Jurnal Bhara Petro Energi
Volume 2, Issue 1 (Mei 2023)
e_ISSN: 2828-3457

Analysis Glycol Losses On Gas Dehydration Unit PT X Field Z

Desi Kusrini
Akamigas Balongan, Indonesia

Corresponding author:
Desi Kusriani, Akamigas Balongan, Indonesia.
Desiakamigas18@gmail.com

Article Info :
Article history:
Received: Mei 3, 2023
Revised: Mei 10, 2023
Accepted: Mei 30, 2023

Keywords:
Keywords 1; *Glycol losses*
Keywords 2; *dehydration*
Keywords 3; *Glycol*

Abstract

The dehydration process gas is a process of separation of gas from the water content by mixing an absorbent for example glycol, in PT X field Z process of dehydration of gas using triethylene glycol to decrease Water content Minimum below 7 lb / mmscfd to be sold to consumers. The goal of the research is to determine the water content that is absorbed in the contactor, knowing the number of glycol loss and knowing the cause of glycol loss after experiencing the process of dehydration. Every dehydrated process using glycol is always there whose name is glycol losses either in reboiler or contactor, but the losses are classified normal or abnormal loss, losses can be either liters or percentage loss glycol lost. To determine how much glycol is missing during the dehydration process then we have to look for production data such as gas flow rate data, inlet water content and outlet water content contactor then moisture content data, and the last data from glycol like SG Glycol and purity glycol, later from the data is known calculation of circulation glycol and know the amount of glycol loss whether the normal loss or abnormal loss. The water content omitted is 32.49 lbs / h while the Glycol losses found in the above-normal state are 0.35% with the lowest amount of Glycol losses of 0.02 gal / MMSCF and the largest 0.091 gal / MMSCF and the cause of Glycol loss Include the number of the tray, time, surface area of absorption, flow speed, and the temperature that is in the reboiler or the regeneration of glycol.

Kata Kunci:
Kata Kunci 1; produksi
Kata Kunci 2; gross split
Kata Kunci 3; sektor minyak dan gas

Abstrak

Proses Dehidrasi gas adalah suatu proses pemisahan gas dari kandungan air dengan cara mencampurkan suatu absorbent misalnya saja glycol, di PT X Lapangan Z proses dehidrasi gas menggunakan trietylene glycol untuk menurunkan kandungan air minimal di bawah 7 lb/mmscfd agar bisa dijual ke konsumen. Tujuan Penelitian ini adalah untuk menentukan kandungan air yang terserap di contactor, mengetahui jumlah glycol loss dan mengetahui penyebab glycol loss setelah mengalami proses dehidrasi. Setiap proses dehidrasi menggunkan glycol selalu ada yang namanya glycol losses baik itu di reboiler ataupun contactor, namun losses tersebut digolongkan loss normal atau upnormal, losses bisa berupa liter ataupun presentase loss glycol yang hilang. Untuk menentukan berapa banyak glycol yang hilang pada proses dehidrasi maka kita harus mencari data produksi seperti data flow rate gas, kadar air inlet dan kadar air outlet contaktor kemudian data kandungan uap air dan yang terakhir data dari glycol seperti SG glycol dan kemurnian glycol, nantinya dari data tersebut diketahui perhitungan sirkulasi glycol dan mengetahui jumlah glycol loss apakah normal loss atau upnormal loss.Kandungan air yang dihilangkan ialah 32,49 lbs/jam sedangkan Glycol losses yang ditemukan pada keadaan diatas normal ialah 0,35% dengan jumlah Glycol losses yang terendah sebesar 0,020 gal/MMSCF dan yang terbesar 0,091 gal/MMSCF dan penyebab Glycol loss meliputi jumlah tray, waktu, luas permukaan penyerapan, kecepatan alir dan suhu yang berada di reboiler atau saat regenerasi glycol.

