CASE STUDY: OCCUPATIONAL STRESS AND SLEEP QUALITY RELATED FACTORS AMONG MACHINERY SERVICE OFFSHORE WORKERS

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ABSTRACT

The offshore drilling rig is indicated to be a high risk work environment. The workers live and work on the rigs for many consecutive days until the end of their work period (hitch). The rig environment determines their work patterns and living conditions, which do not operate on a regular basis like other onshore tasks. This can potentially lead to occupational stress and affect sleep quality. It can decrease worker attention and alter their perceptions of their surroundings, leading to accidents, near-misses or unsafe behavior.

This research is a cross-sectional survey study. The objective of this research was to study the occupational stress levels, sleep quality levels, and related factors among 67 offshore workers who service the machines in the drilling mud treatment and quality improvement process. Three questionnaires were used as research instruments to collect the data regarding the personal, work and environmental factors, the occupational stress and the sleep quality. The data were collected while workers were working on the rig in one hitch (28 days). All completed data were analyzed by descriptive statistics and the relationships were measured by using the Chi-square test.

The results demonstrated that 59.8% of all workers had a low to moderate level of occupational stress, and the related factors were the attitude towards job characteristics ($p < 0.001$), rig recreational area ($p < 0.001$) and rig communication system with people on shore ($p = 0.02$). As for sleep quality levels, it was discovered that 52.2% of all workers had poor sleep, and the related factor was caffeine consumption ($p = 0.009$). This research has shown that stress and poor sleep quality occurred in workers while working on the rig. Therefore, workplace environmental management, attitudes towards jobs and work environment, and training and preventive measures for related factors shall be the focus for future provision.

KEY WORDS: OFFSHORE WORKER/ OCCUPATIONAL STRESS/ SLEEP QUALITY

115 pages

กรณีศึกษาปัจจัยที่มีความสัมพันธ์กับความเครียดจากการทำงาน และคุณภาพการนอนหลับในผู้ให้บริการทางด้านเครื่องจักรบนแท่นขุดเจาะน้ำมันนอกชายฝั่ง

CASE STUDY: OCCUPATIONAL STRESS AND SLEEP QUALITY RELATED FACTORS AMONG MACHINERY SERVICE OFFSHORE WORKERS

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บทคัดย่อ

สภาพแวดล้อมในการทำงานบนแท่นขุดเจาะน้ำมันนอกชายฝั่ง จัดเป็นสภาพแวดล้อมที่มีความเสี่ยงสูง โดยพนักงานต้องใช้ชีวิตและทำงานในพื้นที่ที่มีอยู่อย่างจำกัดต่อเนื่องกันจนครบกำหนดในหนึ่งรอบการทำงาน รวมทั้งลักษณะงานและการดำเนินชีวิตมีความแตกต่างจากการทำงานที่ทำบนฝั่ง ซึ่งอาจก่อให้เกิดความเครียดจากการทำงาน ส่งผลต่อคุณภาพการนอนหลับ และอาจทำให้ความตระหนักหรือการรับรู้สภาพแวดล้อมรอบตัวลดลง นำมาซึ่งการเกิดอุบัติเหตุ เหตุการณ์เกือบเกิดอุบัติเหตุหรือพฤติกรรมที่ไม่ปลอดภัยได้

การวิจัยครั้งนี้ เป็นการศึกษาเชิงสำรวจแบบภาพตัดขวาง ซึ่งมีวัตถุประสงค์เพื่อศึกษาระดับความเครียดจากการทำงาน ระดับคุณภาพการนอนหลับ และปัจจัยที่มีความสัมพันธ์กับความเครียดจากการทำงานและคุณภาพการนอนหลับ ในพนักงานผู้ให้บริการเครื่องจักรสำหรับกระบวนการปรับคุณภาพและบำบัดน้ำโคลนบนแท่นฯ จำนวน 67 คน โดยใช้แบบสอบถาม 3 ชุด ประกอบด้วย 1) แบบสอบถามข้อมูลปัจจัยส่วนบุคคล ลักษณะงาน และสภาพแวดล้อมการทำงาน 2) แบบสอบถามความเครียดจากการทำงาน และ 3) แบบสอบถามคุณภาพการนอนหลับ โดยเก็บข้อมูลเป็นระยะเวลาหนึ่งรอบการทำงาน (28 วัน) และวิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนาและวิเคราะห์ความสัมพันธ์ด้วย Chi-square

ผลการศึกษา พบว่า พนักงานร้อยละ 59.8 มีระดับความเครียดจากการทำงานอยู่ในระดับต่ำถึงปานกลาง ปัจจัยที่มีความสัมพันธ์กับความเครียดจากการทำงาน ได้แก่ ระดับทัศนคติต่อลักษณะงาน ($p < 0.001$) ระดับทัศนคติต่อพื้นที่พักผ่อน ($p < 0.001$) และระดับทัศนคติต่อระบบการสื่อสารบนแท่นฯ ($p = 0.02$) นอกจากนี้ พบว่าพนักงานร้อยละ 52.2 มีคุณภาพการนอนหลับไม่ดี ปัจจัยที่มีความสัมพันธ์กับคุณภาพการนอนหลับ คือ การดื่มเครื่องดื่มที่มีคาเฟอีน ($p = 0.009$) ซึ่งแสดงให้เห็นว่าพนักงานมีความเครียดและปัญหาคุณภาพนอนหลับเกิดขึ้นระหว่างที่ทำงานบนแท่นฯ ดังนั้นจึงควรให้ความสำคัญกับการจัดสภาพแวดล้อมในการทำงาน สร้างทัศนคติที่ดีทั้งต่อการทำงานและสภาพแวดล้อม รวมทั้งให้ความรู้และวิธีการป้องกันปัจจัยที่ก่อให้เกิดความเครียดและปัญหาการนอนหลับอย่างถูกต้องและเหมาะสม

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CHAPTER I
INTRODUCTION

1.1 Background and Rationale

Oil and gas exploration and production industries are highly important industries, because global energy demand in both the residential and industrial sectors is tending to continually increase, as a result of serving the demands of consumers. A British Petroleum (BP) Statistical Review [1] showed that world energy consumption has tended to rise heavily over the past 10 years, or specifically from 2004 to 2013. In 2013 in particular, it grew by 8.17% or more than 1.08 times compared with 2004, which was the review's base year. In Thailand, it is found that energy consumption has also tended to rise over the past ten years, or from 2004 to 2013, which is the same as world energy consumption. In 2013, Thailand's energy consumption rates increased by 20.86%, or more than 1.21 times the base year of 2004.

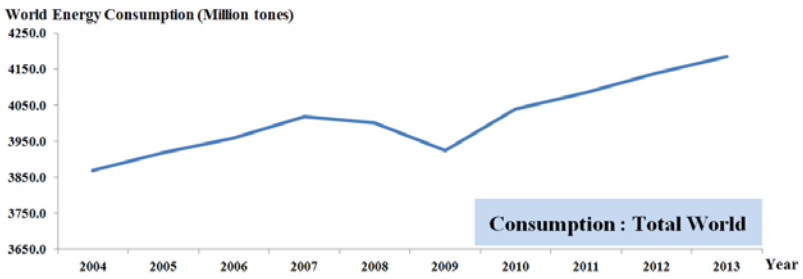


Figure 1.1 World energy consumption statistics between year 2004 and 2013[1]

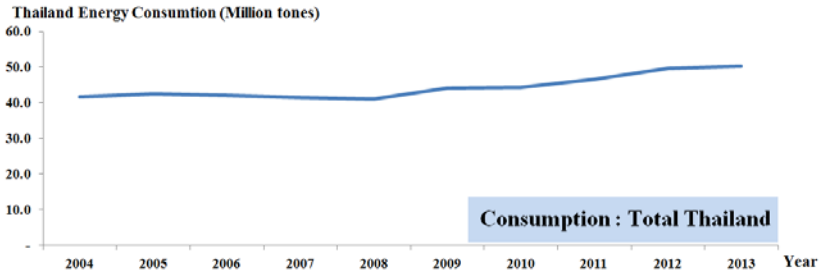


Figure 1.2 Thailand energy consumption statistics between year 2004 and 2013[1]

Onshore and offshore petroleum exploratory surveys in 2013 indicated that there were 30,000 petroleum oil fields around the world, and over 75% of those have already produced petroleum. In Thailand, 63 petroleum oil fields have been discovered and concessions have already been granted. They are divided into 33 onshore and 30 offshore oil fields[2]. Thailand started its offshore exploration and production industries for the first time in 1981, with a production capacity of 27.5 million cubic feet per day. Later, the country's production capacity has developed and continually increased. In 2011, it was at 2,415.5 million cubic feet per day, which is an increase of 88 times within 30 years since the first production in the country[3]. This indicates that Thailand's offshore exploration and production capacity has tended to increase in accordance with a growing demand for energy consumption, and this has resulted in increased numbers of laborers working in the industry.

The offshore environment involves heavy and large equipment and machinery, such as drilling units and derricks, etc. It is considered a high risk work primarily because the operational processes are complicated and can cause serious accidents or injuries. The characteristics of the machinery services company in offshore production in this case study includes the inspection and maintenance of machinery which is used in the solid control processes in well-site services. Offshore workers are responsible for operating heavy and large equipment and machinery which is used for solid control processes. This equipment comprises centrifuges, pumps, augers, etc., and the responsibilities include maintenance of the equipment and machinery according to the preventive maintenance plan in order to prevent any problems which might occur during machinery operation. The workers must use their knowledge and expertise to find the causes of machine malfunctions and quickly repair them, in order to re-establish normal services and ensure 24 hour operation of the offshore drilling rig. The risks that they take correspond to the major accidents of offshore worker statistics. Worldwide accident statistics show that accidents tend to occur at a higher rate each year. This especially concerns maintenance work, which is listed on record as the number one cause of major accidents over the past 10 years, from 2004 to 2013. 32.33% of major accidents happened in all six kinds of offshore work, which comprise: 1) maintenance, 2) drilling, 3) diving, 4) deck operations, 5) management, and 6) production[4].

It is indicated that the offshore environment involves high risk conditions which can directly affect and be harmful to associated offshore workers. It can also potentially lead to the risk of occupational stress and can affect sleep quality[5], because offshore workers live and work on the rigs for many consecutive days without a break in one hitch. They have to stay in restricted work locations and living accommodation until the end of their hitch, in accordance with their work patterns, schedules and break times, which are not operated on a regular basis like other onshore tasks.

Stress research among the offshore workers was carried out by Anne Sneddon et al. [6]; it showed that occupational stress can decrease worker attention, work situation awareness and workers' perceptions of their surroundings; it would cause more accidents, near-misses or unsafe behavior. According to the results of this research, if there are further investigations to find out which factors related to occupational stress affect sleep quality, then this would help companies or the assigned parties who are responsible for the implementation of a suitable crew change management system, in order to minimize the risks which lead to accident occurrence and to maintain the good health of their workers.

