

# RELIABILITY OF MARINE TRANSPORTATION IN MIRI OIL AND GAS ACTIVITIES

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## ABSTRACT

The purpose of this research is to investigate the reliability of marine transportation in Miri Oil and Gas activities. Marine transportation had becoming very important in supporting the oil and gas activities, to transport industrial personnel, deck, bulk and dry bulk cargos from the base onshore to offshore installations. Offshore exploration and production activities are dynamic and the operating cost is very high; allowing no room for lay time or down time. Hence, marine transportations play an important role in ensuring that the activity be continued to achieve the daily production output KPIs. Lately, there are occasions of vessel's frequent breakdown due to machinery failure and later vessel was not being delivered in time or longer vessel turn-around time, and this had significantly disrupted the offshore day-to-day activities in term of vessels' planning and movement of cargos and industrial personnel subsequently result to the losses of revenue, day productions and productivity. In this research, a simple random methodology using standard questionnaires addressed randomly for their feedbacks on how reliable are these marine transport services. Response from the respondents revealed that the vessel performance and services did not meet their expectation due to their frequent machinery breakdown. This was due to poor or ineffective implementation on their preventative maintenance program and this reflects the people; the shipboard and shore base support employees. Realizing this, the competitiveness advantages of treating these employees as the organization assets requires a consistent management philosophy and a coherent set of human resources practices in addition to an effective implementation of the preventative maintenance system. The management must be willing to adopt the 'We CARE (Credibility, Action, Result, Engagement)' or 'Get REAL (Recognition, Enforce, Action, Leadership)' management concept. The client should also support by allocating appropriate allowable maintenance days for the maintenance job to be executed perfectly.

## ABSTRAK

Tujuan penyelidikan ini adalah bagi menyiasat kebolehpercayaan pengangkutan marin dalam aktiviti minyak dan gas di Miri. Pengangkutan marin adalah amat penting dalam menyokong aktiviti industri minyak dan gas, untuk mengangkut kakitangan perindustrian, kargo geladak, kargo pukal, dan kargo pukal kering daripada pengkalan bekalan ke luar pantai. Eksplorasi luar pantai dan aktiviti-aktiviti pengeluaran adalah dinamik dan kos operasi adalah sangat tinggi; tidak membenarkan ada ruang untuk masa terluang atau masa henti. Oleh itu, tugasan pengangkutan marin memainkan satu peranan penting dalam memastikan bahawa kegiatan itu berterusan untuk mencapai KPIs pengeluaran harian. Kebelakangan ini, terdapat peristiwa-peristiwa dimana kapal kerap kerosakan akibat kerosakan jentera dan kapal tidak dapat dikembalikan untuk beroperasi dalam masa yang ditetapkan atau pusingan masa kapal lebih panjang, dan ini telah mengganggu aktiviti-aktiviti harian luar pantai, perancangan serta pergerakan bagi kargo dan kakitangan perindustrian dengan kesudahan mengurangkan hasil pendapatan, pengeluaran dan produktiviti harian. Dalam penyelidikan ini, satu kaedah rambang yang mudah dengan menggunakan soal selidik yang standard dibuat secara rambang untuk mendapatkan maklum balas tentang perkhidmatan pengangkutan laut ini. Maklum balas daripada responden menyatakan bahawa prestasi dan perkhidmatan kapal tidak mencapai jangkaan mereka akibat kekerapan kerosakan jentera. Ini merupakan akibat daripada kurang pelaksanaan atau kurang berkesannya program pencegahan dan penyenggaraan seterusnya ia mencerminkan kakitangan berkaitan; iaitu kakitangan di atas kapal dan kakitangan sokongan di daratan. Menyedari hal ini, kelebihan daya saing mengiktirafkan kakitangan sebagai aset organisasi memerlukan falsafah pengurusan konsisten dan satu set amalan-amalan sumber manusia, tambahan kepada pelaksanaan berkesan sistem penyenggaraan and pencegahan. Pihak pengurusan haruslah melaksanakan konsep 'We CARE (Credibility, Action, Result, Engagement)' or 'Get REAL (Recognition, Enforce, Action, Leadership)'. Pelanggan harus juga memberi sokongan dengan menyediakan jangka masa yang berpatutan untuk kerja-kerja penyenggaraan dijalankan dengan baik lagi sempurna.