Introduction

Natural gas is fuel fossil a gaseous consisting mainly of methane (CH4). And can be found in oil fields, natural gas fields, and coal mines. When a gas rich in methane is produced through the putrefaction of bacteria anaerobic from materials organic other than fossils, it is called biogas. The impurities in the produced gas must be removed so that the combustion produced by the gas is complete. Water can reduce the energy produced during complete combustion, and it can also damage equipment to be used. The water content of gas dehydrated must be following the contract agreed upon in the stated contract.
The absorbent used in the gas drying process must have high water solubility, is not corrosive, is not easy to form a foam (foaming), is easily regenerated, and is cheap. Absorbent along with dry gas, forming foaming or heating in the reboiler are called glycol losses. Glycol losses are the loss of some of the content glycol used during the process dehydration. Glycol losses can occur due to the uneven contracting process or due to too high a moisture content in the composition of the mixture glycol. Often the occurrence of glycol losses in the process dehydration gas makes the use of glycol not meet existing standards. Therefore, glycol losses must be maintained so that the process dehydration gas can run optimally and continue to work economically. In a gas processing process, a dehydration process is needed to remove water content in the feed, so that unwanted things do not occur in the process. The thing that needs to be considered from the chemicals involved in that the solvent (water-absorbing material) must have the ability such as high absorption of water, and low absorption of hydrocarbons, Difficult to evaporate at the absorption temperature, low viscosity for easy absorption. Pump, and has good contact between gas and phases liquid, regeneration, low corrosion potential, easy to operate and maintain.

1.1 Types of Glycol

From the various solvents available, it turns out that glycol meets these criteria. There are four types of glycol that have been used successfully for dry natural gas, namely ethylene glycol (EG), diethylene glycol (DEG), triethylene glycol (TEG), and tetraethylene glycol (TREG).

- Diethylene Glycol is odorless, colorless, non-toxic, and hygroscopic.
- Triethylene glycol has characteristics that tend to be the same as other types of glycol. There are many uses of Triethylene glycol that can be utilized in the industrial world, one of which is as a desiccant in natural gas dehydration because Triethylene glycol has properties Hygroscopic that can absorb water.
- Tetraethylene glycol (TREG) can be regenerated at temperatures up to 430 F, so it will produce very high purity. However, the price is very expensive so it is rarely used.

1.2. Determine glycol losses and their percentage

Glycol losses can occur in some gas dehydration tools, however, glycol losses occur mostly in TGRS and glycol contractors, because these two devices are very prone to glycol losses. If in TGRS, glycol losses occur as a result of the temperature reboiler being too high, exceeding the boiling point of the TEG so that the TEG evaporates and follows the water that will be treated by IPAL (Wastewater Treatment Plant). Whereas in the glycol contactor the temperature of the lean glycol which is too hot exceeds 15 º above the temperature of the gas entering the glycol contactor. So that the lean glycol will bond with the wet gas and go to the produced gas so that the glycol will occur in losses. The number of glycol losses can be determined in the following way. (Francis S and Richard E, 1991. "Oilfield Processing Of Petroleum Volume One: Natural Gas" Oklahoma, 160).

a. Glycol Losses

$$GL = \frac{Make\ Up\ Glycol}{Day} \times \frac{1gal}{3.785\ liters} \times \frac{1}{Qgas}$$

information :

gal conversion to bbl = $\frac{1gal}{3.785\ liters}$

Day = *Glycol Make Up time*

Make up glycol = make up Glycol

Qgas = Flow rate gas

b. Weight H_2O entering /hour

lb H_2O entering/hour= Q x I x $\frac{1}{24}\frac{day}{hour}$

information:

lb H_2O = lb H2O entering
I = Water removed

c. lb *water content*

= *Water Removed* x *gas rate* x $\frac{1}{24}\frac{Day}{hour}$

information:
Water removed = Water removed lb/mmscf
Gas rate = mmscf

d. percentage *glycol loss*

= $\frac{v\ losses}{v\ sirkulasi}$x 100%

information:
Vactual = volume of circulation
Vsirkulasi = number of glycol needed in 1 hour

The process of gas dehydration does not always go well. Several problems arise during the process. This problem occurs in the dehydration process unit. The problem includes:

1. Absorber
The main problem that occurs in the absorber is the inefficient dehydration process that occurs foaming and solubility of hydrocarbons in the glycol.

