RENEWABLE ENERGY RESOURCES-"THE FLAMMABLE ICE OR METHANE HYDRATE"

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Abstract: The use of conventional energy sources during the past century has led us into a point where the problems about greenhouse gases, pollution and climate change are becoming unbearable in some places across the world. When conventional oil and gas will be depleted we will have to switch our usual energy sources into some newer, cleaner and perhaps even more cheaper. One of these sources is apparently some reserves that can be found across the world in different places, called methane hydrate.

Keywords: energy, fuel, exploitation, methane, hydrate.

1. INTRODUCTION

Energy is indispensable. We need it to heat or cool a specific place, to power the vehicle and other various daily tasks. However, the world is facing serious energy problems [3], [7].

For Gary, from South Africa, "the high cost of fuel" represents a big problem. Jennifer, from the Philippines, is concerned about finding a reliable energy source because of the "power outages". Fernando, from El Salvador, says he "is concerned about the impact of man on the environment". Because in many times, energy sources are also sources of pollution [4].

On 20 January 2014, the Commission established an action plan to support the development of the ocean's energy exploitation, including the energy generated by waves, tidal energy, the conversion of thermal energy and the energy of the salinity gradient. Its communication entitled "Blue energy-actions needed to harness the potential of ocean energy exploitation in European seas and oceans by 2020 and later".

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2. VECTOR OR FIELD-ORIENTED CONTROL

Approximately three quarters (71%) From the surface of the earth is covered by oceans, being a global body of salty waters (water). The oceans hold about 96.5% of all water on Earth.

The first quantities of methane gas extracted from the ice beneath the soil were obtained in the 1970's, in Siberia, the extraction from the sea is much more difficult. In The Japanese And Canadian sea using a new hot-air method, it has recently been able to extract methane gas. The government from Tokyo estimates that it will exploit about seven trillion tonnes of methane in the future decade (figure 1).

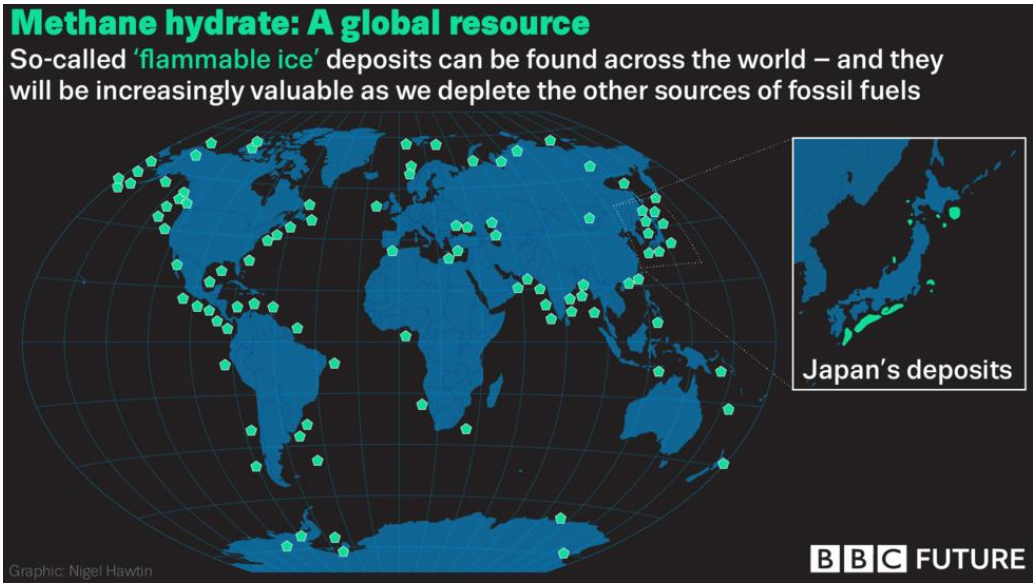

Fig. 1. Deposits of flammable ice around the world

Buried under the seabed around Japan, there are layers of methane, trapped in molecular ice cages. In some places, sediments covering these frozen water and methane warehouses have been eroded, leaving whitish chunks from what appears to be the dirty ice that rises to the surface [2].

A piece of this seems and feels much like ice, except for a sensation of squeaking in the palm of the hand, with the difference that it does not melts only, but also ignites. Many international research programs and companies from Japan, among other countries, are competing to take over this strange, counter-intuitive substance known as flammable ice-from under the seabed to use methane for fuel. If all these things are demonstrated and are cost-effective, they can even begin extraction by the end of the next decade. But the journey to this point has been far from an easy one.

There is no doubt that methane hydrates could provide a major source of fuel, especially that recent estimates suggest that they constitute about one-third of the total carbon retained in other fossil fuels, such as oil, gas and coal [6]. Several nations, especially Japan, want to extract it. It is not difficult to find, often leaving a characteristic

seismic signature that can be detected by the research vessels. The problem is taking over that gas and bringing it to the surface [1], [9].

