

# “Valuesale” of Helium Extraction & On-Purpose Propylene Processing from Natural Gas

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## Abstract

Helium containing percentage of 0.05 % have been proofed to be economical and can be used to enhance market value or valuesale of natural gas in futures market exchange includes its hedge mechanism control. Helium is extractes from sales gas and its combustion/oxidation properties are not depreciated by the extraction so the sales prices of the natural gas as a whole are enhanced as addition profit of the helium pure gas production.

**Keywords:** Helium, Valuesale, Economical, Natural Gas, Hedge Mechanism

## Foreword

“Helium Nat Gas Project” are submitted to BeyondPetroleum Berau, Ltd. She deal with energy of the Future, fusion reactor as a coolant, in this project are the economics of helium extraction from natural gas, the only commercial sources of helium.

At least, accompanying Process Simulation, Process Integration & Improvements, Environmental Impact Assessment & Economic Evaluation here provided hedge fund assets appraises through [1].

Analytical analysis of Nat Gas’ Price through “cash case” problems at least, provided from techno econophysics to economics approximation, herewith Descriptive-analytic & Deconstructive notions of philosophical Technoscience which refers specifically to the technological & social context of science from Donna Jeanne Haraway, Professor Emerita of History of Consciousness.

The world’s largest gas field is the offshore South Pars / North Dome Gas-Condensate field, shared between Iran & Qatar.

Ever intended to adopt the Habibienomics through Bose-Einstein condensation but the revelation at least come from JP Bouchaud & M Mezard: “**Wealth condensation in a simple model of economy**”, <arXiv:cond-mat/0002374v1> 24 Feb 2000 where ‘poverty trap’ use to solve many nat gas plant in Austria the tally from Alexander van der Bellen of 50.3 % - 49.7% are inherent with economical discrepancies in Indonesia configured that 50.3 % nation wealth owned by 1 % rich families.

Economical threshold of 0.05 % helium containing handled by ‘analytical analysis’ for hedge mechanism [Surat Berharga

Negara/SBN non-komersial ] through ECONOMICS- Empirical Evidence, the information received by means of the sense, particularly by observation & documentation of patterns & behavior through experimentation herewith proposed Prof. Dr. Nantana Gajaseni, doctor of philosophy in Environmental Economics.

In the KBLI/Klasifikasi Baku Lapangan Usaha Indonesia, the ‘Helium Nat Gas project’ beheld between processing industry/ Industri Pengolahan & banking industry/Industri Perbankan [www.technofunc.com](http://www.technofunc.com)

## 1. Introduction

Nat gas also called fossil gas is a naturally occurring mixture of gaseous hydrocarbons consist of methane primarily, in addition to various smaller amounts of other higher alkanes. As a fuel & a non-renewable resource, she is formed when layers of organic matter [marine microorganisms or nannoplanktons] decompose under anaerobic conditions and are subjected to intense heat & pressure underground over millions of years.

The energy that the decayed organisms originally obtained from the sun through photosynthesis is stored as chemical energy within the molecules of methane & other hydrocarbons. Natural gas can be burned for heating & electricity generation.

The extraction and consumption of nat gas is a major & growing contributor to climate change. Both the gas itself [specifically methane] & carbon dioxide, which is reeleased when natural gas is burned, are ‘greenhouse gases’. When burned for heat or electricity, natural gas emits fewer toxic air pollutants, less carbon dioxide, and almost no particulate matter compare to other fossil & biomass fuels.

Can be in underground geological formations, natural gas often found alongside other fossil fuels like coal & oil. During petroleum production, nat gas is sometimes flared rather than being collected & used.

Before nat gas can be burned as a fuel or used in manufacturing processes, it almost always has to be processed to remove impurities such as water. The byproducts of this processing include ethane, propane, butanes, pentanes & higher molecular weight hydrocarbons. Hydrogen sulfide [which may be converted into pure sulfur], CO<sub>2</sub>, water vapor & sometimes helium [in this working paper intended to study its economical percentage, extraction & production] and nitrogen must also be removed.