- Dehydration is not efficient; if dehydration is not sufficient then the gas from dehydration is still contained water with high enough levels. Causes of this include the water content in lean the glycol is too large, the absorber is inadequate,
- The temperature of the inlet Gas is too high, the temperature lean glycol is too low and over circulation or under circulation glycol.
- Foaming will cause be carried out glycol to by the gas flow out of the absorber. As a result, there is a loss of glycol (glycol loss) in the dehydration process. The solubility of hydrocarbons in glycol in the absorber.

2. Reboiler
Operational problems in the reboiler include salt contamination, degradation glycol, and problems associated with acid gases.

3. Kontrol
In industry, dew points are used to indicate the water content in a gas stream. If the decrease in the dew point of the dehydrated gas is too small, there may be several causes, namely, the circulation rate is glycol too low, the lean concentration is glycol low, the occurrence of foaming, and the gas velocity in the absorber is too high.

Method

Final research entitled "Analysis of glycol losses in the gas dehydration unit". Compiled using a research method to make it easier to complete the Final Project. The research methods used are as follows:

2.1 Preliminary
This preparatory stage is the stage of collecting initial information that is done to identify, formulate, and determine the objectives of problem-solving by considering knowledge based on existing literature. As in the production engineering literature on campus and E-book obtained from supervisors in the field.

2.2 Data Collection
Collection and processing are carried out in making this final project with observation and interviews. This is done by visiting the production field and observing the dehydration process and its flow. Then collect all the information about the data from the field that becomes the object of study. The data obtained from the field are in the form of gas flow data, water content, the weight of glycol, and other supporting data. From the data obtained, it will then be adjusted and processed based on the object of study, namely analyzing the glycol loss that occurs in the PT X.

2.3. Conclusion Stage
Stages At this stage, which is carried out after all the stages have been carried out, a conclusion is drawn from what has been obtained during the final project. Several points drawn into conclusions are referred to through the initial purpose of why this Final.
2.4. Flow Chart
Figure 2.1 is shown the flow chart of the stage research.

