

# Forecasting the Cost of Surface Facilities Based on Crude Oil Prices Using Linear Regression Method

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## Abstract.

In early 2016, oil prices fell to its lowest level (30.32 US/bbl) over the last 12 years, and the coronavirus (Covid-19) outbreak that started at the end of 2019 has had a negative impact on the world economy (including the oil and gas industry). Since then, petroleum exploration and exploitation activities have decreased worldwide. The oil and gas companies had to make extra cost savings and produce new strategies to avoid negative cash flow and keep the projects economically acceptable, such as: cost efficiency, proposed incentives (investment credit, interest cost recovery, etc.), proposed changes to the terms and conditions of the existing contract (depreciation acceleration, DMO holiday, share of First Tranche Petroleum (FTP), change of Split Ratio, etc.), etc.

In terms of Investment Cost, this paper will assist the Contractors and the Government in determining the investment costs (surface facilities) of oil projects and its relationship to oil prices in order to assist them in evaluating the economics of oil and gas projects. Therefore, this paper will evaluate and analyze the relationship between the project cost of surface facilities (US\$/bbl) and the oil price (US\$/bbl). The steps had taken in this paper are as follows: collecting the project cost of surface facilities (2003–2020), oil price history (2003–2020), calculating the deviation between the cost of surface facilities and oil prices and developing a formula in the form of an estimate of the project cost of surface facilities at a certain oil price based on statistical data of 224 onshore – oil projects in Indonesia.

Based on the evaluation and statistical analysis of 224 onshore – oil projects in Indonesia, the formula that shows the correlation between the project cost of surface facilities (US\$/bbl) and oil price (US\$/bbl) is  $z = 0.007x + 2.1148$ , where  $z$  = cost of surface facilities and  $x$  = oil price. By using the oil price year 2020 (average WTI Crude by 39 US\$/bbl), the estimated cost of surface facilities in the onshore area in Indonesia is 2.38 US\$/bbl

**Keyword(s):** Cost Analysis, Surface Facilities, Oil Prices, Plan of Development, Production Sharing Contract

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## INTRODUCTION

In early 2016, oil prices fell to their lowest level (30.32 US/bbl) over the last 12 years, and the coronavirus (Covid-19) outbreak that started at the end of 2019 has a negative impact on the world economy (including the oil and gas industry). Since then, petroleum exploration and exploitation activities have decreased worldwide. The oil and gas companies had to make extra cost savings and produce new strategies to avoid negative cash flow and keep the projects economically acceptable, such as: cost efficiency, proposed incentives (investment credit, interest cost recovery, etc.), proposed changes to the terms and conditions of the existing contract (depreciation acceleration, DMO holiday, share of First Tranche Petroleum (FTP), change of Split Ratio, etc.), etc.

Based on Presidential Regulation Number 22 of 2001 and Number 9 of 2013, the Government of the Republic of Indonesia formed an institution called the Special Task Force for Upstream Oil and Gas Business Activities (SKK Migas). The institution is assigned to manage upstream oil and gas business activities under a Cooperation Contract. One of the functions of SKK Migas is to give approval of proposed Plan of Development (POD) documents based on technical and economic evaluations from both SKK Migas and the contractor.

As of December 2020, there were 525 projects approved by the government of Indonesia, and 224 of them were onshore oil projects, which are expected to maintain the national energy supply and increase national income from the oil and gas industry.

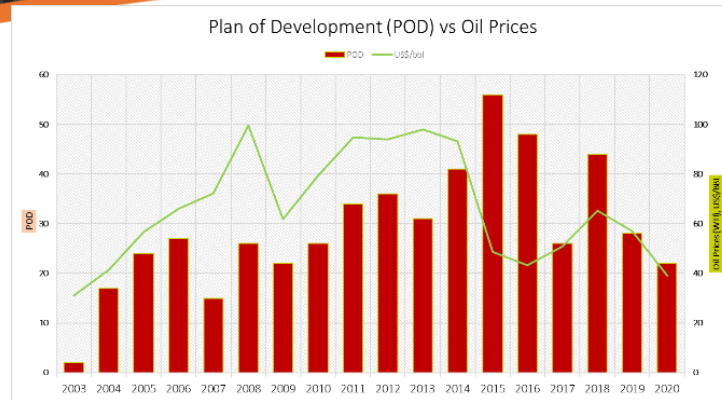
This paper will evaluate and analyze the relationship between the project cost of surface facilities (US\$/bbl) and the oil price (US\$/bbl). The steps taken in this paper are as follows: collecting the project cost of surface facilities (2003–2020), oil price history (2003–2020), and calculating the deviation between the cost of surface facilities and oil prices.

Then, developing a formula in the form of an estimate of the project cost of surface facilities at a certain oil price based on 224 oil projects in Indonesia.

