

Natural gas – different names

Naturgass: Energy rich gas found in underground oil fields, natural gas fields and in coal beds. Natural gas is normally found in a mix with heavier gases and liquids. The heavier components are separated on the oil rig or at a processing terminal.

LNG: *Liquefied Natural Gas.* Natural gas is cooled to liquid form at -162°C . This is done to facilitate bulk transport and storage. By doing this we are able to store 600 times the energy in the same volume compared to gas at standard conditions.

CNG: *Compressed Natural Gas.* Natural gas is compressed by increase of pressure 2-300 Bar, also to facilitate bulk transport and storage. CNG has 2-300 times the energy in the same volume compared to gas at standard conditions.

Properties of natural gas components

Gasstype	Kjemisk formel	Typisk andel i naturgass, %	Kritisk temperatur°C	Brennverdi, nedre, kWh/kg	Antennelsestemperatur, °C	Ekspløsjonsgrenser i luft, vol.%
Metan	CH ₄	85-95	-83	13.9	645	5.1-13.5
Etan	C ₂ H ₆	5-15	32	13.2	530	3.1-11.7

Tabell 3.1 Sentrale tekniske data for metan og etan

Natural gass?

> Whats missing? What are the molecules called?



Important properties

- > Combustible gas = combustible when mixed with air
- > Propane is combustible in a 2-10% mix with air.
- > Natural gas is combustible in a 4-14% mix with air.
- > The cleanest of the fossil fuels
- > Odourless and colourless
- > The gas is originally odourless and is for safety precautions added scent (Ethylmerkapthan).



Natural gas properties

- > Is the most applicable energy source today
- > The cleanest fuel available today
- > Able to compete with other energy sources
- > Non-toxic – Lighter than air
- > In Norway natural gas can quickly replace other energy sources which have greater impact on the environment.
- > Is a very safe and environmentally sound energy source

Different phases of substances

Example: ice – water - steam

- > Normal state – phase at normal pressure and temperature
- > Energy gases are normally in gas phase
- > A gas is not stable by form or volume