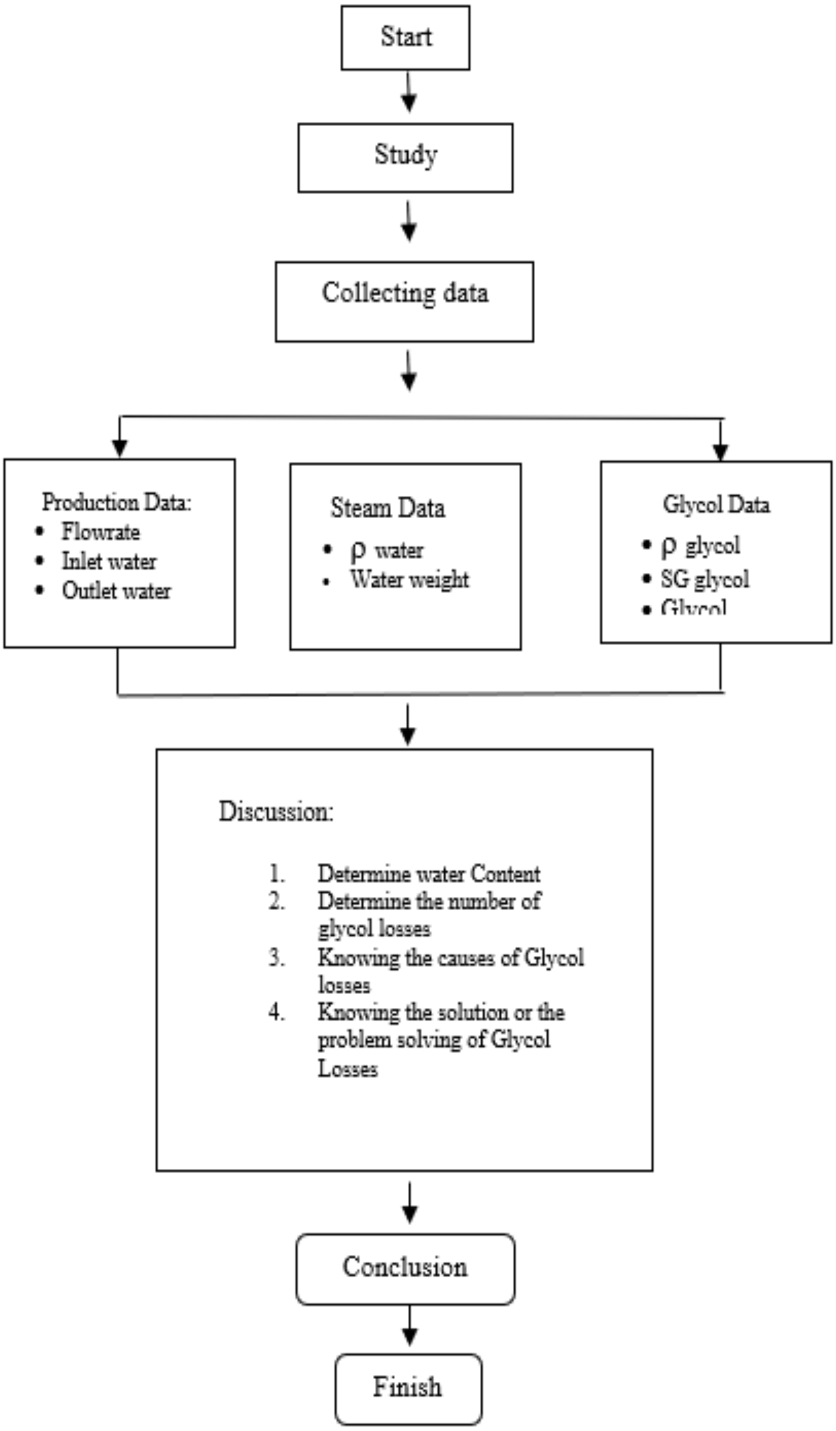

Figure 2.1 Research Stage

Result And Discussion

Below is the make-up data glycol carried out in 2022 presented in the Table 3.1, and Table 3.2 for result of calcultion of glycol losses.

Table 3.1 of Data Make up Glycol

Date	Day	make up TEG (drum)	Liters	avg. flowrate (MMSCFD)
15-Jul-22		1	208	62,14
14-Agt-22	30	1	208	62,4
28-Sep-22	45	1	208	61,16
28-Okt-22	30	1	208	60,87
30-Okt-22	2	0	0	60,7
15-Nov-22	15	1	208	60,35
05-Des-22	20	2	416	60,28

Source: research data

$$Glycol\ loss\ \left(\frac{gal}{mmscf}\right) = \frac{make\ up\ TEG\ (Liter)}{day}\ x\ \frac{1\ gal}{3.785\ liter}\ x\ \frac{1}{flow\ rate\ (mmscfd)}$$

a. *Glycol* loss 15 July 2022 - 14 Augustus 2022

$$= \frac{208{,}18\ liter}{30 day}\ \text{x}\ \frac{1\ gal}{3.785\ liter}\ \text{x}\ \frac{1}{62{,}4\ mmscfd} = 0{,}029\ \text{gal/MMSCF}$$

b. *Glycol* loss 14 Augustus 2022 – 28 September 2022

$$= \frac{208{,}14\ liter}{45\ day}\ \text{x}\ \frac{1\ gal}{3.785\ liter}\ \text{x}\ \frac{1}{61{,}16\ mmscfd} = 0{,}020\ \text{gal/MMSCF}$$

c. *Glycol* loss 28 September 2022 – 28 October 2022

$$= \frac{208{,}14\ liter}{30\ day}\ \text{x}\ \frac{1\ gal}{3.785\ liter}\ \text{x}\ \frac{1}{60{,}87\ mmscfd} = 0{,}030\ \text{gal/MMSCF}$$

d. *Glycol* loss 28 October 2022 – 30 October 2022

$$= \frac{0\ liter}{2\ dayi}\ \text{x}\ \frac{1\ gal}{3.785\ liter}\ \text{x}\ \frac{1}{60{,}7\ mmscfd} = 0{,}00\ \text{gal/MMSCF}$$

