

COST ANALYSIS OF OUTSOURCING STRATEGY BY CVP METHOD IN MAINTENANCE TEAM OIL AND GAS COMPANY

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Abstract – The maintenance team having limited resource loading to support daily Operation activities, the impact is a late response to conduct corrective jobs and impact on production target. In line with the Company strategy, the position for retired maintenance employee (low-grade technician) or employee who will be assigned to another department will be not replaced. The company decided to apply to outsource service contracts for a “backfill” low-grade technician position. These maintenance services are to provide resource unit rate (RUR) scheme short service activities and material/spare part procurement for materials that are not supplied by Company Warehouse.

This paper aims to provide an adequate methodology by decision-making method Kepner Tregoe Analysis for problem analysis and SMART Analysis for decision analysis to overcome the problem of resource shortages and to determine the best alternative for the best human resource strategy based on the conditions of the oil and gas market around 2017-2018 where oil prices tend to be low at that time.

The methodology here proposed is based upon the evaluation of the expected profit function of both the total revenue and the total cost, by performing a trade-off analysis based on the transaction costs and CVP (Cost Volume Profit) analysis. In addition, this research also aims to see how much budget will be given by new Operators after transferring oil and gas block concession on Aug 2021 to new stakeholders using linear regression analysis

Keywords - Outsourcing, decision analysis Kepner Tregoe and SMART, CVP/Cost Volume Profit Analysis

I. INTRODUCTION

Along year 2016-2020 functional maintenance will having problem on lack of manpower due to employee retire or moving to other department by internal hiring, or job posting process. Some of them also internally success assign to the higher position level for example from technician level to senior technician level. Sustaining O&M organization capability by optimizing available resources & cost to deliver business plans 2016 – 2021 without operational interruptions by implementing appropriate resource management plan (i.e. outsourcing strategy) that complies with Company and Government of Indonesia Regulations.

II. METHODOLOGY

The Company having several options to fill the gap with offering outsourcing maintenance strategy but the

problem is the skill set of outsourcing employees doesn't have the same capability as a Company technician. Since on 2015 Company having shaping plan or resource strategy long plan to anticipate resource availability issue due to employee grow up like below program. The purpose of this paper is to determine the best alternative to facing resource strategy by implementing external hiring, TPW (third party workforce), internal hiring, or outsourcing the maintenance services by contract services and also cost structure for each alternative to support End of Contract of Company while operating in Sumatra and as baseline data for new Operator of Rokan Block. Also we will calculate how much profit or gain by implementing method of outsourcing

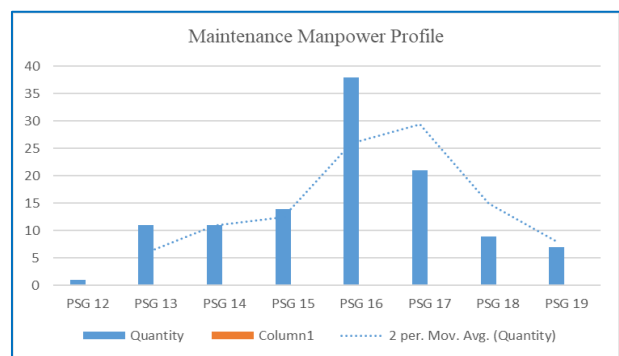


Fig 1 Normal Distribution of Maintenance Manpower

The methods that are used for selecting some alternatives are *Kepner Tregoe* and *SMART analysis* to select the best alternatives based on current conditions. After reviewing all alternatives then the Author has the conclusion that the best of maintenance strategy for a staffing plan is using contract services or outsourcing strategy. The thesis also research cost structure before implementing outsourcing strategy and after implementing strategy and estimate calculate how much the profit while implementing staffing plan outsourcing instead of internal hiring or external hiring.