The process to enhance the economic value of nat gas coined: sweetening sour gas, the natural gas at least still contains hydrogen-sulfide. Propylene for methanol synthesis from nat gas described [2].

### 1.1. Helium Extraction & Sales Gas

Diagrammatically, of 'Sales gas' & helium from Helium Recovery Unit <- LNG Plant <HUGOTONHELIUM.jpg> as well as 'To sales gas pipeline' from NGL Recovery pointed out the Sweetening Units' <Natural gas- Wikipedia> in nat gas extraction by countries in cubic meters per year around 2013 map e.g. referring Catalysis in Industry, there is sought "oxidation/combusting efficiency" [3].

Helium is a pure colorless, non-flammable & non-poisonous gas previously used in first superconductor 1911 & in ADS/Accelerator Driven System as  $\alpha$ -particle.

Natural gas flaring is defined as the controlled combustion of natural gas for operational, safety or economic reasons. Venting is the direct release of natural gas into the atmosphere.

Helium produced from natural gas by treatment of vent gas from NRU/Nitrogen Rejection Units or LNG plants [4].

For helium containing in nat gas approximately between 0.2 – 4 %, Donghoi Kim stated whereas "extraction of helium from gas source containing more than 0.05 % has been proven economical".

Accompanying Helium Extraction Unit maybe can be provided by American Helium Inc. evaluated through descriptions in "Harga Gas Alam di Bursa NYMEX" proposed to KG-Media & PT. Smartfren Telecomm, Tbk, tried to be analyzed of the 0.05 % helium economical criteria to 0.2 % minimum containing [in natural gas] through  $t = 0.5 \rightarrow t = 2$  in file:///F:/Discrete\_Gaussian\_kernel%20(1).svg & took in comparison to peak on J19 [January 2019] in NYMEX Natural Gas Contract Monthly "Settlement" Price.

It seems can be assumed as bell curve of  $t = 4$  that fitted to Size of Jump in market value [Mark Buchanan: "The Physics of Trading Floor", SCIENCE, 2000], whereas it were the distinguish g Real & Theoretical for example evidence in

"superlattice"/nanocomposite magnet.

These log normal distribution then smoothed from histogram of random –Gaussian of the number of occurrence vs  $Z[t] = \ln Y[t + \Delta t] - \ln Y[t]$  [Terry Mart: "Mengapa Fisikawan Nuklir/Partikel Teori Membutuhkan Komputasi", LKSTN15, 13 Juli 2004].

Intended to adopt "valuesale" for market value between "adding value" instead of added value in Habibi Economics & Value Tale, herewith are list of suggestions the price & oxidation/combusting efficiency of natural gas remain constant or altered by extracting helium, not ever carried in Indonesia as 14th largest producing nat gas in the World.

Natural gas which contain H<sub>2</sub>S, CO etc called sour gas, the process of the removal named as "sweetening" and for funding network to bank industry, tried to describe its econophysics consideration includes not more than sociophysics assuming people as cluster of particles stand for the origin of econophysical approach for instance analyzed in Ulusoy & Tunga Sen: "A Sociophysical Approach to Relationship Between Politics & Economy : The Lagrange Model of The Crowds", <http://www.dergipark.gov.tr/quantrade> -

Another scheme to enhance the 'valuesale' of nat gas, Monthly "Settlement" Price NYMEX Natural Gas Contract from January-April 2018 to 'peak' between Oct 2018 – April 2019 for form incremental-saw tooth function whereas the similar increment depict between 'Size of Jump in market value' & Theoretical-Real of normal Gaussian curve  $R = f[H] > R_0$  between  $-H_n$  &  $H_n$ , in which the Real-part seems similar to  $R/R[H = 0]$  vs Magnetic field [kG] plots of magnetoresistance in superlattices to configures  $Z[t] = Y[t]$ .

