

# Chemicals Used in Condensate Production and Impact for Imported Natural Gas Condensates

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## I. Definition of Natural gas condensates

Three CAS numbers describe natural gas condensates:

### **Natural gas condensates (petroleum) EINECS No. 265-047-3; CAS no. 64741-47-5**

A complex combination of hydrocarbons separated as a liquid from natural gas in a surface separator by retrograde condensation. It consists mainly of hydrocarbons having carbon numbers predominantly in the range of C2 to C20. It is a liquid at atmospheric temperature and pressure.

### **Natural gas condensates EINECS No. 272-896-3; CAS No. 68919-39-1**

A complex combination of hydrocarbons separated and/or condensed from natural gas during transportation and collected at the wellhead and/or from the production, gathering, transmission, and distribution pipelines in deeps, scrubbers, etc. It consists predominantly of hydrocarbons having carbon numbers predominantly in the range of C2 through C8.

### **Natural gas (petroleum), raw liq. mix EINECS No. 265-048-9; CAS No. 64741-48-6**

A complex combination of hydrocarbons separated as a liquid from natural gas in a gas recycling plant by processes such as refrigeration or absorption. It consists mainly of saturated aliphatic hydrocarbons having carbon numbers in the range of C2 through C8.

## II. Natural gas condensate Exemption

Natural gas condensates are exempt from registration according to Annex V of REACH and in accordance with Article 2(7)(b) of REACH.

## III. Definition of Substance

REACH Article 3(1): Substance: means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.

## IV. Chemicals Used in Natural gas condensate Production

Various types of chemicals (which themselves can be mixtures or formulations of various chemicals) are required to aid the production, handling and transportation of crude oil and petroleum gas. The chemicals used fall into several types as outlined below. Trace (ppm) quantities may be found in the associated gas condensates.

Most oilfield production chemicals (OFCs) are complex formulations of many different chemicals. Often the constituent chemicals themselves are not pure chemical species but a mixture of reaction products, reactants, and diluents. The formulation usually has one or two

primary ingredients that give the additive its main functionality. In addition, the formulation is specifically designed for each oilfield, and within the oilfield, for each well, and for each well the recipe may vary depending upon the time and the operation conditions.

Chemicals are used in various stages of oilfield development namely drilling, cementing, well completion, and well stimulation/workover. These chemicals may end up as impurities in the 'live' crude oil. During crude oil production, the flow of oil out of the well needs to be assured by preventing the deposition of hydrates, wax, asphaltenes, or scale. Chemicals are added to provide a means for controlling such deposits. The presence of water, bacteria, and acids all result in a corrosive environment. Production of crude oil usually involves a significant bulk water phase, many (OFCs) are water-soluble by design. When used in continuous low dose injection they remain with the water phase at the upstream facilities. The production of oil usually involves its separation from water and gas. A small amount of these production chemicals may be present in water droplets dispersed into the gas phase as an impurity, hence potentially finding their way into gas condensate as low level impurities. The condensate from a number of wells/fields may be combined during transportation, such that it is nearly impossible to ascertain the resulting combination of OFC's that may be present in natural gas condensate at a particular loadport.

Additionally chemicals may be needed during the transportation and logistical handling of the natural gas condensate, e.g. in a pipeline, tanker, or terminal. Drag reducing agents can be added in pipelines to improve flow. Mercaptan scavengers, hydrogen sulfide scavengers are often added to cargoes in order to satisfy shipping or loadport requirements for stability. Chemicals can be added either by continuous dosage or in batch treatments. The concentration in the crude usually ranges from 10 – 200 ppm. These post-production chemicals help to control corrosion, scale, hydrogen sulfide, bacteria; help to prevent hydrate formation and help to resolve emulsions. In other words, they are added to preserve the stability of the natural gas condensate during transport to the refinery.

Chemical families that may be used in the production and transportation of natural gas condensate include the following:

<b>Function</b>	<b>Description</b>	<b>REACH Category</b>
(a) Scale Inhibitors.	Used in the oil production process to prevent the deposition of mineral scale that may occur in the pores of rock formations, in downhole pipework and in surface treating facilities.	Impurity
(b) Corrosion Inhibitors:	Aqueous acids are used to stimulate production from reservoirs. Such acids expose oil production systems to the possibility of corrosion. Thus corrosion inhibitors are required to protect the downhole pipework and vessels of oil production facilities.	Impurity
(c) Oxygen Scavengers.	Often used to mitigate corrosion problems in water injection systems, in hydrotesting and drilling.	Impurity
(d) Biocides:	Bacterial growth in waters associated with crude oil production is controlled by the use of biocides. Biocides are water-soluble and removed with the water from crude.	Impurity
(e) Emulsion Breakers:	Production of Oil usually involves the co-production of large quantities of water. Natural surfactants present in the oil or water, other chemicals such as corrosion inhibitors combined with the shearing effect from turbulent flow and pumps may create emulsions. Demulsifiers are used to resolve water-in-oil emulsions.	Impurity
(f) Antifoam Agents:	Foaming problems occur in many oilfield processes. Problems occur when gas breaks out from crude oil in separators, or in gas	Impurity

	processing plants	
(g) Drag reducing Agents	High molecular weight oil-soluble polymeric compounds are added to crude oil pipeline fluids in order to enhance flow and minimize pressure drop. A long pipeline can have more than one injection point	Impurity
(h) Hydrate Inhibitors	Gas hydrates are formed when water molecules crystallize around hydrocarbon molecules at certain pressure and temperature combinations. They can plug flowlines and damage process equipment. In addition to specific chemicals, methanol or glycols (MEG, DEG, TEG) may be used to prevent crystallization of the water molecules.	Stabilizer
(i) Hydrogen Sulfide Scavengers	Hydrogen sulfide in produced oil and gas poses safety and corrosion concerns. Scavengers bind the H <sub>2</sub> S in a form that is stable in the liquid phase. They can be added at oil production facilities or in transit in a pipeline or tanker.	Stabilizer
(j) Mercaptan Scavengers	Low molecular weight (C1-C3) mercaptans have offensive odors and are toxic. It is necessary to remove and neutralize them. Mercaptan scavengers either oxidize the offending species or convert them to less volatile molecules.	Stabilizer

## V. Origin, Trading and Handling

Natural gas condensate imported into Europe can be traded several times before entering Europe and its original source may not be completely known as storage and combining may have occurred. Natural gas condensate is handled under strictly controlled industrial conditions, with no professional or consumer uses.

## VI. Conclusion

The chemicals described above can be considered in two categories: 1) impurities which remain in natural gas condensate resulting from production of crude oil and 2) stabilizers for transport - precise concentrations of these chemicals in natural gas condensates arriving at refineries is not known, but they would be in the ppm range. As such, these chemicals form an integral part of the gas condensate substance, which itself is exempted of Registration as per Annex V Article 2(7)(b). No specific registration is therefore required under REACH for the introduction of such production-related impurities and stabilizers with the importation of natural gas condensates into the EU.