Neurosis, stress and other unidentified symptom statistics of the Thai population over the past 17 years, from 1994 to 2010, are likely to have also continually increased each year [7]. From the data obtained, it is revealed that in 2010, 8% of the labor force population around the world, aged between 15 and 59 years, had faced occupational stress [8]. In Thailand, the statistics on stress, insomnia and headaches were 18.9% in 2009, and these were the top three illnesses among the Thai labor force. This indicated that the stress levels and sleep quality of the Thai population in general and the labor force in particular were still serious problems which could affect the occupational health and safety of the population and labor force.

During the past 10 years, there have been several research studies relating to occupational stress and sleep quality, mostly conducted with groups of workers who work in hospitals, factories, and the service sector, etc. However, there was limited research conducted specifically with offshore workers of machinery service companies, especially in Thailand, and this observation caught the researcher's attention.

1.2 Research Questions

1.2.1 What are the occupational stress levels and sleep quality levels of offshore workers who work in the machinery service company of this case study?

1.2.2 What kind of personal factors, work factors and offshore environmental factors are related to the occupational stress and sleep quality of offshore workers who work in the machinery service company of this case study?

1.3 Objectives

1.3.1 General objectives

To study the personal factors, work factors and offshore environmental factors related to the occupational stress levels and the sleep quality levels among the machinery service offshore workers.

1.3.2 Specific objectives

1.3.2.1 To evaluate the occupational stress levels among the machinery service offshore workers.

1.3.2.2 To evaluate the sleep quality levels among the machinery service offshore workers.

1.3.2.3 To study the relationships between personal factors, work factors and offshore environmental factors and occupational stress levels among the machinery service offshore workers.

1.3.2.4 To study the relationships between personal factors, work factors and offshore environmental factors and sleep quality levels among the machinery service offshore workers.

1.4 Research Hypotheses

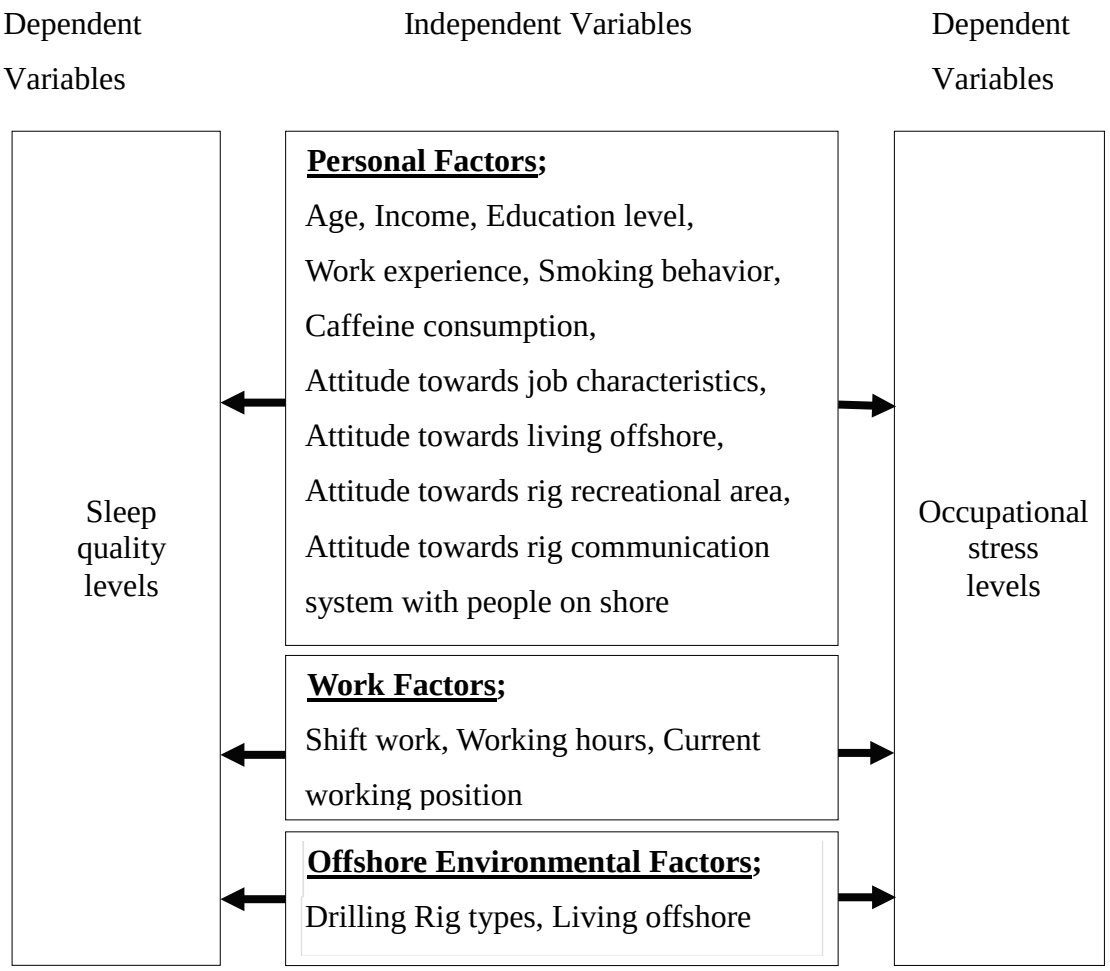
1.4.1 The personal factors, work factors and offshore environmental factors were related to the occupational stress levels among the machinery service offshore workers.

1.4.2 The personal factors, work factors and offshore environmental factors were related to the sleep quality levels among the machinery service offshore workers.

1.5 Scope of the Research

The researcher was studied the occupational stress levels and the sleep quality levels, and the personal factors, work factors and offshore environmental factors related to the occupational stress levels and the sleep quality levels of 67 offshore workers who held the position of Crew Chief and Engineer and worked at one 'Machinery Service Company' in this case study. The study periods per offshore worker were conducted within one hitch, or 28 working days on the rig, and the total study period for this research was conducted over approximately 3 months, in order to collect complete data from 67 offshore workers. The questionnaire was composed of three sections, which were used to collect data about factors concerning occupational stress and sleep quality. Section 1 of the questionnaire was developed by the researcher, and it recorded the personal information. It contained questions asking about personal information such as: age, income, education level, work experience, smoking behavior, caffeine consumption, attitudes, and working data such as: shift work, working hours, current work position, and offshore environmental data such as drilling rig type, and living offshore. The questionnaire about attitudes was adapted from the research of stress prevention among offshore workers[9] and the barrier reef pilot questionnaire[10, 11]. It was developed to measure the attitudes of offshore workers. Section 2 of the questionnaire was concerned with the offshore stress scales[6], and was used to study the occupational stress levels. Section 3 of the questionnaire used the "Pittsburgh sleep quality index (PSQI)"[12, 13], which examined the levels of sleep. All data were analyzed to evaluate the levels of occupational stress and sleep quality, including the relationships between personal factors, work factors and offshore environmental factors and the levels of occupational stress and sleep quality amongst offshore workers who work at one 'Machinery Service Company' in this case study.

1.6 Conceptual Framework



1.7 Glossary of Term and Definition

1.7.1 Offshore exploration and production industries: means exploratory surveying and the drilling of petroleum on the offshore drilling rigs.

1.7.1 Working processes of the offshore machinery service company in this case study: means the processes which use solid control of machines and equipment for the treatment and improvement of the quality of drilling mud, which is drilled from the well using machines such as: a centrifuge, shaker, auger, cutting, etc.

1.7.2 Offshore workers of the offshore machinery service company in this case study: means workers who hold the position of Crew Chief and Engineer, work on the various types of offshore drilling rig and work together in the machinery service company of this case study.

1.7.3 Factors related to the levels of occupational stress and sleep quality: means objects or conditions that affect the occupational stress levels and sleep quality. Three factors which are categorized as personal, work and offshore environmental factors were studied in this research.

1.7.4 Personal factors: means personal attributes which relate to the levels of occupational stress and sleep quality. In this research, the researcher studied personal factors concerning: income, age, education level, work experience (demographic), and additionally: smoking behavior, caffeine consumption, attitudes towards job characteristics, living offshore, rig recreational area and the rig communication system with people on shore.

1.7.5 Income: means the amount of money that offshore workers earn from the company each month, plus any other money such as extra money from part-time jobs during time off or staying at home.

1.7.6 Age: means the real ages of offshore workers from date of birth to the year the questionnaire was conducted.

1.7.7 Education level: means the highest education level of the offshore workers who participated in the research.

1.7.8 Work experience: means the entire period that the offshore workers have worked on offshore drilling rigs both in the past and at the company in this case study; it was counted from the first year that the workers started offshore work until the present year in which the questionnaires were conducted.

1.7.9 Smoking behavior: means smoking status. It can be determined from smoking (from one or more rolls of smoked cigarettes per day) and no smoking (zero rolls of smoked cigarettes per day).

1.7.10 Caffeine consumption: means caffeine consumption status. It can be determined as a drink (from one or more cups of caffeine consumed per day) or no drink (zero cups of caffeine consumed per day). Caffeine consumption included all kinds of beverages which contain caffeine in their composition, for example: coffee, soft drinks, energy drinks, tea, etc.

1.7.11 Attitudes towards job characteristics: means the state of mind or feeling to give an opinion or the acceptance of job characteristics, problems, duties and responsibilities, etc.

1.7.12 Attitudes towards living offshore: means the state of mind or feeling to give an opinion or the acceptance related to being satisfied with the conditions of being accommodated on the offshore drilling rig.

1.7.13 Attitudes towards rig recreational areas: means the use of any facilities in the recreational areas of the offshore drilling rig, such as: the fitness room, sports area, recreation room, restaurant, etc. It also includes the state of mind or feeling to give an opinion or acceptance related to being satisfied with the conditions of facilities and rest areas on the rig.

1.7.14 Attitudes towards the rig communication system with people on shore: means the communication devices or systems that the offshore workers use to communicate with people who stay on the shore, such as: onshore staff, families, girlfriends, friends, etc. It also includes the state of mind or feeling to give an opinion or acceptance related to being satisfied with the conditions of the communication system on the rig.

1.7.15 Work factors: means job characteristics and work conditions related to the levels of occupational stress and sleep quality. In this research, the researcher studied the work factors concerning shift work, working hours and current work position.

1.7.16 Shift work: means the period of working hours for offshore workers in each day, which is divided into two times. These are the daytime for shift work of 06.00 – 18.00 hrs. and the night time that can be divided into two shifts; the first shift is 12.00 – 24.00 hrs. and the second is 18.00 – 06.00 hrs.

1.7.17 Working hours: means the time that the workers spent to complete their job in each day. It can be indicated overtime or no overtime. No overtime means the number of normal working hours (12 hours per day) and overtime means the number of normal working time, plus the extra time that workers spent to support the next work shift in order to fix or debrief problem related to machine operation.

1.7.18 Current working position: means the present position of the offshore workers who work at the company in this case study. They can be divided into two positions: Crew Chief and Engineer.