e. *Glycol* loss 30 October 2022 – 15 November 2022

$$= \frac{208{,}14\ liter}{21\ day}\ \text{x}\ \frac{1\ gal}{3.785\ liter}\ \text{x}\ \frac{1}{60{,}35\ mmscfd} = 0{,}091\ \text{gal/MMSCF}$$

f. *Glycol* loss 15 November 2022 – 5 December 2022

$$= \frac{416{,}35\ liter}{30\ dayi}\ \text{x}\ \frac{1\ gal}{3.785\ liter}\ \text{x}\ \frac{1}{60{,}2\ mscfd} = 0{,}0621\ \text{gal/MMSCF}$$

Table 3.2 Calculation results Glycol Losses

Source :

Periode	Day	Make up TEG (drum)	Volume (liters)	*Glycol Losses* (gal/MMscf)
15 July - 14 Augustus 2022	30	1	208,18	0,029
14 Augustus– 28 September 2022	45	1	208,18	0,02
28 September – 28 October 2022	30	1	208,18	0,03
28 October – 30 October 2022	2	0	208,18	0,00
30 October– 15 November 2022	15	1	208,18	0,06
15 November – 5 December 2022	20	2	416,35	0,09

research calculation result

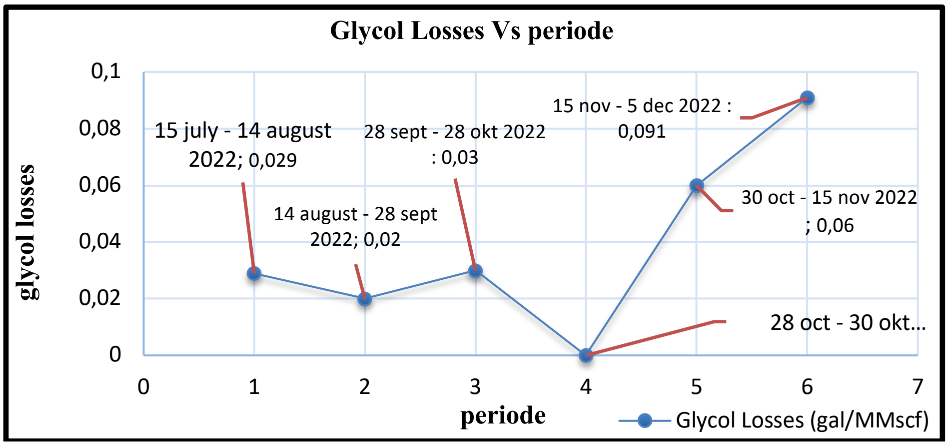

Figure 3.1 Comparison of Glycol Losses

Source: research result

Figure 3.1 is a graph of the results of the comparison Glycol losses with a period wherein the graph the glycol losses that occur are up to normal because glycol losses the tolerable in regeneration are glycol 0.01 - 0.05 gal / MMscf. ("Surface Productions Design Of Gas Handling Systems and Facilities Volume 2", 204).

To determine the water *content* absorbed, the following data are needed:

Material *Balance*
a. *Mousture Content inlet* 20,23 Lbs/MMscf
b. Mousture Content toutlet 7,47 Lbs/MMscf
c. Water Removed (20,23 – 7,47) = 12,76 Lbs/MMscf)

From the following data it is used to calculate the calculation below as follows:
Calculation using *sample* on 18 September 2021

$$\textbf{Lb } \mathbf{H_2O} \textbf{ incoming/hour} = Q \times I \times \frac{1 \text{ day}}{24 \text{ hour}}$$

$$= 61{,}12 \text{ MMSCFD} \times 12{,}76 \text{ Lb/MMSCFD} \times \frac{1 \text{ day}}{24 \text{ hour}}$$

$$= 32{,}26 \text{ lbs/hour}$$

To remove water vapor, the required TEG circulation rate is 2 Gal TEG/Lb H_2O so that :