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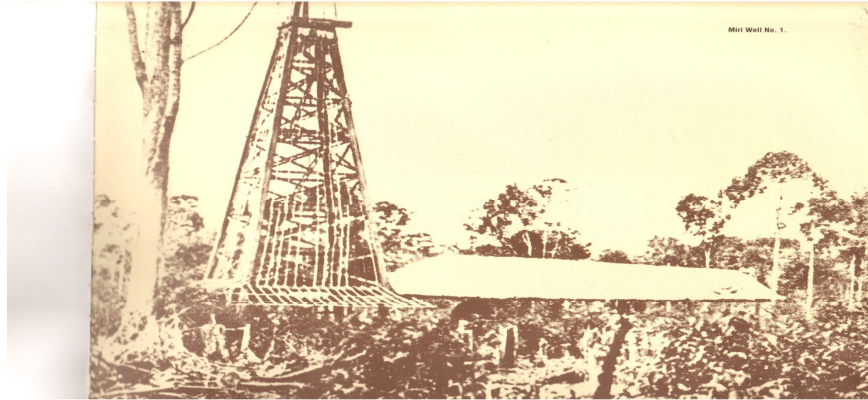
## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 History of Oil in Sarawak, Malaysia**

Malaysia's first oil well was discovered by Shell on the top of Canada Hill in Miri Division, Sarawak in 1910 (Figure: 1.1 - 1). Named by Shell's Miri Grand Old Lady No.1, it was completed on 10 August the same year with an initial production of 83 barrels per day in December. With that discovery, Shell built its first oil refinery in 1914 located in Lutong, Sarawak (Figure: 1.1 - 2) to cater the production from Sarawak and Sabah.





**Figure 1.1 – 1:** Malaysia's first oil well, Miri Grand Old Lady No.1 in 1910



**Figure 1.1 – 2:** Lutong Refinery 1916



**Figure 1.1 – 3:** Port Dickson Refinery

Malaysia second refinery build by Shell in Port Dickson (Figure: 1.1 - 3), was designed specifically to meet the requirements of the Peninsular Malaysia increase market demand in 1960; and at the same time to cater the increase of the oil production.

Since the closure of the Miri land field, the activities were shifted to offshore where the producing fields are all located at remote area offshore. In 1963, Baram Sarawak's first offshore field was discovered with the help of advance in exploration and production technology used. These were followed with the discoveries of few new offshore fields such as West Lutong, Tukai, Baronia, Betty, Bakau, and Bokor to name few.

Since then, Shell has progressively extended the search into deeper waters using complex drilling structures for offshore operations. These giant offshore structures are a visible symbol of development in exploration and production technology that has taken place in Sarawak in particular and Malaysia in general, especially over the last decades (Figure:1.1 - 4).

Since almost all the oil and gas exploration and production activities are offshore, it is important that a reliable marine transport services be provided to support their activities and cater for their needs.



**Figure: 1.1 - 4:** Typical offshore structure/platform.

## **1.2 Involvement of Marine Transport in the Oil and Gas activities**

As discussed earlier, the exploration and production activities are located in the remote areas offshore, and supplies are from shore. Therefore, the needs of designated infrastructures and facilities to support these operations have to be made available.

These includes but not limited to the marine transport to support and serve in transporting materials, essentials supplies, equipments and people out to the offshore installations, thus provides networking from land and sea at the same time to complete the supply chain processes. These marine transports comprises of various types namely Anchor Handling Tug and Supply (AHT's), Straight Supply Vessel (SSV), Landing Craft Motor/Tug (LCM/T), Accommodation Workboat and work barge (WB), Diving and Survey vessel (DSV), Safety Standby Boat (SSB), Superfast and Fast Crew Boat (SFCB/FCB) and Mooring Launch (ML). These vessels types are specially designed and built base on the job specifications, to be fit for purpose.

Although the world price of the hydrocarbon is fluctuating, the offshore exploration and production activities are still active as long as the demand is still there. This had attracted more foreign investors coming in to participate in the exploration and productions of these hydrocarbon products. Along the way, industry players had explore even to deep waters and this had prompt to the discoveries of new oil and gas field further offshore. The day-to-day offshore activities had also increased where the movement of goods, essentials supplies, material and people in a timely and economically manner; and had becoming crucial in supporting the day to day activities.