1.7.19 Offshore environmental factors: means the factors that are affected by the work environment on the offshore drilling rig, which are related to the

levels of occupational stress and sleep quality. In this research, the researcher studied the offshore environmental factors about drilling rig types and living offshore.

1.7.20 Drilling rig types: means the types of offshore drilling rigs that the offshore workers who participated in this research work on. They can be divided into two types: the tender rig and the jack-up rig.

1.7.21 Living offshore: means; **Accommodation arrangements:** can be divided into: 1) permanent (the offshore worker stays in the same room whenever they work on the rig), and 2) temporary (the offshore worker does not stay in the same room whenever they work on the rig). **Number of occupants:** means the number of offshore workers per one sleeping room. **Room size:** means the total space in one sleeping room measured in square meters. **The average space occupied inside the accommodation:** means the size of the space inside the sleeping room that is available to each offshore worker. Size of space occupied per person can be calculated from the size of the total area divided by the number of occupants.

1.7.22 Occupational stress levels: means the results of occupational stress level evaluations which were conducted among the machinery service offshore workers in this case study for one complete hitch or 28 offshore working days. The researcher used an 'offshore stress scale' questionnaire[6] to study the occupational stress levels of the offshore workers in order to measure the level of stress and describe the causes of the stress which the offshore workers perceived. The worker response to stress in each question was classified into a levelled scale of six intervals from Zero (never), One (very rarely), Two (rarely), Three (occasionally), Four (often) and Five (very often). The level of stress was determined on the six-levelled scales as: no, least, low, moderate, high and extreme.

1.7.23 Sleep quality levels: means the results of sleep quality level evaluations which were conducted among the machinery service offshore workers in this case study for one complete hitch or 28 offshore working days. The researcher used the PSQI [12, 13] in order to study individual sleep qualities, sleep capability, periods of sleep, efficient sleep, trouble with sleep, usage of sleeping-pills, and a dysfunctional body or mind. The sleep quality levels displaying the PSQI global scores of greater than five indicate poor sleep quality and scores lower than or equal to five indicate good sleep quality.

CHAPTER II
LITERATURE REVIEW

The researcher studied and collected data from other research studies, as well as journals and articles, which are all related to occupational stress and sleep quality levels, and described the factors which are related to occupational stress levels and sleep quality levels, including the work processes involved with offshore workers in the machinery services company of this case study. These are to be used as a guideline for this research study, and the information gathered consists of the following topics and contents:

2.1 The Offshore Machinery Service Company in this Case Study

2.2 Occupational stress

2.3 Sleep quality

2.4 Occupational stress factors

2.5 Sleep quality factors

2.6 Related studies about occupational stress

2.7 Related studies about sleep quality

2.1 The Offshore Machinery Service Company in this Case Study

The offshore exploration and production industry has the potential to inflict serious accidents. It concerns drilling processes, heavy tools and equipment, and operations that are controlled using high levels of technology. An offshore drilling rig operates 24 hours per day, and timing is a variable factor in all processes. Offshore workers have to work quickly in order to maintain timing with other processes, and so they have to work hard to complete this work on time [6].

2.1.1 Petroleum formation and exploration: Petroleum is a fossil fuel that has resulted from the deposits of plant debris and other animal remains, which later formed oil after billions of years of underground layer compression. Vast

quantities of these remains were settled under seas or lake bottoms, and were also buried under sedimentary layers of mud, rock and sand at high temperatures and pressures, to become an organic material which nowadays is turned into crude oil or petroleum. Petroleum is a mixture of hydrocarbon compounds made up predominantly of carbon and hydrogen compounds. It also contains oxygen, nitrogen and sulphur, and is divided into two types depending upon its chemical compositions as a result of thermal energy and tectonic pressure, as follows [14]:

a. Crude oil – Crude oil is an oily liquid which consists of hydrocarbon compounds that are easily vaporized, and it can be divided into 3 types: paraffin, naphthene and aromatic, depending upon the nature of the hydrocarbons.

b. Natural gas – Natural gas is a complex mixture of 95% hydrocarbons. The hydrocarbons in natural gas are saturated and stable, such as methane (CH_4), while natural gas is a light compound which has a low boiling point.

Petroleum exploration is conducted using geological methods such as using satellite images to detect and study the structures of sedimentary rocks and explore shale and petroleum accumulation, in order to recognize the geological characteristics of sedimentary structures before conducting a thorough exploration. This is carried out via a magnetic survey, which measures the differences in magnetic fields to determine the structures and sizes of the petroleum sources. A seismic survey is conducted by sending shock waves underground and measuring the vibration levels, which can be used to calculate the thicknesses of rock layers. The data are used to create a map which shows the locations and features of the rock layers. A gravity survey is conducted to measure the differences between gravities, in order to explore the types and characteristics of the rock beneath the earth's surface [15].

2.1.2 Features of offshore drilling rigs: The complexities of rock layers determine the difficulties of the required drilling process. The main drilling rig has two types: onshore (land) and offshore drilling rigs. Examples of offshore drilling rigs are: the barge, jack-up, fixed platform, semi-submersible and drill ship. These types of offshore drilling rigs have different features which are suitable for marine environments. The researcher studied two types of offshore drilling rig, as follows: [14]

a. Offshore drilling rigs which are fixed to the seabed;

1 Jack-up drilling rig – These rigs are fixed to the seabed using 3-5 support legs, and each leg is between 300 and 500 ft long. They can be used in waters from 13 to 350 ft deep depending upon the climate.

2 Fixed platform – There are two types of fixed platform rig: 1) the 'piled steel' platform is a compliant tower, which has a tower-like steel structure, and 2) the 'gravity structure' platform which is built of concrete. These are permanently fixed to the seabed after drilling has finished.

b. Floating rigs which are held in position by anchor wires or chains;

1 Barge rig – Drilling equipment is installed on a multi-level barge. It was formerly used in coastal areas, shallow waters and lakes; the barge is navigated into the required area, and water is released into the flood chamber so that the barge is lowered to the bottom. After work is finished, the water is pumped out to let the barge float again. Later, this approach was developed and used further offshore. The barge is used as living quarters and for storing drilling equipment, and the tower is moved to the drilling rig. This type is called a 'barge tender'.

2 Semi-submersible rig – This is a floating offshore drilling unit with pontoons. Water can be pumped into or out of the pontoons to make the unit float or become submerged. It can be used in water depths of between 600 ft and 1500 ft. When drilling, the semisubmersible rig will be anchored to the sea bottom using mooring chains. It needs to be towed by a tugboat.

3 Drillship – The drillship has all the drilling equipment installed on a ship, and it can propel itself. In the past, an anchor was used to secure the ship, and today the ships are equipped with computer-controlled propellers. The outstanding point of a drillship is that it can work in water depths of more than 3280.84 ft. [16].

2.1.3 Petroleum drilling process: After an exploratory survey of the petroleum source, random subsea drilling is conducted to check the size of the oil field and the potential reserves of petroleum, in order to estimate the potential petroleum production per day and future reserves[4]. A drill unit is used in the drilling process, which can drill into the rock layers and shatter the rock into small pieces. The petroleum beneath the earth's surface is under higher pressure than the atmosphere.

When the drill unit drills and pumps the drilling mud, which consists of compounded heavy components, a viscous fluid mixture consisting of water, chemicals and mineral oils is released under high pressure causing a primary drive to occur between the drill pipe, casing and the well, and this can lead to the risk of a blowout or explosion. Thus, it is very important to properly control the flow rate of the fluid[14]. The drilling mud will flow to the centrifuge to draw the solid particles, or rock debris such as gravel, stone and sand, out of the drilling fluid and pure petroleum is simultaneously obtained which is transferred through a pipe to a gas and oil separation plant. A small amount of contaminants will be burned off if they are of no economic value or are unusable[16].

2.1.4 Description of the working process of the Offshore Machinery Service Company in this case study: The working process of the Offshore Machinery Service Company in this case study is a service to provide solid control machines and equipment for treatment and improving the quality of drilling mud and separating mud components, in order to obtain pure drilling fluid and transfer it to the next process of petroleum production. Some pure drilling fluid is returned to the oil well to act as a well lubricant in the drilling process. The solid control machines and equipment are the centrifuge, cutting dryer, pump, shale shaker and auger.

The centrifuge process is used to treat and improve the quality of the drilling fluid obtained from the well. The drilling mud is transferred to the shale shaker, wherein the sizes and mesh sizes of the shale shaker depend upon the refinement and purity of drilling mud required. After that, the drilled solids are passed through shale shaker and transferred to the cutting machine and drying machine. Waste from the drilled solids from the cutting and dryer machine are washed in another drilling fluid which is stored in a tank, and the good quality drilled solids are conveyed to the centrifuge machine for refining according to the size of fluid requirement. A drilling fluid sample is sent to a laboratory for testing and weighing, before being transferred to the next process. Sediment from the centrifuge machine is mixed with sediment obtained from the shale shaker, and the separated fluid is sent for further treatment. The solid control machinery and equipment service process of the company in this case study is operated by employees who work in the position of engineer or crew chief. The crew chief is responsible for supervising subordinates or employees who work in engineer positions. The job descriptions of these two positions

do not differ significantly, and they are responsible for controlling the machinery and equipment, including: proper operation, routine inspection, scheduled maintenance as a preventive maintenance plan, and taking the drilling fluid samples to the laboratory for testing and weighing. When the machinery and equipment experience abnormal operation, they thus have additional work which includes inspection, maintenance and repairs. The crew chiefs also have to handle more paperwork than the engineers.

2.1.5 Work hours and break times: The offshore worker works on a rotating shift, and each offshore drilling rig has different shift types depending upon the size of the rig, work load, and amounts and capacities of machinery and equipment. The company in this case study sets up a rotational schedule of 28 days of work on the rig which operates 24 hours with 12 working hours per work shift, and 28 days of rest on shore. There are two shift work patterns as follow:

a. Work shifts pattern No. 1 – First shift is from 06.00 - 18.00 hrs and the second shift is from 18.00 - 06.00 hrs. This work shift pattern is set up for a rig which has between 2 and 4 workers who operate the machinery and equipment per rig, depending upon the rig size, workload, amounts and capacities of the machinery.

b. Work shift pattern No. 2 – First shift is from 06.00 - 18.00 hrs, the second shift is from 12.00 - 24.00 hrs, and the third shift is from 18.00 - 06.00 hrs. This work shift pattern is set up for a rig which has between 1 and 3 offshore workers per shift per rig who operate the machinery. On each shift there are also two operators working an overlapping shift between 12.00 - 24.00 hrs. The break times during working hours are arranged according to the work characteristics as mentioned above. All other breaks per shift are arranged at appropriate intervals as follows:

c. Rest break after working half of the shift – There is a one hour break for lunch and rest, so they are ready for the next period.

d. Interval breaks – There are short breaks of between 10 - 30 minutes, so the workers can rest or engage in personal activities.