The methodology here proposed is based upon the evaluation of the expected profit function of both the total revenue and the total cost, by performing a trade-off analysis on the basis of the transaction costs and CVP (*Cost Volume Profit*) analysis. In CVP analysis we know about fixed cost, variable cost and total revenue. To shifting or reduce maintenance cost then Company wants to transform salary and compensation employee (category fixed cost) to be variable cost (implementing contract service). By transferring those method than Company will decrease fixed cost significantly but the risk is the

qualification of Company man not the same with contract services man, and then Company release O&TC module for 3rd party

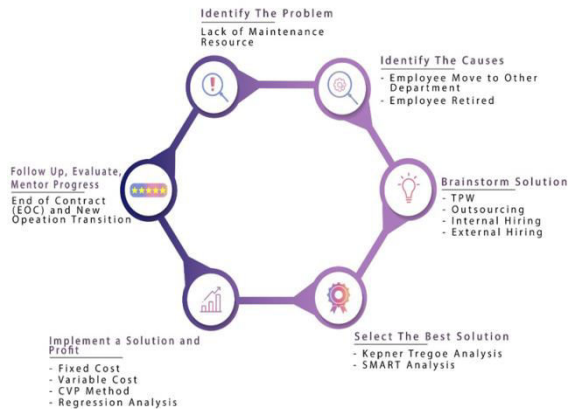


Fig 2 Conceptual Framework of this research

In addition, this research also aims to see how much budget will be given by new operators after transferring oil and gas block management to new stakeholders using linear regression analysis. By this total revenue prediction after EoC than the new maintenance team will have program for new score card to achieve and continue the successful of maintenance program

Conceptual framework for the problem to be solved, using a 6-steps concept:

1. *Identify the problem*

Problems encountered are Maintenance Team having lack of resource due to retire or moving to other department (job posting) and the Company should maintain high performance to deliver critical equipment reliability and availability. How to manage current resource to deliver high result and how's the strategy for next 5-10 years

2. *Identify the causes.*

Causes encountered are clear when people tried to looking new challenge by applying to other position, to enhance the career or when people get retired so Company need to replace or backfill the vacant position. But the problem are does Company need to hire new employees, looking from other department, outsourcing or local hire? In order to obtain optimal solutions results and so that problem are solved uses the Kepner-Tregoe (KT) problem analysis to find the root of this problem

3. *Brainstorm solutions*

To find the best solution to solve the lack of resource so we identified several options to select best alternatives:

- Third party workforce (TPW)
- Maintenance Outsourcing
- External Hiring
- Internal Hiring

Based on several options we will determine which best alternative by looking highest profit that we will get

4. *Select the best solution*

The best solution will depend on conditions that influenced on maintenance activities types that give

highest profit to Company until end of PSC to other Operator, that criteria are:

- Cost
- Technician competency
- Safety
- Contract availability
- Risk

5. *Implement the solution plan*

Implementation the solution is conclusion and implementation based on the best solution result from calculation of fixed cost, variable cost and CVP/cost volume profit analysis and conducting forecasting of budget for new Operator by regression Analysis

III. RESULTS

Starting with analyze using Situation Appraisal (SA). First, we need to recognize concern, deviation, threat and opportunities. Then separate with break broad concern into more clearly defined sub concern, and list additional concern that must be resolved. The next cycle is set priority with decide in which order to work on your separated concern. After that plan for resolution with select the appropriate process to resolve each concern, plan the who, what, where, when and extend of resolution.

TABLE 1 SA APPROACH OF MAINTENANCE RESOURCE

No	Concern	Timing	Trend	Impact	Process	Priority
1	Retired employee will not be backfilled	High	High	High	PPA	1
2	High cost of external hire employee	Medium	Medium	Medium	DA	5
3	Maintenance cost reduction	High	High	High	PA	2
4	Career development of internal employee	High	High	Medium	DA	3
5	Skill set of outsourcing employees	Medium	Medium	High	PPA	4

The most critical concern for this case is retired employee will be not backfilled. The second priority is maintenance cost reduction due to oil price getting worst and the third priority concern is career development program for current employee for career enhancement. After getting top three concern situational analysis then we will continue on setting problem analysis (PA) using **KP approach** to discuss some problem at past and what is the fault