The circulated TEG

$= 2{,}0 \frac{\text{gal TEG}}{\text{H2O entering}}$ x lbH_2O entering

$= 2{,}0 \frac{\text{gal TEG}}{\text{H2O entering}}$ x 32,26 Lbs/hour

= 64,26 gal/hour

SG_{glycol} **=** $\rho teg/\rho H_2O$
ρteg = Sg glycol x ρH_2O
= 1,1257 x 8,33 ppg
= 9,377 ppg

Lb TEG 99% = circulation TEG x (ρteg)
= 64,26 gal/hour x 9,377 ppg
= 605,121 lbs/hour

Lb H_2O *Removed* = water removed x gas rate x $\frac{1}{24} \frac{\text{hari}}{\text{hour}}$

= 12,76 MMSCFD x 61,12 Lb/MMSCFD x$\frac{1}{24} \frac{\text{hari}}{\text{hour}}$

= 32,49 lbs/hour

Lean glycol has a purity of up to 99% which will be used to bind the moisture content in *wet gas* on *basis of* 1 hour operation containing:

Lb *lean glycol* = Lb TEG x *glycol* (99%)
= 605,121lbs/hour x 99%
= 599,07 lbs/hour

Lb H_2O = Lb TEG x H_2O (1%)
= 605,121lbs/hour x 1%
= 6,05 lbs/hour

After knowing the weight of *lean glycol* and water vapor, we can determine the weight of *rich glycol* which contains:

Lb Rich Glycol
= Lb *lean glycol* + (Lb H_2O 1 % + Lb H_2O *Removed*)
= 599,07 lbs/hour + (6,05 lbs/hour + 32,49 lbs/hour)

= 637,610 lbs/hour

presentase *rich glycol* = $\frac{\text{Lb lean glycol}}{\text{Lb rich glycol}}$ x 100%

= $\frac{599{,}07 \text{ lbs/hour}}{637{,}610 \text{ lbs/hour}}$ x 100%

= 93 %

For calculations. *Percentage glycol losses* When the circulation is known, *glycol* then calculates *the actual volume* that will be used to determine the occurrence of *normal losses* or *abnormal losses.* The Calculation is *actual volume* as below:

Lb lean TEG = 605,121lbs
= 274,478 Kg
ρ_{glycol} = 9,375 ppg
= 1125,7 kg/m³

The circulated Glycol

$$= \frac{\text{Lb TEG}}{\rho\ glycol}$$

$$= \frac{274{,}478}{1125{,}7}$$

= 0,243 m³
= 243 liters/hour
= 64,19 gal/hour

Flow rate 12 september = 60,35 mmscfd

$$= \frac{60{,}35\ mmscf}{24\ hour}$$

= 2,514 mmscf/hour

Glycol needed for every 1 mmscf of gas

$$= \frac{circulation\ Vglycol}{Q\ 12\ septemer}$$

$$= \frac{64{,}19\ gal/jam}{2{,}514\ mmscf/jam} = 25{,}67\ \text{gal/mmscf}$$

Percentage of Glycol Losses

$$= \frac{v\ losses}{v\ sirkulasi} \times 100\%$$

$$= \frac{0{,}091\ \text{gal/mmscd}}{25{,}67\ \text{gal/mmscd}} \times 100\% = 0{,}35\%$$

The result of above calculation is summirezed on the Table 3.3, below:

Table 3.3 Volume glycol loss percentage

lb H_2O entering /hour	Gal. TEG circulation /hour	lb TEG 99%/Hour	lb H_2O removed
32,26 lbs/hour	64,53 gal/hour	605,121 lbs/hour	32,49 lbs/hour
Base 1 hour operation			
Lb *lean glycol*	Lb H_2O	Lb *rich glycol*	V *glycol* circulation
599,07 lbs/hour	6,05 lbs/hour	637,610 lbs/hour	64,19 gal/hour
Percentage Glycol Losses			
0,35 %			

