

Energy accumulation system based on gas hydrates

Peter Durcansky^{1,*}, Jozef Jandacka¹, Milan Malcho¹, Michal Holubcik¹

¹University of Žilina, Faculty of Mechanical Engineering, Department of Power Engineering, Univerzitna 1, 010 26 Žilina, Slovakia.

Abstract

Accumulation of primary energy of natural gas is a perspective option to store natural gas as artificially created hydrate, where this matter can be stored and, if necessary, can be released to cover energy peaks. Gas can be stored this way at partially higher temperatures and low pressures compared to other storage technologies. The technique of rapidly and continuously producing hydrates of gas could compete with the existing means for storing and transporting these energy reserves in more than an economically efficient aspect, but again these new technologies need development. Transporting and storage of natural gas is economically and technologically demanding, which is always reflected in the resulting price. Natural gas hydrates allow transport and storage at low pressures and relatively favorable temperatures. Presented article deals with design of new energy accumulation system based on gas hydrates. In article is presented the main design and also a numerical model, where the parameters of created hydrate are qualified.

Keywords: gas hydrate, energy storage, numerical simulation

Received on 29 June 2020, accepted on 19 August 2020, published on 21 August 2020

Copyright © 2020 Peter Durcansky *et al.*, licensed to EAI. This is an open access article distributed under the terms of the [Creative Commons Attribution license](#), which permits unlimited use, distribution and reproduction in any medium so long as the original work is properly cited.

doi: 10.4108/_____

*Corresponding author. Email: peter.durcansky@fstroj.uniza.sk

1. Gas hydrate as energy storage

The natural gas energy storage in hydrate structures is advantageous in terms of storage safety, because the hydrate structure enables to store the gas at higher temperatures and lower pressures in comparison to other storage technologies such as liquefaction or compression. The gas hydrate is a huge source of energy that is included in the considerations as gas supply source for the next decades. It is estimated that 99% of the global gas hydrate supply occurs in marine sediments, in seabed sediments, at depths from 300 m to 4000 m. Hydrates can also occur on land, but exclusively in permafrost areas, in frozen areas, with temperatures below 0° C throughout the year. To store energy in a suitable form, transport the hydrate and release the energy, constitutes a current challenge in processes where the need for energy storage is exploited. At the present time, there is a strong pressure on the efficiency of these processes, efficiency of energy use, to increase efficiency and security in this energy storage technology. But the practical use of methane

hydrates can be not only in way of storing energy, but also to ensure coverage of gas peak demands in processes, by this gas released from hydrates. [1, 2]

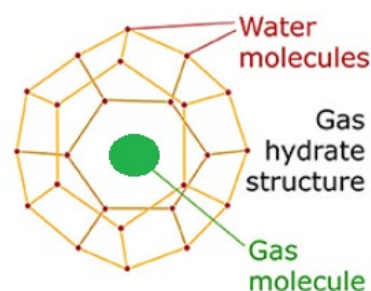


Figure 1. Gas hydrate model [frontiersin.org]

Hydrate is in general a compound containing water and gas molecules bound in water structure. Naturally occurring hydrates are considered to be a huge energy