2.1.6 Offshore working area: The offshore working area is divided into two areas: 1) the outdoor working area where the machinery and equipment is installed, and 2) the office area. The details are as follows:

a. Outdoor working area – The company in this case study has two types of offshore drilling rig. These are the tender rig and jack-up rig as mentioned earlier.

b. Office area – The company in this case study has a central office shared with other companies, and the laboratory for testing the fluid is located inside the office, although some rigs have laboratories outside the office or in the container.

2.1.7 Living offshore and rig recreational area: The living offshore and rig recreational area is situated in the accommodation zone of the offshore drilling rig. They have various characteristics, depending upon the arrangements of the client company and the numbers of offshore workers who are assigned to work on the rig. From the initial survey, the offshore living and rig recreational area is as follows:

a. Accommodation arrangement – There are 2 types as follows:

1 Permanent accommodation – The workers have permanent accommodation or bedrooms of their own whenever they work on the rig.

2 Temporary accommodation – No permanent accommodation or bedroom for workers. A bedroom is arranged by the client company and is not the same room whenever they work on the rig. The workers have to share bedrooms with workers from other companies.

b. Bed features – There are 2 types; single bunk bed and single bed.

c. Numbers of workers per room – There are 2 types of arrangements: two persons per room and four persons per room.

d. Bedroom sizes – There are many sizes of bedroom, depending upon the offshore drilling rig size. For the offshore machinery service company in this case study, there are two types of air-conditioned bedroom, with 8 sizes as follows:

1 Bedrooms for two persons – there are 3 sizes (width x length x height in meters) of bedroom: 3 x 2 x 3, 1.5 x 2 x 2.5 and 2 x 3 x 2.5

2 Bedrooms for four persons – there are 4 sizes (width x length x height in meters) of bedroom, with a walk path in the middle: 3 x 4 x 3, 3 x 2 x 2.5, 4 x 4 x 3 and 3 x 3 x 2.5.

2.2 Occupational Stress

Stress is a physiological state that arises when the body responds to stress that provoke physical, psychological and behavioral responses. This results in personal

changes wherein self-adjustment occurs when attempting to resist stress, such as joy and sadness, and this may lead to seeking the use of drugs or chemicals, etc., which can maintain the balance of the body [17].

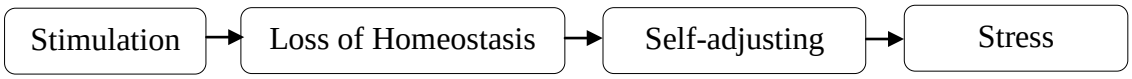


Figure 2.1 Mechanisms of stress (Selye, 1958 which refers in Thanawan M, 1999)

Furthermore, stress can also result in the release of hormones in the body. When the body and mind endure stress, this will affect the body in its mental adjustment and management. The stimulus will occur and cause emotional stress to affect the nervous system and endocrine gland systems. They will work together and transfer sensory information through nerve cells in the hypothalamus. This causes the release of a hormone called corticotropin (CRH), releasing hormones into the blood. Adrenocorticotropic hormones (ACTH) will be released by the pituitary gland, and the ACTH will control the adrenal cortex into releasing glucocorticoid. Excessive glucocorticoid will influence the metabolism of carbohydrates and cause high blood sugar levels and increased hemoglobin [18].

2.2.1 Definition of occupational stress: Occupational stress occurs from working conditions or other factors related to work, and it causes both positive and negative effects. The positive effects are, for example, increased output of the company, and higher quality of work and company effectiveness. Negative effects may affect workers directly, and their body and mind may lose balance. Many researchers have defined occupational stress as follows:

Supawadee (1999) described stress as the state arising when a person faces a situation or an event that causes pressure upon him. It causes his body or mind to lose balance, as well as other responses in the body and mind such as palpitations and restlessness [18].

Kulnari (2005) defines stress as “the feeling that comes from work or is affected by work, such as: work overload, lack of skills or ability to work, lack of good relationships with colleagues and company policy, etc. These factors may cause pressure to workers which leads to physical and psychological symptoms, and thus their performances or work quality become worse” [19].

Pongthep (2004) described stress as the body and mind's responses to stimuli, both inside and outside of the body. They can be real events, imagined events or expectations. They can cause worry or anxiety, and so make stressed people unable to lead a normal life or even lose bodily abilities. This can cause changes in the physical and psychological systems, which are then expressed in behavioral changes[20].

Suparat (2003) described stress as a personal response to threatening events in the environment which are caused by physical conditions and disturbances [21].

Thapanee (2005) described stress in terms of the general factors and work factors that stimulate stress, which can occur inside and outside the body or mind, and which affect the balances of body and mind. It results in physical symptoms such as heart racing, anxiety, and boredom of work [22].

From the reference definitions above, it can be concluded that stress means changes to the body and mind when aroused by external or internal factors. Therefore, a person has to adjust themselves in order to cope with the situation or realize their own awareness of the threats of stressors, and the effectiveness and efficiency of their work. It also causes abnormalities in body and mind.

2.2.2 Types of stress: Stress can occur to everyone and almost at any time. Generally, stress can have both positive and negative effects [22]. Negative stress is stress caused by negative stressors, such as: depression, anxiety, sleeplessness, job failure, family problems, etc. Negative stress leads to physical and psychological health problems. In contrast, positive stress is stress caused by positive things, such as: happiness, joy, exams, work, etc. It is found that negative stress can affect or harm the body and mind more than positive stress [20]. Stress is thus categorized as follows:

a. Physical stress – It is caused by internal factors in the person's body or mind. The stimuli that cause stress may come from internal or external sources [20]. It can be divided into two types:

1 Emergency stress – immediately occurring in the body and mind; for example, when one faces an emergency, such as a fire, robbery or accident, etc.[22].

2 Continuing stress – is when the body is affected by stimuli or threats continuously; examples of continuous stress include a woman's pregnancy or age-related changes, etc. [22].

b. Psychological stress – It is caused by a stimulus that disturbs the mind; for example, feelings of disappointment or failure, stress caused by environmental conditions, family life or income, etc. [20]. When people are affected by psychological stress, they have to apply mental strength to solve the problem before the body system responds. They must solve the problem or oppose the problem [22].

2.2.3 Mechanisms of occupational stress response: Stress that occurs in the mind and body can lead to many diseases, such as: coronary artery disease, gastric ulcers, influenza, obsessive compulsive disorder and mental disorders, as well as accidents and lower work performance. The body has to adjust itself to reduce stress so that no disease will affect the body and mind. On the other hand, if it is mild stress it may have positive effects on both the body and mind. For example, it can motivate stressed people to put more effort into their work. When stress occurs, the body and mind will develop a stress response system which can be divided into 3 stages, as follows[20]**:**

First stage: Stage of 'alarm reaction'. When an abnormal event occurs, affected people may feel astonished or worried due to lack of knowledge or experience. Their body may be resistant to the event in order to reduce such stress. The body's reactions are muscle tension and increased oxygen needs in response to the stressor.

Second stage: Stage of 'resistance'. This is the reaction that occurs when the body and mind has recognized or experienced stress. The body will create a resistance mechanism to cope with such stress; then the body and mind will return to a normal state after the stress is resolved.

Third stage: Stage of 'exhaustion'. This is the last stage of the body's stress response. In this stage, the level of stress resistance will reduce so that the body and mind will respond to stress once again. The body and mind may feel exhausted if the stress is not reduced or becomes chronic [23].

Robin explained that stress has an inverted U relationship to job performance. If workers have low levels of stress then they will have poor job performance. If the stress levels are higher, this can provide stimulation to workers and thus enhance their job performance. However, if the stress level is much higher or becomes chronic to the point where workers cannot solve problems or it is beyond their ability to solve such, then their job performance will be poorer [22].

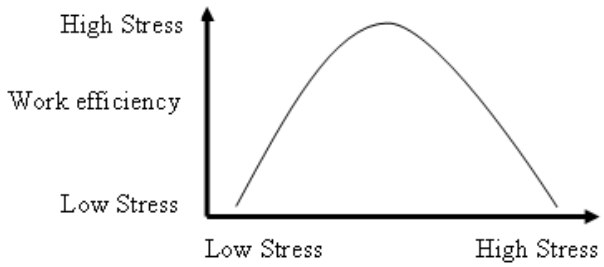


Figure 2.2 U relationship to job performance
(Robbin with reference in Thapanee (2005)[22]

2.2.4 Occupational stress assessment can be divided into 3 types, as follows [24]:

2.2.4.1 Psychological measurement – This is a complicated procedure which needs measurement tools. The person who makes measurements needs to have knowledge about using such tools. This method can display stress results clearly; for example: blood pressure monitoring, pulse rate and muscle tension, etc.

2.2.4.2 Behavior observation – This method can also display stress results clearly. A behavior observation form is used to observe behavior, both directly and indirectly. Direct behavioral changes can be seen in the changes of body movements, such as hand shaking, stammering and fast breathing. Indirect behavioral changes are those such as absenteeism, avoiding confrontation, etc.

2.2.4.3 Self Report – The self report or questionnaire is the most popular method. A questionnaire is used to assess feelings when faced with stressful events. This method is simple, however the data obtained may not correspond to reality because the questions were concerned with events in the past and the respondents may forget or fail to accept that that event is stressful. In this study, the researcher used a questionnaire to study the levels of occupational stress. Samples of a questionnaire designed by other researchers to measure occupational stress levels are as follows:

2.2.4.3.1 Stress level assessment form, Department of Mental Health, Ministry of Public Health[25] is used to examine the behaviors and feelings of the respondents. For example, it asks 'in the past two months does the respondent feel upset, annoyed, nervous, or hopeless, and at what level?' The stress levels in the assessment are as follows:

a. Stress at much lower than normal level means that the respondents may give false replies which do not correspond to reality; or the respondent is sluggish and lacks motivation about life, or is already satisfied with life.

b. Stress at a normal level means stress is useful in daily life, as it can act as a source of motivation to achieve success in life.

c. Stress at a slightly higher than normal level means that the respondent may have a problem and cannot solve it, and that they are not aware that they have stress because there is little change in body, mind and behavior.

d. Stress at a moderately higher than normal level means that the respondent may have serious problems in life and there may be remarkable changes in their bodies, minds and behavior. Thus, they need to solve their problems as soon as possible.

e. Stress at a much higher than normal level means that the respondent is facing a critical problem or may have a serious illness.

2.2.4.3.2 Questionnaire of Suanprung Hospital, which we call the 'Suanprung Stress Test 20[26] is a stress assessment designed to assess the stress of the Thai population. It is used to assess personality, anxiety, and physical and psychological symptoms related to stress. The test is divided into stress levels as follows:

a. Stress at a low level means a little stress that disappears quickly. It is stressed in daily life that does not threaten daily living. The body can adjust to stress automatically as the body is accustomed to it.

b. Stress at a moderate level means stress in daily life caused by threatening things or traumatic events in society. The person's reaction will be anxiety or fear which is considered normal, and not harmful to the body.

c. Stress at a high level means stress caused by highly stressful events. The person cannot adjust himself to reduce stress quickly. This level is dangerous. If it cannot be relieved, it will become chronic and lead to many diseases later.

d. Stress at an extreme level means high level stress that continues for a long period. The affected person fails to adjust and then feels

bored, hopeless, worn out and lacking control. They may easily experience some physical symptoms or illnesses.