TABLE 2 KEPNER TREGOE SA OF OUTSOURCING STRATEGY

Specification	Is	Is Not	Distinctions	Changes
What: - Object	Decline maintenance resource due to employee retired, assignment to other department etc	Lack of spare parts, tool	Maintenance employee retired will be not replaced	The Functional Maintenance resource team will reduce due to global recession and oil price decrease
- Deviation	# of retire, # of move to other department	# of total employees		
Where: - Object	Functional Maintenance	Operation Department	Oil price decrease due to global recession and oil supply excessive at market and also plan the concession of blok migas will be hand over to new Operator	
- Place	SMO Maintenance	Outside SMO		
When: - Time	Since Aug 2015	Before Aug 2015	Company will loss 38 employees low grade technician due to	
- Frequency				
How Much: - Trend	Higher (worsen)	Stable or better		

TABLE 3 VERIFICATION OF TRUE CASES

Possible causes	The most possible cause:
1. Employee retire will be not backfilled (D&C) 2. Oil Price and excessive oil price (D&C) 3. Employee rotation to other position (K&E) 4. Low grade technician employee will deploy to other team (K&E)	Combination of employee of Company retired will be not backfilled and career path employee that will have new assignment to other team. Employee designate around 38 people will be not backfilled since oil price getting worst and Company need to consider severap option to close the gap
Verification	
Confirmation from HR that Company man for several position will be not backfilled and team need to looking alternative whether TPW, outsourcing or external hire	

After getting verification from HR that several position in functional maintenance such as low-grade technician, safety field person, i-journey operator etc will be dismissed to reduce maintenance cost then we will several option to select best alternative using decision analysis (DA) tool.

The top four alternatives are:

1. Third Party Workforce (TPW). Sometimes call secondee task force. High qualification candidate with high performance
2. Maintenance Service Outsourcing. Possibility to develop new concept of maintenance strategy by implementing outsourcing contract. All resources needed by Company will be prepared by Business Partner/Contractor
3. External hiring – but this option will be eliminated since high cost and timely for short runway Company contract with GOI and facing EoC on August 2021. But due to urgent condition probably external hire will be considered
4. Internal Hiring. Hiring from other department, but since other team also lack of resource it could be hard to get

After get four best alternatives then we will analyze which best alternative to be implemented. Based on analysis for *SMART (Simple Multi Attribute Rating Technique)* and provide anticipate future events or potential problem of the chosen decision through Potential Problem Analysis (PPA) then we start with several stages

a. Stage 1 and 2

Determine several alternatives (4 alternatives) with each of description that describe maintenance strategy related

on resources implementation based on KT analysis on first stage analysis

TABLE 4 VERIFICATION OF TRUE CASES

Alternatives	Description
Alternative 1	Third Party Workforces (TPW)
Alternative 2	Contract Services with Outsourcing contract
Alternative 3	External Hiring
Alternative 4	Internal Hiring

b. Stage 3 - Maintenance strategy categorization of criteria like below chart. The most criteria more related on cost and benefit and other factors that would influence the decision that will be taken

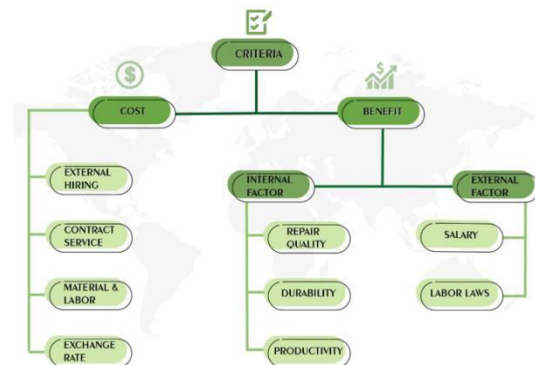


Fig 3 Chart of Maintenance Strategy Categorization

c. Stage 4 – measuring how well the options perform on each attribute for each attributes by using direct rating, To estimate budget needed for each alternative, total cost of each alternative consists of annual salary and annual benefit. From table below we see that the lowest budget for each alternative if implement alternative B