This paper will provide an insight into the development of the oil and gas industry in Indonesia during the fall of oil prices. The paper is also expected to provide contractors with a quick look at the oil and gas industry in Indonesia, especially those who are looking for “affordable” project costs of surface facilities that will help them to create oil and gas projects more interesting economically and also help them to create their petroleum exploration and exploitation strategy in Indonesia by considering this information, which will provide benefits for both the government and the contractor.

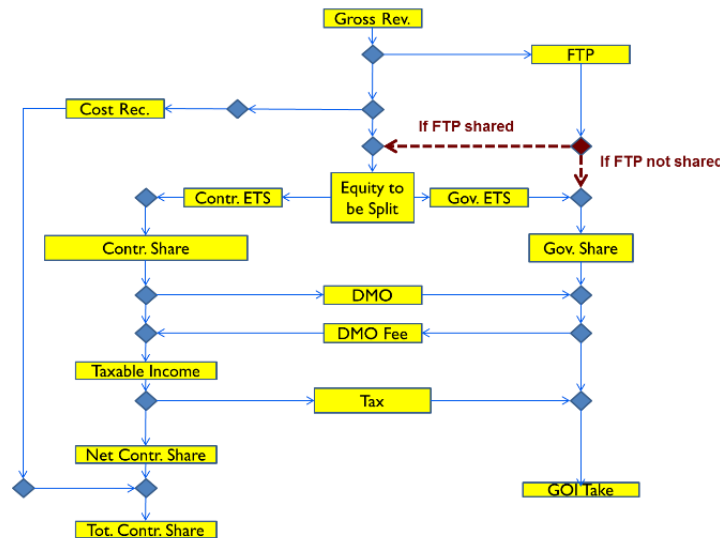
## Oil and Gas Industry in Indonesia

Field Development Plan in Indonesia used to be called Plan of Development (POD). Definition of POD is a plan to develop one or more oil and gas field in an integrated way in order to produce the hydrocarbon reserves optimally by considering the technical, economic and HSE aspects.



**Figure 1 Plan of Development (POD) vs Oil Prices**

In 2020, there were 525 PODs approved by SKK Migas. Based on fig. 1, the COVID-19 pandemic year 2020 had an effect on the decrease in the number of projects in Indonesia while the fall in oil prices in 2015 had no significant impact on the number of projects proposed by contractors. As oil prices in 2015 began to decrease, the number of PODs increased and reached the highest number since 2003 (fig. 1), this might have been caused by the flexibility of the terms and conditions of PSC in Indonesia (fig. 2), which helped the projects become economically acceptable.



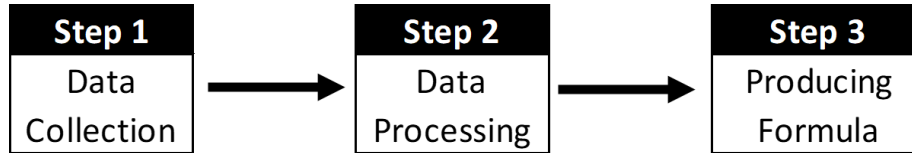
**Figure 2 Production Sharing Contract (PSC) Diagram**

In a Production Sharing Contract (PSC) fiscal regime like Indonesia's, the contractors can develop the projects economically by proposing some changes in terms and conditions of the production sharing contract, such as depreciation acceleration, incentive (investment credit and interest cost recovery), DMO holiday, and share of percentage of First Tranche Petroleum (FTP) or change of Split Ratio.



## METHOD AND RESULTS

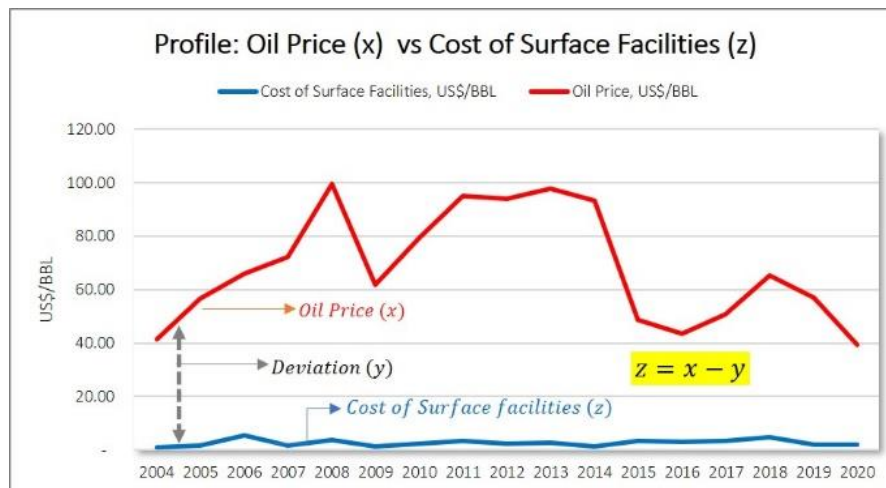
As per 2020, there were 525 PODs approved by SKK Migas and 224 were onshore oil projects.