2.2.4.3.3 Questionnaire of occupational stress from the researchers named 'Cooper et al.' called the 'Occupational Stress Indicator' was developed in 1988 and was referred to by Rawinan in 2009[27]. This instrument consists of 6 question categories which are: opinions about work, personality, environmental awareness and response, factors concerning occupational stress, problem encountering, and an occupational stress level assessment questionnaire. It has divided stress levels as follows:

a. Low level stress means the respondents of the Occupational Stress Indicator Test who get a score lower than or equal to the average -1 standard deviation.

b. Moderate level stress means the respondents of the Occupational Stress Indicator Test who get a score higher than the average -1 standard deviation and lower than the average +1 standard deviation.

c. High level stress means the respondents of the Occupational Stress Indicator Test who get a score higher than or equal to the average +1 standard deviation.

2.2.4.3.4 The Occupational Stress Questionnaire was developed by researchers named 'Anne et al.'[6]. The questionnaire is called 'Offshore Stress Scale' and consists of 32 questions. It is related to the characteristics of the offshore drilling rig work environment, workloads, mistakes at work, feeling of security and safety at work, etc. The results obtained in the questionnaire indicate the stress levels of the respondents. The stress levels are divided into 6 levels: from 0 = no stress to 5 = very high stress.

This case study was conducted with offshore workers who work in an offshore machinery service company and work on offshore drilling rigs. Therefore, the researcher used the Offshore Stress Questionnaire developed by Anne et al.[6], who studied occupational stress, sleep and environment awareness, accidents, near-misses and the unsafe acts of offshore workers on an offshore drilling rig. The offshore stress questionnaire was used to evaluate the occupational stress levels of offshore workers who had a work environment the same

as or similar to that of the case study. The researcher analyzed and interpreted the results by adding up the scores of each opinion to calculate the mean, and compare the levels of occupational stress. For the meaning of each occupational stress level, the researcher referred to the questionnaire of the 'stress level assessment form' of the Department of Mental Health, Ministry of Public Health[25] and the 'Suanprung Stress Test 20' from Suanprung Hospital[26], wherein the scores and scales are similar to the questionnaire in this research, including the stress assessments designed for the Thai population.

2.3 Sleep Quality

Each person has different levels of sleep quality. Sleep quality is unique to each person and depends upon personal behavior and feelings[24]. Normally, humans spend about one third of their lives sleeping[28] and the sleep period begins from going to bed until waking up. Better sleep quality is considered from sleep characteristics as to whether it is deep and sound sleep, represents a complete sleep cycle, and there is no sleep disturbance and the sleeper is refreshed after waking up and can thus work energetically without feeling exhausted or sleepy[29]. Good quality sleep allows the body to repair and replenish damaged cells, release growth hormones, strengthen the immune system, boost energy and boost the memory and also allows our body to rest. Good quality sleep is very beneficial to our daily living[28]. Poor sleep quality or not enough sleep can cause a symptom that affects the level of consciousness, which is called 'drowsiness'. Drowsiness decreases levels of consciousness when doing activities[30]. This symptom can be harmful to both the body and mind, and it may cause mistakes or accidents at work. The characteristics of good sleep quality are as follows:

a. The quantitative aspect of sleep means the amount of sleep per day, number of sleep disturbances or awakenings during sleep, and sleep onset latency[12].

b. The qualitative aspect of sleep means the feeling of getting deep sleep or enough sleep [31].

2.3.1 Definition of sleep: Sleep is a phenomenon of the bodily process that helps create a balanced body. Sleep is different from the rest or unconsciousness as it can be aroused or awakened. If we get good sleep quality then we will wake up

feeling refreshed (Ladis cited in Chanipa, 2009)[30]. Other researchers describe the meaning of sleep as follows:

Maturos Kanhasopa (2008): Sleep means the state of reduced levels of consciousness and movement. There are changes in brainwaves as the body carries out repairs to damaged tissues. It occurs over a short period of time. The sleeping person can easily be woken by suitable arousal[12].

Chanipa Chaonafang (2009): Sleep means a complicated physiological process associated with physiological, psychological and behavioral aspects. The physiological changes take place in all organ systems, whereby the organs and muscles become relaxed. There is a reduction in levels of consciousness and responses to stimuli. The body is motionless, which is a temporary state. The sleeping person can be woken by suitable arousal[30].

Kusuman Ramsiri (2000): Sleep means a state of rest of the body and mind. It is an important part of our life[32].

Webster cited by Jiraporn Thapsaengsee (2007): Sleep means a complicated physiological process which is associated with bodily functions. Sleep is a natural process of the human body. There are changes in all body organs that lead to relaxation. There are reduced levels of consciousness and alertness. These phenomena occur temporarily. The sleeping person can be woken by suitable arousal[33].

From the referenced definitions above, the researcher can conclude that sleep means the body has decreased consciousness and alertness, and thereby slows down the workings of the organs. During sleep, the mind is relaxed as there is no stimulus, but if there is an external stimulus the sleeping person can wake up in response to the stimulus immediately.

2.3.2 Sleep cycle: The sleep process occurs as a cyclic and systematic process. If the body is aroused from sleep, it will go back to the sleep cycle again. The sleep cycle is repeated several times throughout the night[12]. We can determine the sleep phase of a person by measuring blood pressure, eye movement, hormone levels and muscle tension, etc.[32]. There are four stages in one sleep cycle and there are two main types of sleep, as follows:

a. Non-rapid eye movement: NREM – The light sleep, which accounts for 75–80% of the total sleep time. During this period, there are slow eye movements

and muscles begin to relax. The brain waves have lower frequency, but higher amplitude. NREM is divided into 4 stages as follows[29]:

Stage 1: At this stage, the body of a sleeping person is still active, but they begin to fall asleep[34]. They are easily woken up if aroused properly[29]. They will wake up unrefreshed. When measuring brain waves, it is found that the brain waves descend from beta to alpha and theta, with a frequency of 1-6 cycles per second[32].

Stage 2: This is the stage of light sleep as the body of the sleeping person prepares to enter deep sleep. It lasts about 10-25 minutes. They are still easily woken up at this stage. The muscles become less tight and the body temperature is lower[29]. The brain waves enter the theta state, and if the theta waves are mixed with spindles and complex waves, it means the body is preparing to enter deep sleep[32].

Stage 3: This is a moderately deep sleep stage and lasts approximately 30-45 minutes after stage 2. Eye movement stops, and the breathing rate, heart rate and pulse rate slow down. There is lower muscle tension. We have to use a louder sound to wake the sleeping person at this stage[29]. The brain emits large and slow delta waves that have strong vibrations[32].

Stage 4: The deepest sleep where the body of the sleeping person will get the best rest. Growth hormones are released to stimulate growth and repair damaged tissues. Most dreams occur at this stage, and it is more difficult to wake the sleeping person up than in stage 3; thus, we need to use louder sounds or more vigorous arousal to wake somebody up[29]. In stage 4 more than 50 percent of the waves are delta waves.

b. Rapid eye movement: REM – The dream sleep, REM sleep, makes up for 20 to 25 percent of the total sleep time. The brain wave patterns change rapidly, and are similar to those during waking. The body will use more oxygen, and the breathing rate and blood pressure will be increased. The muscles become more relaxed, and during this stage we experience vivid dreams. While dreaming, the body of the sleeping person may make some movements. REM sleep assists the development of the central nervous system. It is also important for thinking, learning and memory[29].

In normal conditions, humans start the cycle of their sleep from non-REM sleep, which comprises stages 1-4. As we drift off to sleep, we first enter stage 1. After a few minutes it changes to stage 2, then stage 3, and finally to stage 4. Then it returns to stage 3 and stage 2, and after that a period of REM sleep will begin. The sleep cycle lasts anything from 6 to 120 minutes; then the cycle starts over again[32].

Sleep cycle patterns change or become different depending upon a person's age. The first sleep cycle develops at 2 years old, and our sleep cycle will then change when we are about 20 years old. The first stage of sleep will take longer, while stages 3 and 4 and REM will become shorter in duration. For adults and older adults of around 40-50 years of age, the duration of stage 4, which is the deepest stage, will be decreased by about 50%. When entering old age, sleep efficiency and quality will become lower as age increases. The duration of stage 1 will be longer (by 15%), while the durations of stages 3 and 4 will be very much shorter or almost negligible [11].

Human consciousness is controlled by the reticular formation. This is a group of nerve cells that reacts to sensory inputs from the surroundings. Sensory inputs are changed into electrical signals or nerve impulses and are transmitted into the brain portion of the cerebral cortex[28], which is involved in movement and sensation, as well as the autonomic nervous system, which then sends signals to other parts of the body[34].

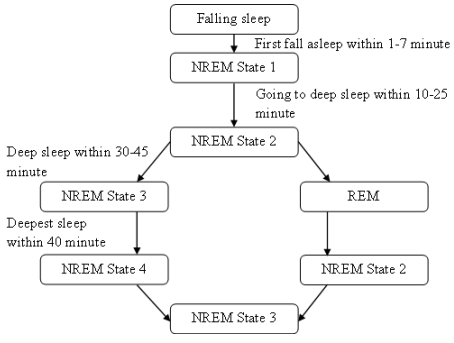


Figure 2.3 The Sleep cycle for one cycle (Maturos Kanhasopa (2008)) [29]

2.3.3 Causes and effects of poor sleep quality: Getting enough quality sleep helps to repair damaged cells and tissues in the body and allows your body to rest. There are many signs of inadequate or poor sleep quality[35]; for example, unsound

sleep and feeling unrefreshed after waking up, etc. Its effects can be seen in poor work performance, lower quality of life and lower functional ability of the body. It can also cause health problems, such as: headaches, unrefreshed feelings, depression, lack of concentration and lethargy. The affected person will use more medical services and more easily cause accidents [36].

Causes of poor sleep quality are: stress, environmental change, sleep disturbance, and physical symptoms such as high sensitivity to stimuli and excitement, and also psychological illnesses such as depression, anxiety and adjustment disorder. Sleep problems may also be caused by some illnesses, such as: heart disease, asthma, stroke, respiratory problems, chronic coughing, urinary tract infections, frequent urination, dementia, and an enlarged prostate. Sleep problems can also be caused by using drugs; for example the caffeine in coffee and soft drinks can stimulate the nervous system. For some people a specific disease may cause poor sleep; for example, restless leg syndrome causes trouble sleeping. Symptoms of restless leg syndrome include itching, a burning sensation or aching in the legs, particularly when you are sleeping, and an overwhelming desire to move your legs. Some people suffer from the limb movement disorder (PLMD) and the sleep disorder which occurs as a result of limb movement during sleep. Some people also suffer from obstructive sleep apnea, which occurs from brief and frequent interruptions of breathing during sleep: Most such patients are overweight, have a short, thick neck, and have symptoms of snoring and daytime sleepiness[37].

