P initially in Indian deep waters should have its own short term and long term targets with its own budget and required human resources.
- 6) In order to achieve speedy commercialization of Gas Hydrate resources, policy changes which are similar to HELP for deep water blocks already allotted to the existing stakeholders should be undertaken.

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