### 1.1. Analysis For Helium Extraction

Currently, nat gas is an economically proven source of helium with up to 8 mol% [0.05 % – 0.2 % study from D. Kim] concentration. Helium extraction at earlier stages in the natural gas liquefaction plant shows a motivating initiative to improve the economics & environmental aspects [Al-Sobhi, et.al: "Sustainable design & analysis for helium extraction from sale gas in liquefied natural gas production", J. of Nat Gas Science & Engineering, vol 102, June 2022, 104599], at least if it is true she extracted from vent & end-flash gas. She doesn't depreciate the sale-Value of nat gas itself even after sweetened.

Crude helium usual use low-pressure flash system & high pressure multiple cascade systems whereas cryogenic fractionation is the most industrially used technology to recover helium compared to other technologies [adsorption & membrane]. In this paperwork, cryogenic-based fractionation processes assessed from technical, economic and environmental perspectives.

Helium has many industrial applications implemented in critical machinery, include MRI installations, magnets production, aircraft manufacturing, leak detection systems, electronics fabrication, fiber optics & nuclear facilities. The global helium

demand has reached approximately 30,000 tons/y in 2020 which corresponds to US \$ 1 Billion worth of the world market [Dai et.al, 2021].

The approximated major helium reserves are around 8 million tons, located mainly in Russia, Algeria, Qatar & US. The USA crude & purified helium grades prices were approximately \$ 3.75 – 7.21/m<sup>3</sup> in 2016 and in Indonesia @ Rp. 1,000,000.00/m<sup>3</sup>.

Helium is commercially produced in two grades; crude helium with 50-70 mol % purity & purified helium with more than 99.99 mol% helium. The cryogenic process is used to produce crude helium from nat gas. Advanced units such as pressure swing adsorption/PSA or membrane can be used. Bulk helium extraction undergoes step to purify the natural gas from acid gases [CO<sub>2</sub> & H<sub>2</sub>S], mercury & water. Secondly, extract heavier hydrocarbons before ingoing the nitrogen rejection unit/NRU then step to extract the helium from the nitrogen-helium mixture from the left-over methane gas in the NRU.

The final step is to recover helium from the nitrogen-helium mixture in single or multi-stages to generate crude helium [50 – 70 %mol] or high purity grade. The sale gas stream is directed to LNG processing plants for purification in the LNG case. Research extends ultimately to allocate the optimal fraction of recovered sales gas to purified LNG with helium gas recovery.

### 1.3. New Inference on Plastic/Polyurethane® Foam Thermal Insulation

Academic practical study from ChemEng Dept-FTUI, 2014 provided by Dr. Ir. Sukirno, M.Eng: “**Sistem Insulasi Termal Kriogenik**” about Foam Insulator configures Vessel built from plastic foam for cryogenic temperature to store liquid nitrogen/hydrogen. Thermal insulation in oil & gas processing plant consist of pipes & tanks.

For example of polystyrene foam, urethanes foams represent versatile class of expanded thermoset materials find application in a wide range-H. Grünbauer, et.al: “**Rigid Polyurethane Foams**”, Chapter, May 2004.

These paperwork propose using of foam insulator to store nat gas & helium/sweetened sour gas has been evaluated by Magdalena Svanstroem: “**A Method for Analyzing the Gas Phase in Polyurethane Foam**”, J. of Cellular Plastics, July 1995 whereas FOAMGLAS non-combustible materials [ISO 1182 & other tests] found in PROJECT INFO, April 2001 comprehensively compiled in Frank Williamson: “**Cryogenic Foam Insulation-Abstracted Publications**”, NASA Ref 1002, Sept 1977.

## 2. Conclusion

The conclusion of this whitepaper are ‘valuesale’ of natural gas can be enhanced in any percentage by extraction and processing of helium & propylene even of its trading in futures market. Helium percentage of 0.05 % for hedge mechanism control have been determined to be economical since 2014.

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