2.3.4 Sleep quality assessment: The selection of sleep quality assessment depends upon the objectives and the appropriateness of each assessment. There are two methods used in the assessment[22]:

2.3.4.1 Quantitative assessment is utilized to evaluate the sleep duration, the number of mid-sleep awakenings, and the length of time required to fall asleep from being fully awake. In the assessment, the results recorded during sleep, such as the record of changes in electroencephalography, eye movement, muscle tension, hormone levels, body movement, blood pressure levels and pulse will all be used. These data will give accurate sleep quality results, although the methods are complicated and measuring tools are required. This assessment also has some

disadvantages; it cannot measure emotions or feelings before and after awakening, sleep quality satisfaction and sleep adequacy [34].

2.3.4.2 Subjective sleep quality assessment is applied to assess sleep behavior and sleep adequacy. This includes an assessment of personal factors such as experience and knowledge about sleep[24] as well as sleep perception and disturbances by various factors. A questionnaire can be used to explore the efficiency and quality of sleep. This is an easy and popular method[34]. In this research, the 'Subjective Sleep Quality Assessment' questionnaire was used to study sleep quality. Examples of questionnaires designed by other researchers to measure sleep quality are as follows:

2.3.4.2.1 Mary's Hospital sleep questionnaire: This questionnaire was referred to in research carried out by Wandee Rakim (2005)[38]. It consists of 14 questions to evaluate sleep, the duration of sleep, amount of sleep, sleep satisfaction and sleep quality. This questionnaire is specifically used in hospitals, and is able to measure sleep quality.

2.3.4.2.2 Sleep pattern questionnaire: The sleep pattern questionnaire was developed by Beck (1992) and was referred to in research by Thassana Ninphat[39]. It evaluates the amount and quality of sleep, sleep duration, how long it takes to fall asleep from being fully awake, the number of mid-sleep awakenings, the length of time to fall asleep again after awakenings during sleeping, early awakenings and feelings after waking up.

2.3.4.2.3 The Verran and Snyder-Halpern Sleep Scale was developed by Verran and Snyder-Halpern (1987), and was referred to in research by Kanokthip Lasutthi (2007)[40]. It assesses sleep quality by evaluating the visual analogue scale. Sleep quality being assessed includes the following attributes: the depth of sleep, awakenings, feelings after waking up, and movements during sleep. The following three dimensions of sleep quality are measured: fluctuations during sleep, sleep efficiency and napping during the day.

2.3.4.2.4 The Pittsburgh Sleep Quality Index (PQSI) was developed by Buysse et al.[12]. This questionnaire was developed to assess sleep quality, comprising nine main questions with a multiple choice selection of 4 answer points based upon 7 component criteria. The first criterion is individual sleep

quality; the second criterion is sleep capability, which evaluates sleep duration after falling asleep from being fully awake and sleep problems which occur from not being able to get to sleep. The third criterion is the period of sleep, and the fourth criterion is efficient sleep. The fifth criterion is trouble with sleep; the sixth is the use of sleeping-pills; and finally, the seventh criterion is a dysfunctional body or mind during work time. The results of summary scores for all components were analyzed and interpreted by adding the seven component scores together. The score is between 0 and 21 and it is compared against the sleep quality level scale. Scores of five or lower mean the quality of sleep is good, while scores higher than five mean the quality of sleep is poor or there are problems with sleep.

There are several types of assessment. In this research, the researcher used the PQSI because the questions were clear and matched the research objectives; the respondents could easily answer uncomplicated questions and the questions were suitable for offshore workers who worked on offshore drilling rigs. This finding refers to the research of Siri et al.[13], who studied the sleep and health of offshore rig operators and found that the reliability of the Cronbach's alpha coefficient was equal to 0.70.

2.4 Occupational Stress Factors

The World Health Organization (WHO) noted that the quality of work without pressure correlates with work efficiency. Good health not only keeps people away from illness, but also contributes to better quality of body, mind and good social interaction[41]. There are several causes or factors that influence stress. Each factor or each cause may affect each individual differently or on different levels, depending upon their body and mind mechanisms concerning adjusting to, resisting or responding to specific causes and factors. The researcher Shaffer, referred to in the research of Phimphon (2005), mentioned that the causes of stress may come from both internal and external factors[42]. There are numerous factors influencing or contributing to stress. The researchers Cooper et al.[9] mentioned that forms of occupational stress can be divided into four factors: family factors, social or environmental factors, working factors and personal factors. In this research, the researcher studied to find interesting

factors related to occupational stress. In this research, occupational stress was studied from the levels of occupational stress caused by sleep quality.

2.4.1 Personal factors: The personal factors derive from the characteristics or problems of offshore workers themselves, which may influence occupational stress. The factors being studied in this research are as follows:

2.4.1.1 Income: The workers' main work objective is to earn income to acquire requisites pertaining to living, such as food, clothing and medicine. The workers may also have to work to make a living or support their families[42]. Moreover, from the statistics concerning the Thai population's incomes in 2013, it was revealed that Thai citizens had an average monthly income per person of 8,180 Baht and an average monthly income per household of 24,528 Baht (The National Statistical Office, 2013)[43]. It can therefore be stated that if the workers could not earn a living, could not earn enough for themselves or for their families, or earned less than the average Thai income, then this may be one of the causes of stress. Financial problems or family economic crises should be considered and represent an important factor which can significantly create stress[20]. Differences in monthly income and economic status also have an effect upon different levels of stress[22]. Different amounts of income also contribute to different levels of stress[42]. A higher income indicates that workers are in higher positions with greater responsibility or have higher risk tasks. To maintain or increase their income, the workers would have to complete their work carefully in order to keep themselves in their highly paid position or to receive higher pay[28]. It was also found that the economic status of the workers' family and relatives serves as a source of social support and motivation. If the workers have good relationships with their families they will get support from their families and thus work more efficiently[44].

2.4.1.2 Age: Age often results in maturity and experience of living in various conditions[17]. Older people experience less stress than the younger workers because they have the ability to control their emotions. They are more cautious about work and they have more experience in taking control of situations[29].

2.4.1.3 Educational level: Workers with different levels of education may suffer from stress in different ways[17]. Education may improve problem solving skills or problems concerned with management ability[23]. It has been said that

workers who have higher educational levels will have more skills and knowledge, gain higher positions and receive greater opportunities for career success[28].

2.4.1.4 Work experience: Work experience means that workers have encountered problems in the past and that they are well experienced and thus understand such problems. Therefore, when problems occur again, the experienced workers are able to deal with the problems better and would therefore experience less stress than inexperienced workers[45]. Past experience also teaches workers and makes them more aware of risks, as well as helping them to develop a thinking process to enable better selection of problem solving methods[21]. Workers who have different experiences may also have different types of stress[17].

2.4.1.5 Smoking behavior: The nicotine from smoking a cigarette reaches the brain in 8-10 seconds and causes artery contraction, higher blood pressure and rapid breathing, as well as stimulate the central nervous system and making the smoker feel relaxed. In the beginning, smokers smoke to reduce stress, but when the amount of nicotine in their brain decreases, they will then feel frustrated and stress will be induced. As a result, they have to continue smoking to maintain the levels of nicotine in their body[46]. In Thailand, regulations about smoking in public areas are set out in the Non-Smokers' Health Protection Act B.E. 2535 and the Non-Smoker's Health Protection Act, B.E. 2535[47], in order to control smokers and prevent the health risk presented to non-smokers.

2.4.1.6 Caffeine consumption: Caffeine also has negative effects upon the body. Physical functioning is affected by caffeine, especially when the body is under stress; caffeine worsens the situation. Caffeine has a stimulatory effect on gastric acids and thyroid hormone secretion, which may cause depression. It also stimulates the production of urine, which makes the kidneys work harder. There is, however, research to indicate that drinking tea or coffee helps reduce the risks of nervous system deterioration. However, an appropriate amount of coffee consumed for beneficial health is limited to only 1-2 cups per day[46] or 50 – 100 mg[48] which is in accordance with the announcement of the Ministry of Public Health (Volume 214) B.E. 2543 which allowed no more than 50 mg of caffeine in one unit of drink (Food and Drug Administration, 2004)[48]. However, the consumption of beverages with more than 350 mg of caffeine per day could reduce performance and cause stress[49].

2.4.1.7 Attitude towards job characteristics, living offshore, rig recreational area and rig communication system with people on shore: Attitudes, in this study, refer to feelings about the suitability, and approval and satisfaction towards job characteristics, living offshore, the rig recreational area and rig communication system with people on shore, which may all affect the levels of occupational stress[19]. They are the reactions of the mind when responding to stimuli. They result in various imageries which cause unhappiness and anxiety, and also result in a lack of stress relief or relaxation for stress relief[20].

2.4.2 Work factors: Working is an important factor, and each person may face different working problems. Some highly responsible workers facing high risk tasks may be easily led to experience stress[22]. Associated work factors involved in this research are as follows:

2.4.2.1 Shift work: Shift work is one factor that causes stress at work and disturbs the workers' physiological processes[17]. It also negatively affects their health in the long-term[33].

2.4.2.2 Working hours: Long working hours may cause health problems and stress for workers. It also relates to a worker's quality of working life[50] and levels of stress[35]. Sometimes work requires swift action to meet deadlines and working on time to satisfy customer requirements. These are the causes of anxiety and may lead to poor quality or imperfect work[51].

2.4.2.3 Current working position: Work position, as well as the workload of a person, is responsible for work overload and harsh working conditions; work that requires high concentration, work that requires prompt action or quick decision-making, and job characteristics that are too difficult can all result in occupational stress[22]. The characteristics of the work depend upon the job responsibilities, working conditions and equipment and machinery used[20]. When workers do not have the skills or abilities to work, or they are not suitable for the work assigned, when the work requires new technology in which the workers are not skilled, or when the work is repetitive, stress may also occur[19].

2.4.3 Offshore environmental factors: The offshore work environment in this study covers the characteristics of the rig and its accommodation. Conditions of: work areas and accommodation, the design of work areas and accommodation, work

environments, including heat, light, sounds and limited work spaces and shared accommodation[8], unsuitable work areas or improper working conditions, such as limited work spaces and noise nuisances that disturb worker concentration, lack of sleep, and weather conditions which are too hot or too cold may all cause stress[52]. Different environmental factors can affect the levels of stress in different ways[53] and are also thus associated with occupational stress[54].

2.5 Sleep Quality Factors

There are various factors related to sleep quality and, as such, the associated factors studied in this research are as follows:

2.5.1 Personal factors: Personal factors that either positively or negatively affect the sleep quality of workers. The personal factors studied in this research are as follows:

2.5.1.1 Income: The earned incomes of workers or any adequacy concerning their incomes may result in anxiety, and such anxiety may be the cause of insomnia, thus affecting their quality of sleep[33].