TABLE 5 TOTAL COST FOR SEVERAL ALTERNATIVE (SOURCES: HR DEPARTMENT MAINTENANCE)

Alternative	Description	Annual Salary (IDR)	Annual Benefit (IDR)	Total Cost
A	Third Party Workforce (TPW)	120.000.000	20.000.000	140.000.000
B	Contract Services with Outsourcing	84.000.000	10.000.000	94.000.000
C	External Hiring	228.000.000	57.000.000	285.000.000
D	Internal Hiring	192.000.000	48.000.000	240.000.000

d. Stage 5 - Determining weight of the attributes (each of attribute put weighted and this is example of external hiring attribute)

Based on table 6 below the highest of weighted of attributes is salary, productivity/safety, skill set, career plan and knowledge. Salary of budget needed to pay employee become the main constrain to select alternatives

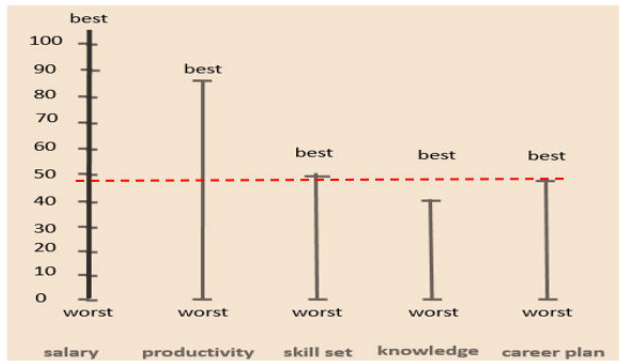


Fig 3 Chart of Maintenance Strategy Categorization

Then notify and comparing for each alternative and put in table weighted based on five attributes direct method that have describes like salary, productivity/safety, skill set, career plan and knowledge

e. Stage 6 - Calculating aggregate of weighted value for each alternative based on stage 5

TABLE 6 AGGREGATE CALCULATION FOR EACH ALTERNATIVE

Alternative	Description	Salary (0.23)	Productivity (0.29)	Skill Set (0.16)	Knowledge (0.13)	Career Plan (0.09)	Aggregate of weighted value
A	Third Party Workforce (TPW)	70	100	60	50	30	70,645
B	Contract Services with Outsourcing	40	100	30	30	30	62,174
C	External Hiring	100	90	50	40	30	74,848
D	Internal Hiring	90	40	30	50	90	70,667

f. Stage 7 - Provisional decision: trading benefit vs cost
 This stage we will choose the lowest cost of all alternatives by looking spending of total cost implementation. You can see the cheapest alternative is by alternative B or contract services with outsourcing strategy

TABLE 7 PROVISIONAL DECISION (SOURCE FROM HR DATABASE)

Alternative	Description	Total Cost	Aggregate Benefit
A	Third Party Workforce (TPW)	140.000.000	70,645
B	Contract Services with Outsourcing	94.000.000	62,174
C	External Hiring	285.000.000	74,848
D	Internal Hiring	240.000.000	70,667

And then put on graph to see the lowest point of each alternative. Based on figure 3.2 chart of provision below alternative B is the lowest total cost with aggregate benefit 62.17. The frontier line is a line in dominated area with point in C, A and B. If the Company has difficulty in choosing the most preferred efficient frontier point then we make another graph to compare and analyze the best alternative selected like below simulation and graph

