



• How can we extract them ?

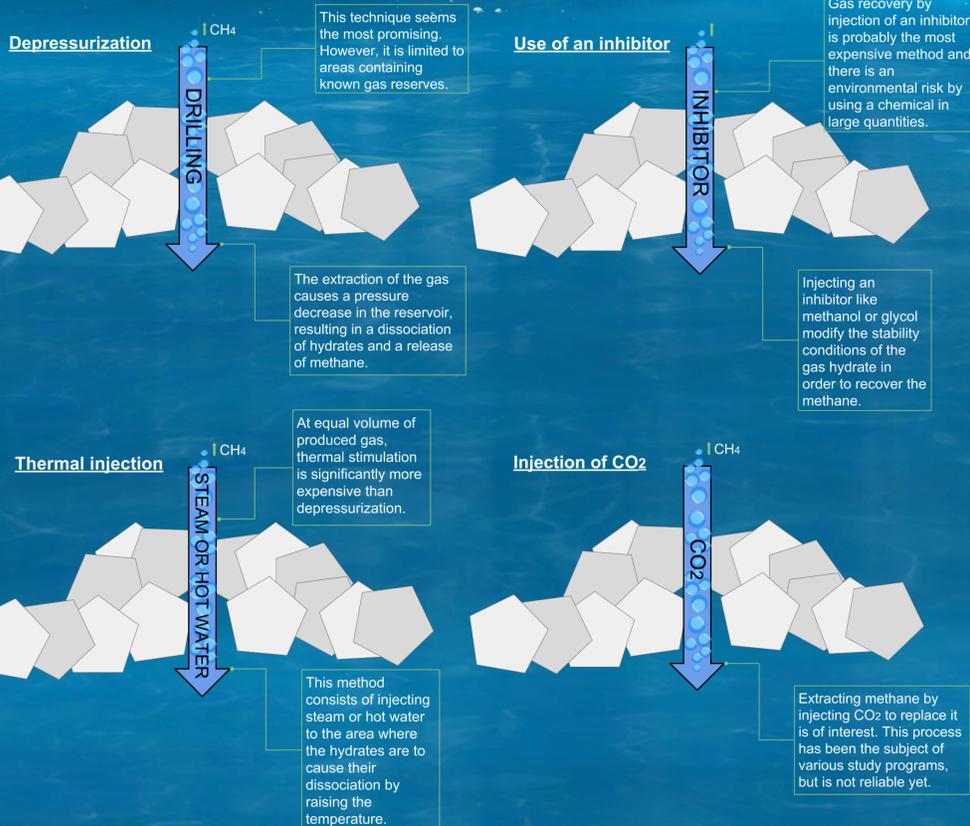


Figure 1 : Method of extracting methane hydrates
Source : Own work

• How are they created?

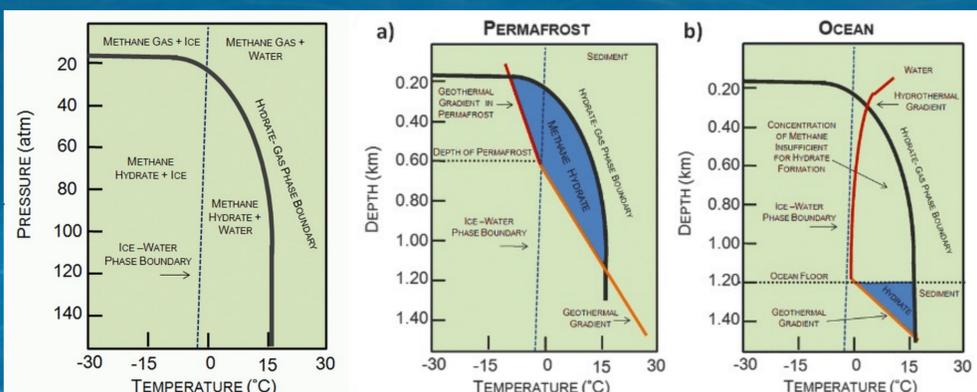


Figure 3: Condition of formation of methanes hydrates
Source : <http://www.uiab.fr/download/file/conferences-/arctique-p.co-uiab-051017-2.pdf>

• ADVANTAGES

- Natural gas emits 50 to 60 percent less **carbon dioxide** (CO_2) when combusted in an efficient way compared to a new coal plant (McGrail, 2004).
- Methane hydrates are a new source of energy and found to be everywhere in the world.
- It is a highly **energy-intensive** fuel.
- Evidence shows that the deposits of methane hydrates are enormous, with more energy stored than world's oil, coal and gas **combined**.