2.5.1.2 Age: Age determines sleep duration and stages of sleep[11, 28]. Babies sleep a total of 16 or 17 hours a day, and hours of sleep are known to decrease at the age of 16. Between the ages of 25 and 45, hours of sleep will decrease to 7-8 hours a day and to 6.5 hours a day when people reach old-age[34]. It can be inferred that increasing age, thus contributes to a decrease in the amount and quality of sleep[39]; this includes longer times taken to fall asleep, mid-sleep awakenings, and early awakenings[44].

2.5.1.3 Education level: Higher education levels help people to increase their awareness and understanding of the problems[17]. When workers have a greater understanding of their problems, they can thus reduce their anxiety about work problems and thereby reduce stress and sleep disturbances [23].

2.5.1.4 Work experience: Workers who have experience working on oil-rigs, or those who have no experience at all, may both have problems adapting to sleep times. This may lead to sleep problems and therefore affect sleep quality. When workers work in an unfamiliar environment, or if they have no

experience on the job, this may cause anxiety and also result in sleep problems[38]. Conversely, workers who have long experience in the same environment would tend to fall asleep more easily[55].

2.5.1.5 Smoking behavior: The nicotine in cigarettes makes the smoker feel relaxed. A low amount of nicotine in the blood produces the same effect as a sleeping pill and promotes relaxation. A high amount of nicotine will stimulate the central nervous system and make one feel excited and also agitated. Smoking a cigarette one hour before going to bed will make it harder for the smoker to fall asleep; they may even be unable to sleep. On average, smokers will get 30 minutes less sleep than non-smokers. This indicates that smokers have a problem with insomnia to a greater extent than non-smokers[29]. Smoking one cigarette an hour before going to bed, or 4-6 hours before going to bed, will make it harder for smokers to fall asleep because nicotine stimulates the central nervous system and causes feelings of agitation. If a smoker quits smoking, then they can fall asleep faster and have fewer nocturnal awakenings. Besides, smoking or inhaling cigar smoke can lead to snoring and respiratory problems because the tissues in the respiratory tract will be swollen and thus block the airways[7].

2.5.1.6 Caffeine consumption: Caffeine can be found in beverages such as coffee, soft drinks and energy drinks, etc. Caffeine can also increase the number of nocturnal awakenings. It induces the adrenal glands to increase cortisol release, whereby cortisol raises the heart rate, alertness and blood pressure. Caffeine has a half-life in the bloodstream of circa five hours, and so drinking more than 6 cups of coffee a day will increase awakenings and insomnia, and drinking 2-3 cups of coffee a day will reduce sleep duration and cause fluctuations in sleep. On the contrary, if workers are sleep deprived then drinking coffee, starting from 40 mg[49] up to 400 mg of caffeine, will increase worker alertness and therefore workers will work better than those who do not consume caffeine at all[34].

2.5.1.7 Attitude towards job characteristics, living offshore, rig recreational area and rig communication system with people onshore: Negative attitudes or opinions about the appropriateness, approval or satisfaction or dissatisfaction of job characteristics, living offshore, the rig recreational areas and rig communication system with people on shore can all affect the mind and emotions, as

well as the sleep of workers[56], because the body does not experience good or proper sleep, thus causing depression[32]. Moreover, the satisfaction caused by the provision of a suitable, pleasant and convenient environment in the recreational areas can make workers relax and rest after hard work[57].

2.5.2 Work factors: The work factors studied are as follows:

2.5.2.1 Shift work: Shift work can affect the daily activities, social lives and sleep patterns of operators. Basically, all humans have a biological rhythm driven by a circadian clock controlled by the brain. Throughout the 24 hour cycle, the brain's circadian clock regulates: sleeping and awakening patterns, body temperature, hormone production, the digestive function, and other bodily functions. Shift work can affect such sleeping and awakening cycles, and therefore becomes the cause of health problems[45].

2.5.2.2 Working hours: The normal working hours on an offshore drilling rig are 12 hours. If the workers are required to do maintenance work or other work outside of working normal hours, then this will also disturb their sleep patterns by reducing sleep hours.

2.5.2.3 Current working position: Worker positions, including duties, responsibilities and workloads are all a part of the workers' life cycle. Sometimes features of work can cause fatigue, or there are problems in work which cannot be resolved immediately. These affect the mind, emotions and sleep quality and they may cause sleep problems for the worker[56].

2.5.2.4 Offshore environmental factors: Normally, people sleep better in a familiar environment,[38,55] and so the researcher has studied the work environment which includes: drilling rig types, living offshore, satisfaction with accommodation and its facilities, roommates, noise and light disturbing sleep, use of the rig recreational areas for relaxing and boosting sleep, and the use of the rig communication system with people on shore which can help reduce anxiety.

2.6 Related Studies about Occupational Stress

Rundmo et al. (1998) studied organizational factors, safety attitudes and workloads among 1178 offshore workers who worked in the North Sea. The study was

conducted during two separate periods; the first time was in 1990 and the second time was in 1994. The study used a self-completion questionnaire survey to collect the data. This survey found that the top three causes of job stress, which afflict offshore workers came from the opportunity of decision-making, supervisor's consultation, and communication. They concluded that the offshore work environment had some risk factors leading to stress[5].

Anne Sneddon et al. (2013) studied stress, fatigue, situation awareness and safety research among 185 offshore workers who worked in the UK. An offshore stress questionnaire was developed and used to collect the data. It was found that the top three causes of stress were the threat of job loss (52% of sample respondents), followed by lack of communication (28% of sample respondents) and time pressure (23% of sample respondents). The stress was associated with situation awareness in the workplace, and could cause more than 48% of cases of unsafe behavior. When workers had higher levels of stress they would have less awareness about their surrounding environment, which would lead to much more unsafe behavior[6].

Sutherland and Cooper (1996) studied and surveyed stress patterns which occurred among 146 offshore workers who worked in the North Sea and provided explanations and recommendations for stress prevention. The designed questionnaire provided the basic information of offshore personnel. The researchers performed the factor analysis and found the common pattern of 5 causes of stress as follows: 1) Stress intrinsic to the job (included understimulataion, low job content, physical conditions of working and living, living conditions, physical well-being offshore, work overload, transportation); 2) Role stress (included safety and insecurity offshore, unpredictability of work patterns, physical climate and work); 3) Career stress (included lack of career prospects and reward); 4) Being in the organizational structure and climate (included organizational structure and climate), and 5) The home/work interface[9].

Pimporn Rung-aya (2005) studied factors which affected stress among 233 bus drivers. The stress questionnaire initiated by the Department of Mental Health was used for evaluating and collecting the data. The results showed the average bus driver had normal stress levels at a total score of 11.86. Incomes, working hours, and shift work was associated with stress[42].

Surasawadee Tanudsintum (2007) studied the stress among 91 polishing workers who worked in Bangkok and Phatumthani provinces. They used the demand control model or job content questionnaire to examine and collect the data. The results revealed that 64.8% of all sample respondents did not show high strain while the remainder did show high strain (35.2%). Factors concerning age, education, work experience and income were associated with the stress level[51].

Suchada Kumsuchart (2012) studied factors influencing the stress levels among 155 professional nurses who worked in Sakon Nakon hospital. The stress questionnaires for the nurses were used for collecting the data. The results showed that the average sample respondent was stressed at a level of 41.2±8.7 or the stress ratio between 35.8% – 43.2%. Factors related to work experience and income were associated with the stress levels[58].

A reference to the above researchers' results thus indicates that there are many factors (personal, work and environmental) which can directly affect employees and may be likely to cause occupational stress.

2.7 Related Studies about Sleep Quality

Anne Sneddon et al. (2013) studied stress, fatigue, situation awareness and safety research among the 185 offshore workers who worked in the UK. The developed sleep quality questionnaire was used to collect the data. It was found that 8.5% of all sample respondents reported poor sleep quality and that a poorer sleep quality level was associated with less awareness about their surrounding environment and would thus lead to much more unsafe behavior. Moreover, the researchers found that factors about noise from the work environment (33% of all sample respondents) and people moving/talking in the accommodation (25% of all sample respondents) can be contributing factors which affected the sleep quality level[6].

Siri and others (2013) compared the sleep pattern and health status before and after two working periods of 93 Norwegian offshore workers who worked in the North Sea. The differences between shift schedules were also evaluated. The Pittsburgh Sleep Quality Index (PSQI) was used to examine the sleep quality level. It

was found that on average offshore workers experienced poor quality sleep (5.7±2.7) and that there was no difference in sleep quality between the shift schedules (33.3% of all sample respondents who worked the day shift experienced poor sleep quality and 44.1% of all sample respondents who worked in the swing shift experienced poor sleep quality) [13].

Napakkawat Buathong (2003) studied sleep quality among 261 cabin attendants in Thai Airways International public company. The Pittsburgh Sleep Quality Index (PSQI) was used to examine the data. The results showed that 57.9% of all sample respondents had poor sleep quality and that factors related to the incomes, smoking behavior and caffeine consumption were associated with sleep quality[34].

Steffen Hope et al. (2010) studied sleep, risks and safety among 9,601 offshore workers on the Norwegian continental shelf. A sleep quality scale was used to examine sleep quality and the results showed that average sleep quality was 3.87±0.74, or moderate to good sleep quality. Factors related to age and shift work were associated with the sleep quality level[59].

Referring to the results of the research completed above, it can thus be indicated that such working populations living in the described conditions have problems with sleep quality, and this affects their bodies, minds and behavior. There are also many additional factors associated with sleep quality, such as stress, workload, shift work, work experience and age, etc. Workers may thus need time to adapt to their working environments, so that they can better adjust their sleep patterns.

CHAPTER III
METHODOLOGY

3.1 Study Design

This research is a cross-sectional survey study. The objective of this research was to study the personal factors, work factors and offshore environmental factors which are related to the occupational stress and sleep quality of offshore workers who work in the machinery service company of this case study.

3.2 Population

The population for this research was 67 offshore workers who worked in one Machinery Service Company of this case study. (Number of workers based on 31st March 2013).

3.3 Sample Size

A purposive sampling technique was used to select a suitable sample size, based on the sample size calculation theory. The size of the sample represented the offshore workers who could be studied in this research. The sample size formula for the finite population was used[60] as follows:

$$n = \frac{NZ^2\sigma^2}{NE^2 + Z^2\sigma^2}$$

n = Sample size

N = Number of population (67 persons)

Z = Velue of the area under the normal curve range = 1.96

σ^2 = Variance of the occupational stress level is $(26.24)^2$ or 688.54 which reference from other research was carried out by Anne Sneddon et al.[6]. They studied about stress among the offshore workers total 185 persons that the result showed the occupational stress level is 57.23± 26.24.

E = Value of error = 0.05

By applying the data in the formula, the size of the sample suitable for this research was 66.99 or 67. The number of the population was not very high and this research was a case study. Therefore, whole data were collected and measured from the 67 offshore workers in this machinery service company.