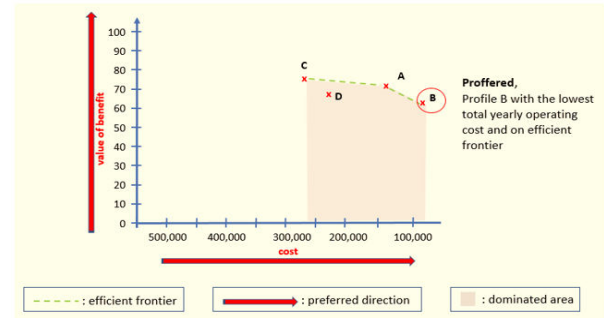


Fig 4 Provision Decision for resources problem

g. Stage 8 – Sensitivity Analysis between internal and external factor

TABLE 8 COMBINING AGGREGATE FOR EACH ALTERNATIVE SOURCE

Alternatives #	Alternatives Sources	Aggregate of Weighted Value (External = 0)	Aggregate of Weighted Value (Original)	Aggregate of Weighted Value (Working Condition = 0)
A	Third Party Workforce (TPW)	63,33	70,645	54,67
B	Contract Services with Outsourcing	33,33	62,174	67,33
C	External Hiring	66,67	74,848	70,67
D	Internal Hiring	50,00	70,667	56,00

The graph on plot X and Y from figure 5 below to know the intersection between line and get the score of 62 and select that the nearest number is 62,17 (or alternative B with contract services/outsourcing). The second alternative that close with number 62 is alternative C with score weighted value 66.67

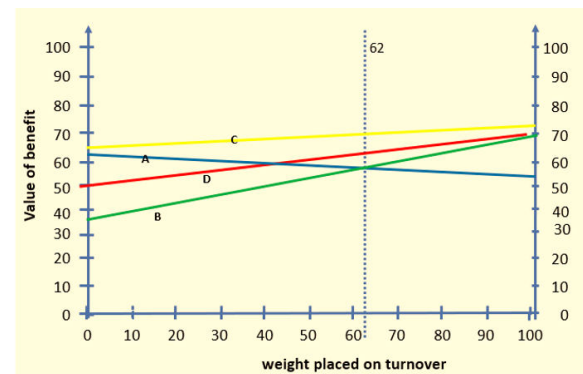


Fig 5 Weight placed on turnover

The decision is as long weight of total turnover < 62 so establishing contract services with outsourcing is the most attractive. But when weight of total turnover > 62 so third-party workforce/TPW is the most attractive

After selected the best alternative and decided best decision making on lack of resource problem and backfill the lack of resource then we will analyze how much profit that generated and comparison between before contract service implementing and after contract service implementing and how much the profit. Income Statement is a report to provide a financial summary of the firm's operating result during a specific period. Income from Maintenance department came from budget that have plotted based on last year spending calculation and has

approved by SKK Migas in WP&B meeting. Based on data of RPC team the total spending cost until end of December 2017 is \$ **12,420,144.09** with total fixed cost is \$ **11,464,748.39**. The portion of fixed cost is significantly higher than variable cost



Fig 6 Income statement 2017

Comparing in year 2018, the total cost until end of December 2018 is \$ **10,033,068.36** and total fixed cost is \$ **9,261,293**. Same with year 2017 the portion of fixed cost significant higher compared with variable cost but reduce compared year 2017



Fig 7 Income statement 2018

$$\text{Total Cost} = \text{Total Fixed Cost} + \text{Total Variable Cost}$$

$$TC = TFC + TVC$$

At the first year implementing contract service with hiring about 45 skill employees and moving around 24 low grade Company technicians to other team or increase their career to be as “Analyst” or then named “Maintenance Representative”. The rest of lack of technician will be backfilled by outsourcing contract/contract services

The cost structure on first and second year of implementing of contract services resulting a big profit in the intersection between total cost and total revenue like figure 8 below. Also from two graphs the TC 2017 moving TC 2018 reduce significantly like below scenario

$$TC_{2017} - TC_{2017} = \$12,420,144$$

$$TC_{2018} - TC_{2018} = \$10,033,068$$

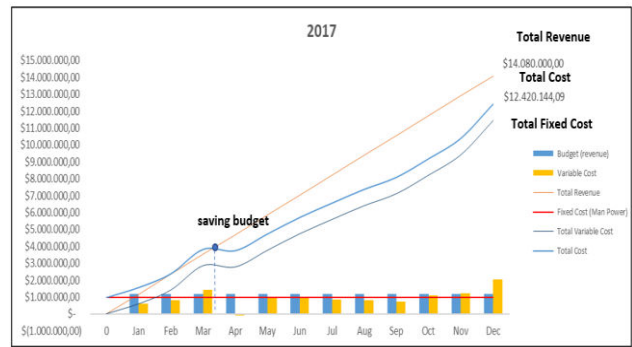


Fig 8 cost structure 2017

$$\text{Profit} = \text{Total Revenue} - \text{Total Cost}$$

Based on calculation and the graph the net profit for implementing contract services in first year analysis (2017) is