The demanding force within the oil and gas industry had becoming more and more competitive and each and every company competing aggressively whether they are local, regional or even international marine transport players. It is therefore important

that any failures and service inefficiency such as vessel frequent breakdown, vessel turnaround time, vessel unavailability, so on and so forth by any marine transport operator will greatly affect the industry. The reverse impact from this non-reliable marine transport operator will result to losing the market share, unable to compete and also sustain.

On the other hand, the chain reaction from these non-reliable transport service providers will also have significant impact to the industry as this will jeopardize their offshore exploration and production activities at large. It is therefore important that these marine transport service providers to provide “Reliable” marine transport especially to compete and remain sustainable within this dynamic global market environment and able to share future market opportunities.

### **1.3 Various types of marine support vessel & their role**

#### **1.3.1 Anchor Handling Tug & Supply (AHT's)**

In the offshore oilfields, a standard design of Anchor Handlings Tugs & Supply (Figure: 1.3.1 - 1) with numerous roles such as the ability to assist in the fire fighting operations, oil pollution control and recovery, and rescue capabilities apart from her core activity in handling anchors of the workboat/barges, barges and drilling rigs. Anchor Handling Tug & Supply plays an important role in supporting these drillings rig and accommodation workboats/barges within the offshore exploration and productions activities such as managing the deployment, retrieval of anchors and anchor wires, or

moving a mooring spread, the barges, drilling rigs and workboat/barges as and when required.

In order for these vessel to carry out their task effectively, efficiently and safely, these vessels are designed and fitted with bigger engines horsepower, winches and anchor handling equipments; bigger deck spaces and below deck stores for bulk cargo.

New and modern Anchor Handling Tug and Supply; they are built with new technology such as the Directional Positioning (DP1 or DP2) system, and these can cater deep sea explorations and productions activities.



**Figure 1.3.1 - 1:** An Anchor Handling Tug & Supply (AHT's)

### 1.3.2 Straight Supply Vessel (SSV)

Straight Supply Vessel (Figure: 1.3.2 - 1) is vessel designed with deeper drafts able to carry all types of offshore supplies and requirements for the need of the drillings activities. In addition, these supplies that is necessary to keep the drilling unit



functioning for months, and sometimes years offshore without having to return to port to replenish their consumables. These vessels should have a bigger deck spaces for storing drill pipes, drilling tools, scaffolding, helicopter fuel tanks, chemicals, food containers and maintenance equipments. Under the deck, these vessels must be able to carry bulk cargo such as cement, barites, bentonite, marine gas oil, fresh water, brine, oil based mud and drill water.



**Figure 1.3.2 - 1: Straight Supply Vessel (SSV)**

### 1.3.3 Landing Craft Motor/Tug (LCM/LCT)

A Landing Craft Motor/Tug (LCM/LCT) (Figure: 1.3.3 - 1) unlike the Straight Supply Vessel (SSV) is vessels designed with shallow draft and a ramp at the bow for the purpose of roll-on and roll-off (RORO) activities. With medium size deck spaces able to carry small to medium offshore supplies and requirements for the productions activities offshore to replenished their consumables such as food in containers and maintenance equipment. Under the deck, these vessels can also carry small quantity of bulk cargo such as potable and drill water, and marine gas oil.



**Figure 1.3.3 - 1: Landing Craft Motor/Tug (LCM/LCT)**

#### 1.3.4 Accommodation Workboat/barge (WB)

Accommodation Workboat (Figure: 1.3.4 - 1) is vessel designed to provide accommodation for the offshore industrial personnel to stay and live during their 4 weeks offshore duty and these vessel will be moored onto the platform throughout the activities. This vessel provides a hotel like accommodation that can accommodate 150 to 200 for these offshore industrial personnel at one time. The reason is that by having this accommodation workboat, they can minimize the productive time loss taken by commuting from onshore to the offshore locations. This vessel is fitted with crane, having large deck spaces for minor fabrication, again to expedite repair work and is important in supporting the offshore maintenance work. Moored from her stern towards the platform; industry personnel can make their way onto the platform and vice versa via a suspended gangway to carry out and executed their daily activities.



**Figure 1.3.4 - 1: Accommodation Workboat (WB)**

#### 1.3.5 Diving & Survey Vessel (DSV)

Diving & Survey Vessel (DSV) (Figure: 1.3.5 - 1) are designed to carry the offshore supplies to meet the requirements for the productions and maintenance activities offshore. Diving & Survey Vessel should have a deck spaces for storing supplies, scaffolding, chemicals, food containers and offshore maintenance equipment. Under the deck, they must also be able to carry bulk cargo such marine gas oil, potable and drill water. New and modern Diving & Survey Vessel is fitted with crane, stern air frame and ROV especially for supporting the diving activity.