Methane hydrate, also called a clathrate of methane, hydromethane or natural gas hydrate, is a solid composite compound in which a large amount of methane is trapped in a crystalline water structure, forming a solid similar to ice. It was initially thought to occur only in the outer regions of the Solar system, where temperatures are low, but significant deposits of methane hydrate and sediments in the Earth's oceans were found [8], [10].

Methane Hydrates are common components of the Geosphere, which appear both in deep sediment structures and in the form of outcrops at the bottom of the ocean. It is believed that Methane hydrates are formed by gas movement from the deep along geological defects, followed by precipitation or crystallization, or at the contact of the rising current of the cold-water gas. They are also present in the deep ice nuclei of Antarctica.

Methane hydrate or "Flammable ice" constitutes an important fuel source. Methane is the result of anaerobic bacteria's action on dead organisms, bacteria decomposing organic substances into smaller molecules. Marine organisms live up to several hundred meters deep, which explains the absence of methane hydrate at depths greater than 2000 m. Water and methane do not chemically react with each other and in areas where the instantaneous freezing conditions of the Water are present, spherical structures are formed from 20 or 24 water molecules that catch trapped inside the molecules of methane gas. A decimeter cube hydrate of methane contains 168 liters of methane (gas), (figure 2).

Fig.2. Example of flammable ice

3. FIRST COMMERCIAL EXPLOITATION OF METHANE FROM HYDRATED DEPOSITS

On March 12, 2013, Japan Oil, Gas and Metals National Corporation (JOGMEC) announced that it successfully performed the first commercial exploitation

test of methane hydrated deposits in Nankin Trough. The method used was of pressurization (figure 3).

The test lasted for 6 days and 120,000 m^3 of methane was produced. This achievement of Japanese specialists comes as a result of their numerous participations to joint projects with the US and Canada. I myself had lengthy discussions with two JOGMEC representatives, who came to Oklahoma University to study the patent of my invention and to negotiate his eventual purchase.

Fig. 3. Flame of methane gas burning during the operation test of methane hydrates made by Japan in the Pacific Ocean

Japan imports about 84% of the energy it needs. After the Fukushima disaster and rethinking the nuclear option, this figure could be higher. That is why the knowledge of the first commercial exploitation of gas from marine hydrates has sparked admiring or worrying reactions for the future of the planetary climate.

The public reaction was mixed, says Ai Oyama, a technical translator and former research analyst working on methane hydrates at the Natural Energy Institute in Hawaii. Some have welcomed the idea that Japan can have energy independence. Others were very careful about any technique that disturbed the coastline near the boundaries of tectonic plates [11].

In general, people feel really scared to do anything at the bottom of the ocean. The place is known to be unstable and earthquakes happen" says Oyama.

The fear is that depressurization of a part of the methane-hydrate warehouse could cause the entire reserve to become unstable. "People are worried that we will start extracting methane from gas hydrates and reaching a malfunction that could not be stopped," Ruppel says.

The problem with this consists of two. Firstly, a lot of methane gas would be suddenly released into the ocean-which could add large amounts of greenhouse gases into the atmosphere.

Secondly, methane hydrate releases plenty of water, as well as a lot of methane when it destabilizes, which would introduce a lot more liquid into the sediment under the ocean floor. In a steep inclined environment, a lot of excess water can lead to landslides. Some environmentalists are actually afraid they might lead to a tsunami.

However, the Japanese program continues to carry out extensive environmental studies to test the safety of methane hydrate production. The data gathered at the first Test of 2013 and a second longer test in 2017, so far have not suggested that the technique will destabilize the ocean floor, Yamamoto says. However, given the history of natural disasters in Japan-about 24,000 people are still in order of evacuation from the earthquake and tsunami in Tōhoku from 2011-The public is extremely sceptical.

Japan has shown that perhaps the time has come for the production of methane from hydrated supplies. Methane hydrates are likely to be a transitional energy in the centuries to come – or maybe it will just be a mermaid song.

4. CONCLUSIONS

Methane hydrate is a solid substance, a mixture of ice and methane, it can be found in huge quantities at low temperatures about 2°C and high pressures of at least 30 atmospheres, a few hundred meters deep (300 – 800 m) at the bottom of the oceans. The quantities being estimated at ca. 2-5 cubic meters of methane. The crystallized water in spherical form keeps the methane gas molecules trapped inside. These deposits are usually found in permafrost soils in the cold areas of the globe as Alaska and Siberia. Beneath the frozen layers of methane that can reach thickness of hundreds of meters, under pressure free methane gas can be found.

This carbon source, the most abundant in the world, can be one of the last new forms of fossil fuel to be extracted on a commercial scale. It is also the only one that has been developed with the end of fossil fuels in sight. The race for methane hydrates is a unique one, in which researchers work on an objective that could be irrelevant by renewable sources until it is reached.

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