$$\text{Profit (2017)} = \$14,080,000 - \$12,420,144.09 = \$1,659,855.91$$

Since current oil price getting low until \$30-40/barrel then maintenance budget will be decreased 10% from last year and supported to continue implement outsourcing contract. Based on last 3 months in year 2017 (starting from January to March) the maintenance team having minus budget and starting April until rest of year the Maintenance team has well managed the budget and saving total budget/profit like above calculation. The detail of budget per month like below table

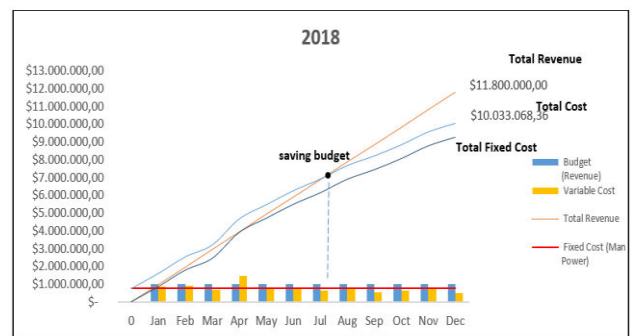


Fig 8 cost structure 2018

Comparing last year 2017, in 2018 the budget decreased and some of fixed cost variable has been converted to variable cost by implanting more outsourcing contract. But from cost structure from January until July indicated minus from revenue/budget per month. Starting on August until rest of the year 2018 the cost structure well managed and surplus on around \$ 1,7 M profit

Based on year 2019, the total cost until fiend of December 2019 is \$ **7,569,068.36** and total variable cost is \$ **7,519,768**. Compare last 2 years the fixed has reduce since the labor cost reduce significantly

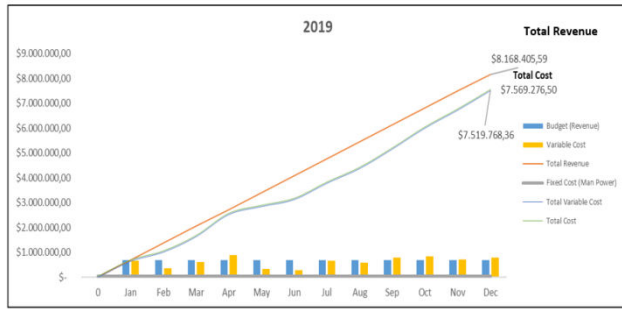


Fig 9 cost structure 2019

According to the last year 2020, when the oil price getting worst in pandemic condition due to covid 19 in early year 2020 Management believe the oil price getting better so that why team has decided to receive additional 20% budget from previous year since drilling activities plan to execute in 2020 to sustain operational target and preparation for end of contract to new Operator

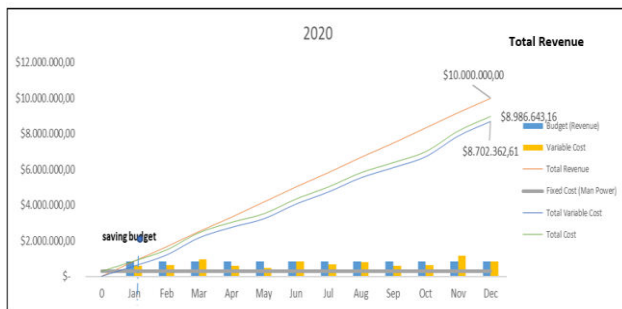


Fig 10 cost structure 2020

The profit of year 2020 is total revenue/budget \$10,000,000 minus total cost \$ 8,986,643 equal with \$ 1,013,356 for budget saving. The summary of profit/budget saving during year 2017-2020 the maintenance budget that resulting from maintenance team line below chart