• CONCLUSION

Methane hydrates seem to become the new revolutionary fuel of this decade. In the maritime world, the use of this fuel on a ship could lead to a curb of 90% of sulphur dioxide, 80% of nitrogen oxide, 95% of particles and 20% of carbon dioxide. However, deep sea mining of methane hydrates is **extremely hazardous**, as it is **harmful for the environment** and has a **huge impact on global warming potential**. Moreover, deep sea mining is **dangerous for coastal populations and ecosystems** and the **price of this extraction** is still enormous. For sustainability reasons, **methane hydrate mining must be avoided**, and research has to **focus on fully sustainable energy sources**.

• REFERENCES

- Christophe Bourry (2008), Caractérisation physique et géochimique d'hydrates de gaz d'environnements géologiques différents, IFREMER
- McGrail (2004), A new method for enhanced production of gas hydrates with CO_2
- Conseil des académies canadiennes (2008), La production d'énergie à partir des hydrates de gaz-potentiels et défis pour le Canada
- JOGMEC (2012) Methane hydrate

• What are methane hydrates ?

- Methane hydrates are a form of ice, containing a large quantity of methane in a crystalline structure. The methane it contains is a potential source of **energy** (c Bourry, 2008).
- **Large deposits** of methane hydrate can be found beneath the sediment of the ocean floor, on the continental slopes, between 350 and 5000 meters deep.

• How to detect methane hydrates fields ?

- **By direct observation**: many locations of gas hydrates were discovered while drilling for oil or natural gas, even though their presence had not been suspected (Conseil des académies canadiennes, 2008).
- **By seismic detection or "bottom-simulating reflector" (BSR)**: this technique uses seismic reflection. It is the **most used technique**, but it does not allow to discern the exact location or the amount of gas.
- **Geophysical markers of sediments**: Used to quantify the **volume** of methane hydrates

• Where can we find them?

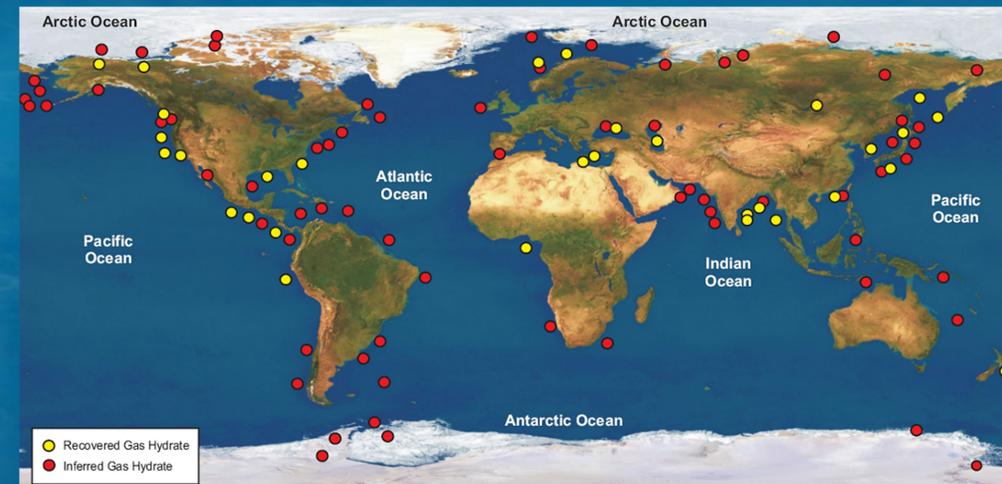


Figure 2: Reserves of Methane Hydrates on Earth
Source : <https://lechodesamericques.com/category/planete/>

• What do they look like?



Figure 4 : Methane clathrate, wikipédia (2019)
Source : https://en.wikipedia.org/wiki/Methane_clathrate

• DISADVANTAGES

- At local level: hydrates have an important role in keeping the sediments together. When they separate, they create a mix between water and gas that becomes **unstable**. The risks are that they can create underwater landslides. These landslides are a problem for the coastal population and for the **marine ecosystem**.
- At global level: the extraction of methane hydrates generates **greenhouse gases**. Methane is a greenhouse gases 20 to 30 times stronger than the CO_2 (JOGMEC, 2012).
- The extraction of methane hydrates is complex and **costly** for the moment.