*Figure 3 Methodology of Forecasting the Cost of Surface Facilities based on Oil Prices*

The simple steps has taken to produce the relationship between the project cost of surface facilities (US\$/bbl) and the oil price (US\$/bbl) in this paper are as follows:

- ✓ **Step 1:** Collecting the cost of surface facilities (2003–2020), oil price history (2003 –2020),
- ✓ **Step 2:** Calculating the deviation between the cost of surface facilities and oil prices,
- ✓ **Step 3:** Developing a formula in the form of an estimate of the project cost of surface facilities at a certain oil price based on 224 oil and gas projects in Indonesia.



*Figure 4 Profile: Project Cost of Surface Facilities (US\$/bbl) and Oil Price (US\$/bbl).*

Based on fig. 4, we find a formula showing the relationship between oil prices, Cost of Surface Facilities and Deviation as follows:

$$z = x - y \quad \dots \text{eq. 1}$$

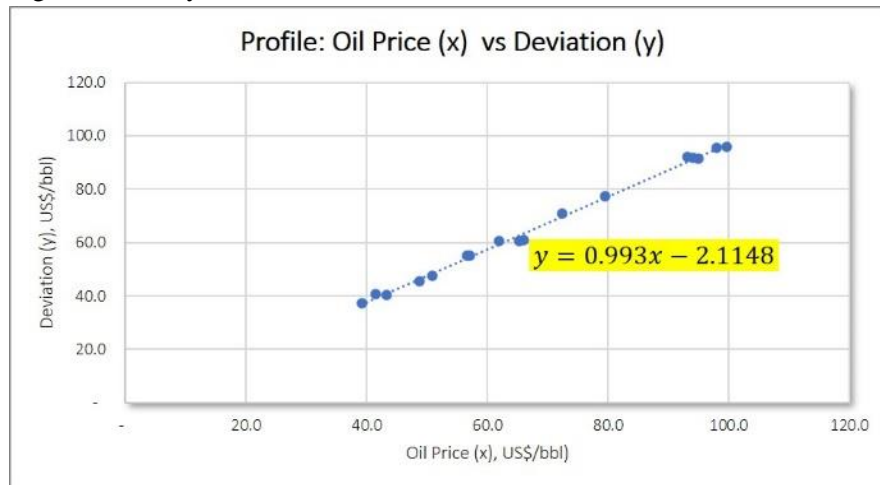
where:

$z$ = Cost of Surface Facilities, US\$/bbl

$x$ = Oil Prices, US\$/bbl

$y$ = Deviation, US\$/bbl

The following are the profile for Deviation (z) versus Oil Prices (y) and the equation that are generated from the linear regression analysis.



**Figure 5 Profile: Oil Prices (US\$/bbl) and Deviation (US\$/bbl).**

Based on fig. 5, we find another formula showing the relationship between oil prices and Deviation as follows:

$$y = 0.993x - 2.1148 \quad \dots\text{eq. 2}$$

where:

*x* = Oil Prices, US\$/bbl

*y* = Deviation, US\$/bbl

By combining equations 1 and 2, the 3rd equation is obtained as follows:

$$\begin{aligned} z &= x - y \\ &= x - (0.993x - 2.1148) \\ &= x - 0.993x + 2.1148 \\ z &= 0.007x + 2.1148 \end{aligned}$$

...eq. 3

As for the way to read the table above, as in the following example:

*“Assuming the oil price is 100 US\$/bbl, the estimated cost of surface facilities is 2.81 US\$/bbl”.*





## CONCLUSIONS

Based on the evaluation and statistical analysis of 224 onshore - oil projects in Indonesia, the formula (equation) showing the correlation between the project cost of surface facilities (US\$/bbl) and oil price (US\$/bbl) is  $z = 0.007x + 2.1148$ , where  $z$  = cost of surface facilities and  $x$  = oil price. By using the oil price year 2020 (average WTI Crude by 39 US\$/bbl), the estimated cost of surface facilities in onshore area in Indonesia is 2.38 US\$/bbl.

This paper will provide an insight into the development of the oil and gas industry in Indonesia during the fall of oil prices. The paper is also expected to provide contractors with a quick look at the oil and gas industry in Indonesia, especially those who are looking for affordable project costs of surface facilities that will help them create oil and gas projects more interesting economically and also help them create their petroleum exploration and exploitation strategy in Indonesia by considering this information, which will provide benefits for both the government and the contractor.

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