**Figure 1.3.5 - 1: Diving & Survey Vessel (DSV)**

#### 1.3.6 Safety Standby Boat (SSB)

A vessel, referred to as a Standby Vessel (Figure: 1.3.6 - 1), are designed to pick up survivors from the installation or from the sea and accommodate up to 100 survivors on a temporary basis and be able to provide first aid treatment for all such survivors, whenever required. The vessel shall be present within a fifteen (15) mile radius from every manned Offshore Installation. Its main purpose is to be available at all times to render assistance in the event of an emergency on or near the installation.



**Figure 1.3.6 - 1: Safety Standby Boat (SSB)**

### 1.3.7 Superfast Crew Boat/Fast Crew Boat (SFCB/FCB)

Superfast Crew Boat/Fast Crew Boat (SFCB/FCB) (Figure: 1.3.7 - 1) are vessels specially designed for providing commuting services from onshore base to offshore installations, industry personnel boat to platform/boat to accommodation workboat/barge, boat to drilling rigs transfer and vice versa, transportation of small and loose materials, equipment and supplies (within its limitations), carrying out standby duties, emergency duties as directed by charterer, pollution control, offshore maintenance and/or production support, salvage and towage, if necessary. This vessel can travel at a speed between 16 to 18 knots for a Fast Crew Boat and from 21 to 25 knots for a Superfast Crew Boat. The need for the high speed is to save the commuting time incurred by the offshore industry personnel either from the onshore base to reach the offshore installation or vice versa.



**Figure 1.3.7 - 1: Superfast Crew Boat (SFCB)**

#### 1.3.8 Mooring Launch (ML)

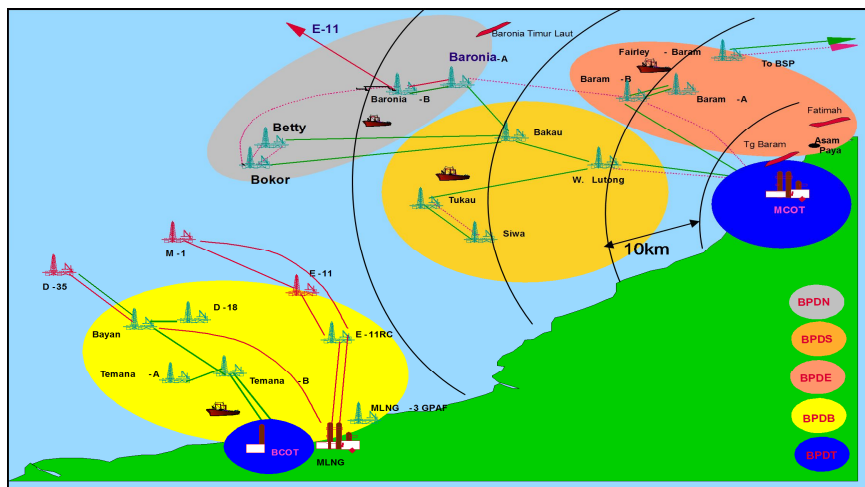
Mooring Launch (Figure: 1.3.8 - 1) are boat that operate within the port limits and they are assigned to attend and assist the berthing / unberthing of tankers at the single mooring buoys (SBMs), Transportation of personnel to / from shore, maintain 24 hour radio watch and standby at tanker throughout the operation, other mooring or maintenance operations as directed by charterer.