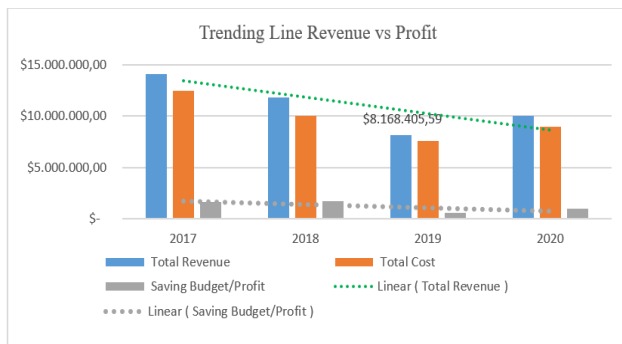


Fig 11 Trending Line vs Profit Cost structure

To predict how much budge after EoC the method that used is by simple regression analysis since only two variables are available. The dependent variable is the total budget required (Y) and the independent variable is profit/saving budget (X) that we propose. By Microsoft excel and formula of regression analysis than we plot the simple regression print out like below:

SUMMARY OUTPUT

Regression Statistics

Multiple R 0.897481
 R Square 0.805473
 Adjusted R -2
 Standard E 1364547
 Observatic 1

ANOVA

	df	SS	MS	F	Significance F
Regressor	4	1,54E+13	3,85E+12	8,281341	#NUM!
Residual	2	3,72E+12	1,86E+12		
Total	6	1,91E+13			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept							0	0
X Variable 1							0	0
X Variable 2							0	0
X Variable	5838805	1922816	3,036591	0,09349	-2434404	14112013	-2434404	14112013
X Variable	4,106383	1,426951	2,877732	0,102519	-2,03329	10,24606	-2,03329	10,24606

Fig 11 regression analysis

The objective of regression analysis is to obtain estimates of a (the vertical intercept) and b (the slope) of the regression line:

$$Y_t = a + bX_t$$

Where Y_t is the estimation of of the Company total budget required in year t obtained from the regression line for the level of profit in year t (X_t). The vertical intercept value is 5838805 and the value of b (slope) is 4,1. So if we predict 2021 year budget by estimating profit/saving budget proposed USD 900,000 (X_t) we can get predict budget required is

$$Y_{2021} = 5838805 + 4.1 (900,000) = USD 8,634,549$$

And 2022 year predicted by propose USD 800,000 profit, so the forecast budget for year 2022 is

$$Y_{2022} = 5838805 + 4.1 (800,000) = USD 8,323,911$$

By estimating two years from current year so the new Operator after EoC will easy to determine the best maintenance strategy to support maintenance program in maintenance team oil and gas industry

TABLE 9 COMPARATION BUDGET OUTSOURCING AND EMPLOYEES

	2017	2018	2019	2020	2021	Total
# Outsourcing EE	44	60	80	132	145	145
Budget (USD)	166.897	546.207	728.276	1.201.655	1.320.000	3.963.034
# Employees	13	36	40	52	60	60
Budget (USD)	537.931	1.489.655	1.655.172	2.151.724	2.482.759	8.317.241
Profit	371.034	943.448	926.897	950.069	1.162.759	4.354.207

From table above it seems we can save budget per year average USD 807,000 if implement outsourcing and the total for 4 years implementing outsourcing the Company get gain around USD 4,354,207

IV. DISCUSSION

To conduct maintenance resource strategy, then maintenance team applied maintenance contract services named it *Field Maintenance Support Services (FMSS)*. The first contract has been commenced on August 2016 with contract duration was 3 years. Since the area coverage for all Sumatra Operation then the contract has been split into North area and South area. The Company has named it FMSS North and FMSS South, the profile of two contracts like below info

The first stage FMSS/outsourcing contract having 3 years duration with total budget IDR 47M. Based on below chart the most spending will be for manpower but depend of quantity that needed by field. It could higher than target (120 person) or less that adequate of field required. This FMSS contract was started in August 2017 after previously a series of discussions and meetings were held regarding how the best form of contract for the maintenance team