Phase transitions

Energigasser

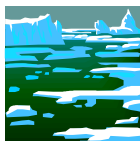
Gass



Væske

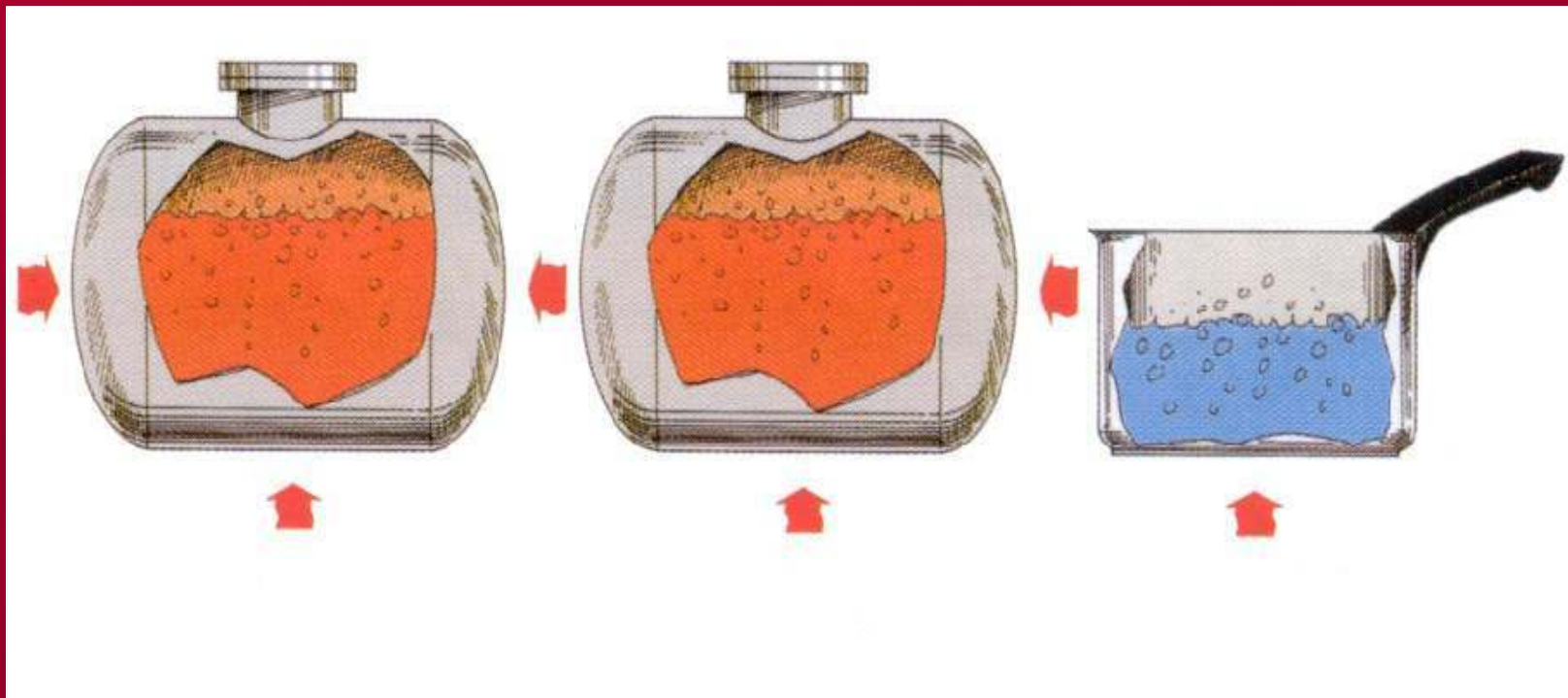


Fast form



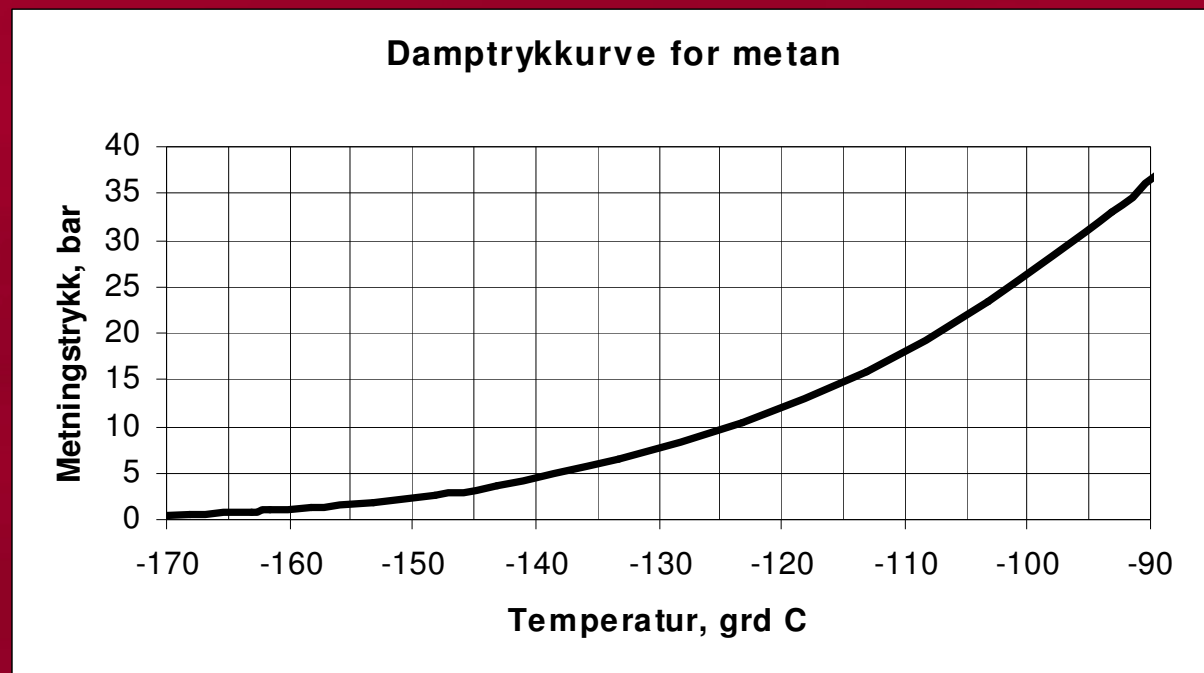
Boiling point

- > Boiling for a gas is the phase transition from liquid to gas phase



Vapor pressure - methane

- > Vapor pressure is the pressure of a vapor in equilibrium with its non-vapor phases.
- > Methane has a steeper curve than C_3 and C_4
- > What is the pressure at -125°C ?