**Figure 1.3.8 - 1: Mooring Launch (ML).**

#### **1.4 How personnel commute from shore to offshore platform**

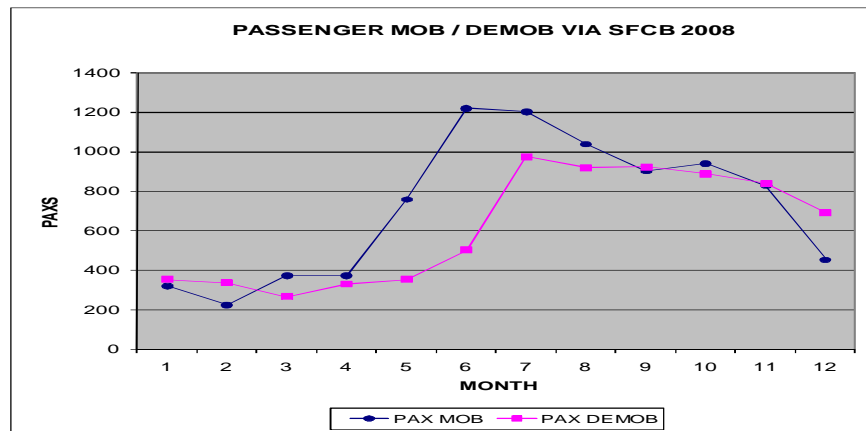
In Sarawak, most of the offshore platform structures are located at high seas of Miri and Bintulu and the mode of transport for these offshore industrial personnel (or passengers) are by means of fast crew boat. Here, the point of embarkation and disembarkation at onshore are from Pulau Melayu wharf and Kiat Siang deport in Miri; and Bintulu Commercial Wharf or Bintulu Port in Bintulu.



**Figure 1.4 - 1: Map showing the locations of Oil and Gas Platform offshore Miri and Bintulu, in Sarawak.**

MONTH	TOTAL TRIP	PAX MOB	PAX DEMOB	TOTAL
JANUARY	17	319	352	671
FEBRUARY	16	223	334	557
MARCH	22	372	264	636
APRIL	23	371	328	699
MAY	32	757	353	1110
JUNE	25	1217	501	1718
JULY	27	1199	973	2172
AUGUST	28	1036	916	1952
SEPTEMBER	23	900	920	1820
OCTOBER	24	939	886	1825
NOVEMBER	25	826	837	1663
DECEMBER	19	452	689	1141
<b>GRAND TOTAL</b>	<b>281</b>	<b>8611</b>	<b>7353</b>	<b>15964</b>

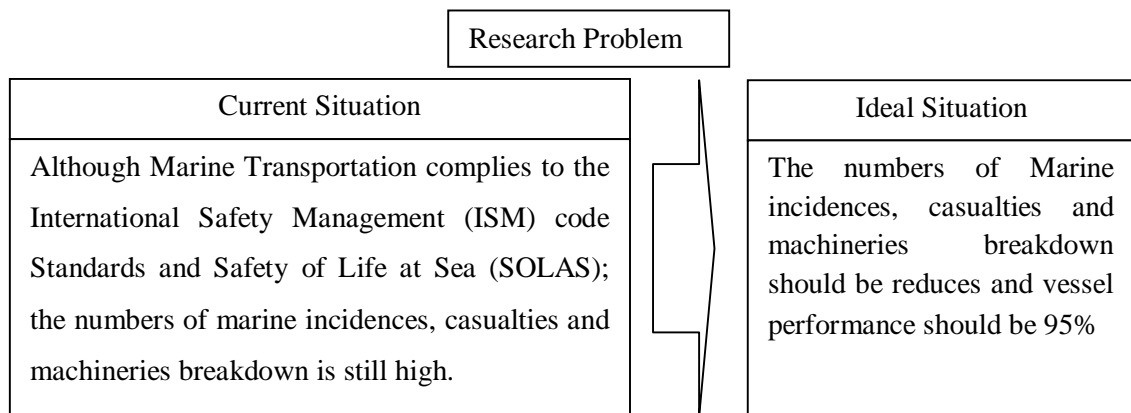
**Figure 1.4 - 2:** Total passenger movement from M1, M3, B11, F6 and F23 field in year 2008



**Figure 1.4 - 3:** Graph showing passenger movement (mob/demob) via superfast crew boat from M1, M3, B11, F6 and F23 field in year 2008

## 1.5 Problem Statement

The increase in offshore activities greatly relied on the efficiency and reliability of the Marine Transportation service providers in providing link between the land and offshore installations/facilities, for the purpose of delivery of essentials supplies and offshore industry personals. Vessel breakdown had resulted in the disruptions in the offshore day-to-day activities, and this had significant impact to the industry due to the as loss of revenue, production and productivity.



**Figure 1.5 – 1:** Research problem; current and ideal situations

## 1.6 Issue and relevance of the study

More often than not, issues in the marine transportation services that provide services to the Oil and Gas industry is when there are incidences of vessel's engines break down. These breakdowns may result to vessel downtime; thereafter vessels could not be delivered back for service in time. Vessel's breakdowns have caused delay in the

offshore day-to-day activities, disrupting of vessel scheduling and significantly result to the loss of revenue, productivity and production.