Source: result research calculation

Conclusion

After carrying out the Final With the title Analysis Project Glycol Losses on the Gas Dehydration Unit at PT X field Z it can be concluded as follows: The water content removed is 32,49 lbs/hr, Glycol losses in the above conditions are said to be abnormal because the amount of Glycol losses lowest is 0.020 gal / MMSCF and the largest is 0.091 gal/MMSCF with a percentage Glycol losses of 0.35%. The cause of glycol losses is such as the number of trays in which the number of trays is very influential during the absorption process, the minimum number of trays on the contactor is 4 trays, while the absorption process in the field uses 8 trays so that it can increase the efficiency of glycol absorption at the contactor. The temperature at the Still Column and Reboiler in the field is designed to be 340 °f - 400 °f, so that with this temperature it can evaporate the water contained in the gas without evaporating the glycol. The flow rate is also very influential on the rebellion process where if there is a little wet gas, the glycol flow rate must also be adjusted so that there are no glycol losses or waste glycol, for the flow rate in the field is 2.209 SCF / gal. Whereas the time for the paging process in the field can be said to be quite long, around 8 hours - 24 hours, this is because when the control panel at TGRS operates, there are problems such as hours caused by factors from old equipment that can cause a decrease in the quality of the equipment. Meanwhile, the location of the potential for glycol losses is in the TGRS (Triethylene Glycol Regeneration System). Problem-solving that can be done to deal with the problem of Glycol losses or other problems, namely by maintaining or replacing equipment, this is because the equipment used is quite old and old.

DAFTAR PUSTAKA

Dr, R. C. (2021, january 2). *Memahami Cost Recovery dan Gross Split dalam Kontrak Migas*. Diambil kembali dari Hukum Online.com: https://www.hukumonline.com/klinik/a/memahami-i-cost-recovery-i-dan-i-gross-split-i-dalam-kontrak-migas-lt602a649c213ed

Dwi Qurbani, I. (2012). *Politik Hukum Pengelolaan Minyak dan Gas Bumi di Indonesia. Politik Hukum Pengelolaan Minyak dan Gas Bumi di Indonesia*, 2-6.

Hernandoko, A. M. (2018). *Implikasi Berubahnya Kontrak Bagi Hasil (Product Sharing Contract) ke Kontrak Bagi Hasil Gross Split*. Jurnal Privat Law, vol 2.

Migas, D. (2017, februari 1). Kementrian ESDM. Diambil kembali dari Kementrian Energi dan Sumber daya Mineral: https://migas.esdm.go.id/post/read/permen-esdm-nomor-08-tahun-2017-tentang-kontrak-bagi-hasil-gross-split

Peraturan dan Kebijakan Perundangan di Sektor Migas. (2020, januari 1). Diambil kembali dari EITI Indonesia: https://eiti.esdm.go.id/peraturan-kebijakan-perundangan-sektor-migas/

Potensi Minyak Dan Gas Di Indonesia Dan Kontribusinya Untuk Perekonomian. (2020, september 5). Diambil kembali dari Transcone Indonesia: https://transcon-indonesia.com/id/blog/potensi-minyak-dan-gas-di-indonesia-dan-kontribusinya-untuk-perekonomian

Prinsip Utama Kebijakan Cost Recovery. (2010, februari 18). Diambil kembali dari ESDM.com: https://migas.esdm.go.id/post/read/Prinsip-Utama-Kebijakan-Cost-Recovery

Putrohari, R. D. (2013, oktober 21). *Peran Industri Migas di Indonesia*. Diambil kembali dari Academia.edu: https://www.academia.edu/5513819/Peran_Industri_Migas_di_Indonesia

Ramli nonci, A. F. (2020). Analisa deskripsi Minyak Bumi. jurnal penelitian dan perekonomian, 1-19.

Romadhon, T. M. (2004). *Peluang Bagi Penyelesaian Konflik Agraria Di Sub Sektor 1 Pertambangan Umum*. Jurnal Analisis Sosial Vol. 9, 4-8.

Utomo, L. T. (2016). *Aspek Hukum Penerapan AsasKekuatan Mengikat dalam Kontrak Bagi Hasil Minyak dan Gas Bumi di Indonesia*. ,Diponegoro Law Jurnal , 5, 4-10.