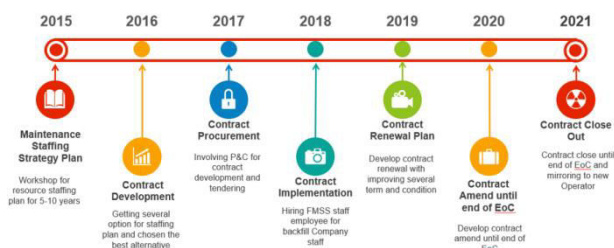


Fig 12 Project Contract Service Timeline

V. CONCLUSION

By using Kepner Tregoe Analysis and SMART analysis so maintenance team has decided the best option for lack of maintenance resource strategy is by implementing outsourcing strategy. The method is outsourcing person will not replace employee but backfill the services that lost due to employee retired or move to another department. Comparing with hiring new Company employees with high overhead we have a chosen program to reduce fixed costs by conducted outsourcing contracts in maintenance activities. With this strategy, we can shift people cost from fixed cost to be variable cost and put in a contract strategy

By implementing an outsourcing strategy, the reduction budget from 2017-2018 to 2019-2020 significantly influences management decision to reduce budget since from the calculation when the first-year applied to outsource the Company gain is around USD 2,000,000 per year. The contract model that has chosen is maintenance services that named it *Field Maintenance Support Services (FMSS)* that divided into two areas FMSS South and FMSS North

The contract services not only support manpower services but also applied material services by providing critical parts that were not available at the warehouse. Event outsourcing is put more “advantage” for Company

we also have to realize that the quality of “origin” employee and outsourcing service still cannot be same. We still have a gap in quality services, safety issues, and compliance. We need another program to “improve” the skill set of outsourcing employees to be qualified and fulfill the maintenance requirement at a field.

Cost-volume-profit analysis (often called *breakeven analysis*) and operating leverage. These simple analytical techniques are frequently used in managerial decision making and can be quite useful when data of fixed cost has converted to variable cost and the cost structure of the firm will be getting better but CVP analysis in Maintenance activities are very rarely discussed in the kinds of literature. The cost structure of the new Operator after EoC on Aug 2021 can be predicted by calculating the forecasting budget by simple regression analysis. It has shown from the previous data that for average the budget needed per year for around USD 8MM with estimating profit/saving budget of USD 800K

REFERENCES

- [1] Richard, S. (2015), *The Behaviour of Cost*, Ivey Publishing, N.J., School of Business Foundation.
- [2] Lulaj, Enkeleda; Iseni, Etem. (2012), *Role of Analysis CVP (Cost Volume Profit) as Important Indicator for Planning and Making Decision in the Business Environment*, European Journal of Economics and Business Studies.
- [3] Valeria, Mazziotta; Giuseppe, Aiello (2011), *The Design of Effective Maintenance Outsourcing Contract*, Università di Palermo.
- [4] Horngren, Charles T and Datar, Srikant M (2012), *Cost Accounting, a Managerial Emphasis, 14th Edition*, Prentice Hall
- [5] Salvatore, Dominick (2012), *Managerial Economics in a Global Economy*, Fordham University Oxford University Press, 7th edition.
- [6] Gulati, Ramesh (2013), *Maintenance and Reliability Best Practices, second edition*, Industrial Press Inc New York
- [7] Wan Mahmood, Wan Hasrulnizam (2011), *Maintenance management system for upstream operations in oil and gas industry, a case study*. Int Industrial and System Engineering, Vol.9 No.3, 2011
- [8] Marcus, Alan J; Myes, Stewart C; Brealey, Richard A (2001), *Fundamentals of Corporate Finance, Third Edition*, Massachusetts Institute of Technology, University of Southern California, University of Kentucky, McGraw-Hill Primis Publishing.
- [9] Sunitiyoso, Yos, *Lecturer Material Decision Analysis Using SMART*, SBM-ITB .
- [10] Parnell, Gregory S; Bresnik, Terry A (2013) “Handbook of Decision Analysis” Wiley Publication 2013