As a whole, materials and people that had been scheduled for offshore installation for the job to be carried out could not reach or delivered on time. The losses incurred not only to the marine transportation service providers itself, but also to the customers and with the impact to the country revenue, in general. The true cost as result of the breakdown could even reach to millions of US dollars, if not properly managed and resolved.

## **1.7 Objectives of study**

The objective of this study is to develop a theoretical framework and methodology for an effective preventative maintenance system. With specific focus on Marine Transportation in Miri Oil and Gas activities emphasizing on the Fast Crew Boats operations, the objectives of this research are:

- i. To review existing vessel's preventative maintenance system and propose a theoretical management framework.
- ii. To identify suitable mix of maintenance strategies.
- iii. To propose recommendations in improving vessels preventative maintenance.

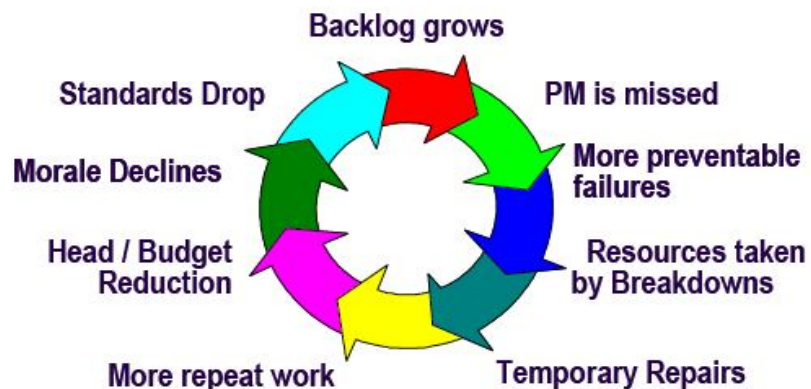
## 1.8 Research questions

The following research questions will be asked to selective clients, vessels' passengers, marine transport technical/maintenance employees and third party service providers/classification society throughout the study:

- i. How reliable is marine transport services?
- ii. How frequent does the vessel breakdown/equipment fails?
- iii. How effective is the Preventative Maintenance carried out onboard?
- iv. What level of competencies is the engineering crew onboard?

## 1.9 Research hypotheses

It is hypothesized that the following vicious cycle of reactive maintenance has the greatest influence to cause vessel breakdown as result of equipment failures.



**Figure 1.9 - 1:** The Vicious Cycle of Reactive Maintenance. (Source: Lloyd's Register Shell Technical Forum, 2008)



### 1.9.1 Preventative maintenance missed

It is hypothesized that the preventative maintenance was not carried out as planned that have caused vessels' machinery to breakdown. Minor defects that can be rectified during the planned maintenance were however not rectified and had resulted to more defective preventable items to aggravate and failed. With the predicted breakdown and in order to attend and rectify them, resources that had been assigned to other assignments had to be assigned to manage and rectify this breakdown.

### 1.9.2 Temporary repairs

It is hypothesized that the temporary repairs carried by the technical support due to unavailability of spares and time constraint had result in the repetitive preventative maintenance work. Vessel was asked to operate with substandard conditions and minor defects reported keep on piling up and at the end the backlog grows and become major breakdown.

### 1.9.3 Budget reduction

It is hypothesized that the organization budget reduction, cost saving, controlling of employees expenses will affect the morale of the maintenance employees, hence will drop the production standard.

## 1.10 Study output

It is expected that at the end of this research study, the researcher will be able to address the fundamental issues faced by the Marine Transportation service providers serving the Oil and Gas activities in Miri, in particular to the 'Hardware' and the 'Software' issues.

To accomplish the research objectives, it is also expected and hoped that this research study could provide a better and in-depth knowledge on the problem issues; as well proposing good management practices onboard and onshore within the industry players. More focus will be on improving the 'Hardware' and 'Software' issues.

### **1.11 Conclusion**

To conclude, although the researcher will come up with the proposal on suggestions and recommendations in enhancing the management system in the preventative maintenance programmed and managing the people, there is still a need for more literature review to clearly identify the problem issues. A thorough research methodology with broader population feedbacks that can also assist to surface the problems and this can be proceeding to a doctoral level of study.

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