Mass and density

- > Mass is the weight of all molecules in a substance.
- > Density is the mass divided by the volume

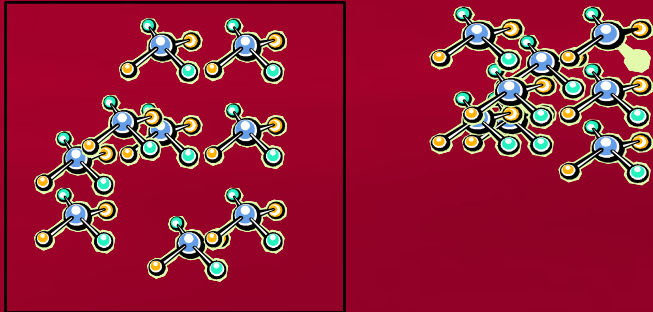


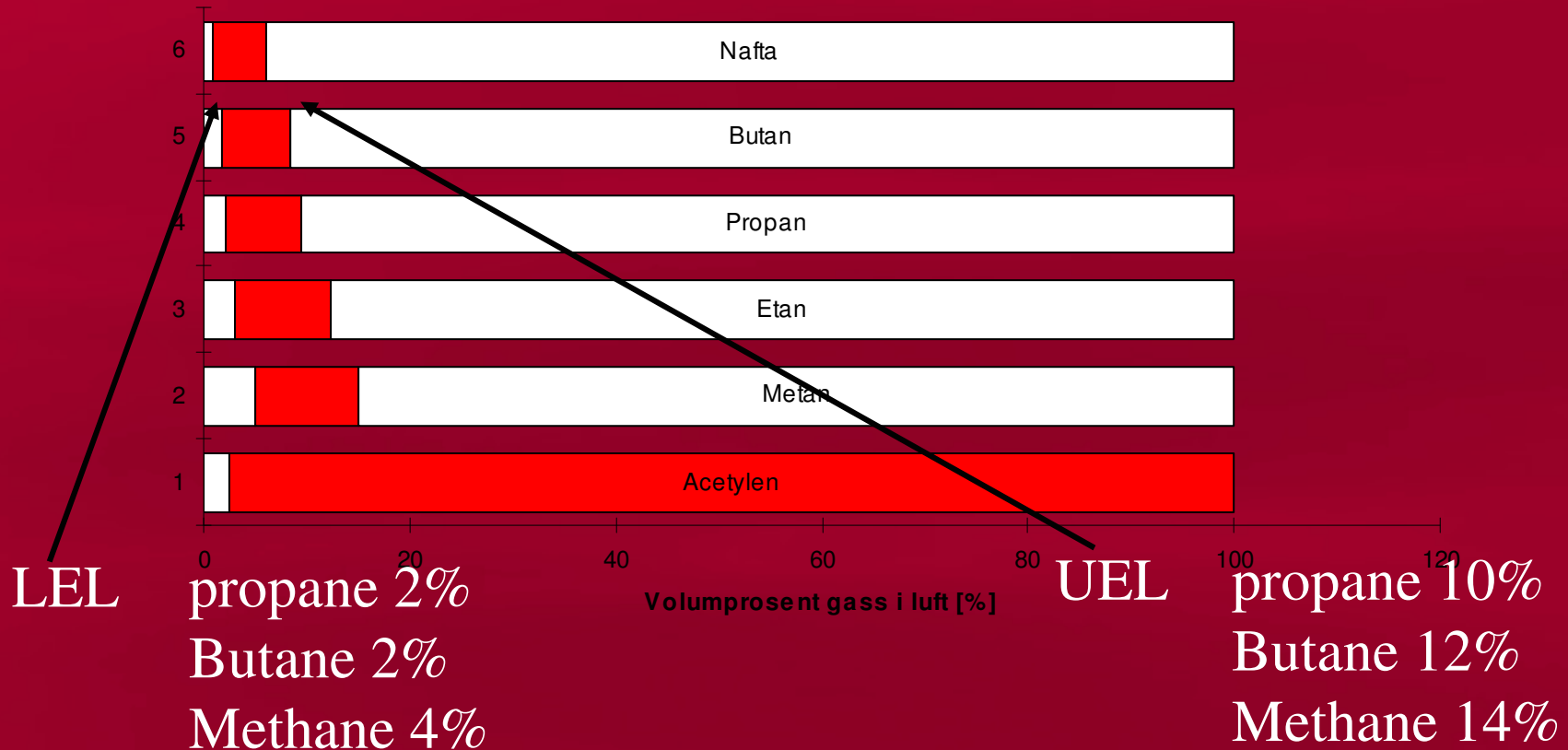
Fig. Samme antall molekyl (samme masse) – tetthet per volumenhet vil endres

Relative density / Specific gravity

- > Relative density is the ratio of the density relative to the density of air or water
- > Gas phase (temperature 15°C and atmospheric pressure)
 - > Air = 1
 - > Propane = 1,55
 - > Natural gas = 0,6
- > Liquids
 - > Water = 1
 - > LPG = 0,54
 - > LNG = 0,45

Explosion limits

Eksplisjonsgrenser for gasser i luft



Combustion