3.4 Sampling Technique

3.4.1 Inclusion criteria

3.4.1.1 Offshore workers who worked as crew chiefs and engineers.

3.4.1.2 Offshore workers who had at least 6 months' offshore experience.

3.4.1.3 Offshore workers who agreed to participate in this research and were willing to sign a consent letter.

3.4.2 Exclusion criteria

3.4.2.1 Offshore workers who were prohibited from working offshore for 28 consecutive working days.

3.4.2.2 Offshore workers who were ill or had any medical conditions such as diabetes, respiratory disease, urinary tract infection, circulatory system disease and heart disease, or the symptoms of these illnesses, which affected their levels of sleep quality and occupational stress.

3.4.2.3 Offshore workers who did not complete all the details required in the questionnaire.

3.4.2.4 Offshore workers who did not provide information on the appointed date without prior notice.

3.4.3 Discontinuation criteria

3.4.4.1 Offshore workers who wished to cancel and withdraw from this research either during or after data collection.

3.5 Variables

3.5.1 Independent variables can be divided into 3 factors as follows;

3.5.1.1 Personal factors; age, income, education level, work experience, smoking behavior, caffeine consumption, attitude towards job characteristic, attitude towards living offshore, attitude towards the rig recreational area, the attitude towards the rig communication system with people on shore.

3.5.1.2 Work factors; shift work, working hour, current working position.

3.5.1.3 Offshore environmental factors; drilling rig types, living offshore.

3.5.2 Dependent Variables as follows;

3.5.2.1 The occupational stress levels

3.5.2.2 The sleep quality levels

3.6 Research Instruments

A questionnaire was used as the research instrument and this was divided into three sections.

Section one: Personal, work and offshore environmental factors: This section required the sample respondents to submit their own data by filling the in the blanks and selecting the checkboxes which best suited them.

1.1 The personal factor questionnaire was based upon the variables that were relevant to this study. It consisted of seven main questions about age, income, education level, work experience, smoking behavior, caffeine consumption and congenital disease.

1.2 The work factor questionnaire was based upon the variables that were relevant to this study. It consisted of four main questions about

shift work, working hours, current working position and the attitude towards the job characteristics.

The attitude questionnaire asked about the level of agreement or acceptance regarding job characteristics. It was developed from the standard questionnaires by Valerie J. Sutherland and Cary L. Cooper[9] who conducted research on stress prevention among offshore workers, and A.W. Parker et al.[10,11] who studied and surveyed the sleep pattern barriers of reef pilots. The selected questions were suitable for the offshore work environment and measured the attitudes among the offshore workers. There were both positive and negative questions. Five sub-questions asked about attitudes towards job characteristics, with six scaled responses indicating the level of agreement.

Agreement level	Score for Positive Questions	Score for Negative Questions
Strongly Agree	0	5
Very Agree	1	4
Moderate Agree	2	3
Fair Agree	3	2
Least Agree	4	1
Disagree	5	0

The results were analyzed and interpreted through the summary scores of each question which were totalled up to find the mean. The scores were divided into six levels, according to the rating scales. The evaluation of the absolute criteria for each level was performed[61,62].

Scales	Means
0.00 – 0.83	No any problem regarding job characteristics
0.84 – 1.67	Very low problem level regarding job characteristics
1.68 – 2.51	Low problem level regarding job characteristics
2.52 – 3.35	Moderate problem level regarding job characteristics
3.36 – 4.19	High problem level regarding job characteristics
4.20 – 5.00	Very high problem level regarding job characteristics

1.3 The offshore environmental factor questionnaire was based upon the variables that were relevant to this study. It consisted of five main questions about drilling rig types, living offshore and the attitude towards living offshore, the rig recreational area, and the rig communication system with people on shore.

The attitude questionnaire asked about the level of agreement or acceptance regarding living offshore, the rig recreational area and the rig communication system with people on shore. It was developed from the standard questionnaires by Valerie J. Sutherland and Cary L. Cooper[9] who conducted research on stress prevention among offshore workers, and A.W. Parker et al.[10,11] who studied and surveyed the sleep pattern barriers of reef pilots. The selected questions were suitable for the offshore work environment and measured the attitudes among the offshore workers. There were both positive and negative questions. Four sub-questions asked about the attitude towards living offshore, another four sub-questions asked about the rig recreational area, three sub-questions asked about the attitude towards the rig communication system with people onshore and two sub-questions asked about using the services of the rig communication system, with six scaled responses indicating the level of agreement.

Agreement level	Score for Positive Questions	Score for Negative Questions
Strongly Agree	0	5
Very Agree	1	4
Moderate Agree	2	3
Fair Agree	3	2
Least Agree	4	1
Disagree	5	0

The results were analyzed and interpreted through the summary scores of each question which were totalled up to find the mean. The scores were divided into six levels, according to the rating scales. Evaluation of the absolute criteria for each level was then performed[61,62].

Scales	Means
0.00 – 0.83	Very high level of satisfaction
0.84 – 1.67	High level of satisfaction
1.68 – 2.51	Moderate level of satisfaction
2.52 – 3.35	Low level of satisfaction
3.36 – 4.19	Very low level of satisfaction
4.20 – 5.00	Dissatisfaction

Section two: Occupational stress levels: This section required sample respondents to quantify how much stress they perceived. The offshore stress questionnaire was developed by Anne Sneddon et al.[6]. It specifically concerned stress among the offshore workers, and measured occupational stress levels. The questionnaire consisted of 32 questions which were developed from the standard offshore stress scales by Valerie J. Sutherland & Cary L. Cooper [9] which was used to measure the level of stress and described the causes of the stress which offshore workers perceived. The questionnaire was used to identify the causes of stress in terms of 5 groups of stress factors as follows: stress intrinsic to the job, role stress, career stress, being in the organizational structure, and climate and home/work interface[9]. Questions were asked about the work load, anxiety, work expectation, company management, job characteristics and mistakes made at work, etc. The six scaled responses indicated the level of stress or anxiety as follows:

Stress	Score
Very often	5
Often	4
Occasionally	3
Rarely	2
Very rarely	1
Never	0

The results of the summary scores for all the questions were analyzed and interpreted by finding the mean. They were compared with the level of occupational stress on the six level scale; the levels included: no, least, low, moderate, high and

extreme stress. Evaluation of the absolute criteria for each interval range was performed[61,62]. The meaning of each stress level was compared to the questionnaire results of the stress level assessment from the Department of Mental Health, Ministry of Public Health[25] and the Suanprung Stress Test 20 from Suanprung Hospital[26]. The scores and scales here are similar to this research questionnaire, including these stress assessments designed for the Thai population. The stress level of no to low has been described as no stress or a little stress that only impacts over a very short period in daily life, but the stress level of moderate starts to affect workers more significantly and tends to cause more serious problems and higher stress levels until the effect manifests itself as physical symptoms if no preventive action is taken to reduce those stress levels.

Score	Stress Level	Meaning
0.00 – 0.83	No Stress	No stress or satisfaction in their own life
0.84 – 1.67	Least Stress	Little stresses occurrence and get well in a short time
1.68 – 2.51	Low Stress	Stress in daily life, but without threat to their lifestyle
2.52 – 3.35	Moderate Stress	Reaction to stress caused by anxiety and fear, but no serious harm to the body
3.36 – 4.19	High Stress	Stress obviously changes the physical, psychological and behavioral characteristics
4.20 – 5.00	Extreme Stress	Continuous stress occurred with effect on physical symptoms

Section 3: Sleep quality levels: The Pittsburgh Sleep Quality Index (PSQI) was used to measure sleep quality. PSQI was developed by Daniel J. Buysse et al.[12] and Siri et al.[13] and has been used to research sleep patterns and health in offshore workers with a Cronbach's alpha coefficient of 0.70. The researcher used the PSQI in the Thai language, translated from English by Chantana[63], who had used it to study the sleep quality and mental health of professional nurses who work in Bangkok province. The PSQI consists of nine main questions which are multiple choice with four answer points, based on seven component criteria as follows:

Component no. 1: Individual sleep quality. The main question no. 9 evaluated the sleep quality during the past hitch of the sample respondents.

Response level	Score for component no. 1
Very good	0
Fairly good	1
Fairly bad	2
Very bad	3

Component no. 2: The sleep capability.

2.1 The main question no. 2 evaluated the number of minutes used to fall asleep.

Number of minutes used to fall asleep	Score
Less than or equal 15 minutes	0
16 – 30 minutes	1
31 - 60 minutes	2
More than 60 minutes	3

2.2 Sub-question no. 5.1 referred to an inability to get to sleep within 30 minutes.

Inability to get to sleep within 30 minutes	Score
No problem	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3
The sum score of the main question no. 2 and sub-question no. 5.1	**Score for component no. 2**
0	0
1 – 2	1
3 – 4	2
5 - 6	3

Component no. 3: Period of Sleep. The main question no. 4 evaluated the period of sleep.

Period of Sleep	Score for component no. 3
More than 7 hours	0
6 - 7 hours	1
5 - 6 hours	2
Less than 5 hours	3

Component no. 4: Efficient sleep. The main questions no. 1, 3 and 4 were used to calculate the percentage of efficiency following a formula.

%Efficient sleep = (Sleep hours ÷ Hours to spend in bed) X 100

%Efficient sleep	Score for component no. 4
More than 85 %	0
75 – 84 %	1
65 – 74 %	2
Less than 65%	3

Component no. 5: Trouble of sleep. Sub-questions no.5.2 to 5.9 referred to this topic.

Trouble of sleep	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3
The sum score of sub-question no. 5.2 to 5.9	**Score for component no. 5**
0	0
1 – 9	1
10 – 18	2
19 - 27	3

Component no. 6: Usage of sleeping-pill. The main question no. 6 evaluated the use of sleeping pills.

Usage of sleeping-pill	Score for component no. 6
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Component no. 7: Dysfunctional body or mind during working time. Main questions no. 7 and 8 evaluated this topic**.**

The main question no. 7 Trouble staying awake during daily activities.

Trouble staying awake during daily activities	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

The main question no. 8 covered keeping up enough enthusiasm to get things done.

Keeping up enough enthusiasm to get things done	Score
No problem at all	0
Very slight problem	1
Somewhat of a problem	2
Very big problem	3
Sum of Main question no. 7 and 8	**Score for component no. 7**
0	0
1 – 2	1
3 – 4	2
5 – 6	3

The results of the summary scores for all components were analyzed and interpreted by adding the seven component scores together. The resulting score falls between 0 and 21 and can be compared with the sleep quality level scale.

Sleep quality level	Mean
Less than or equal 5	Good sleep quality
More than 5	Poor sleep quality

3.7 Validity and Reliability of Instruments

The researcher studied ideas, theories, books and previous research related to occupational stress and sleep quality to create the questionnaire. The scope and details of the questionnaire covered the purpose of the survey. The draft questionnaire was examined for quality, content validity, reliability and detail by three experts. They examined the sentence structure and use of language for suitability and ease of understanding. All suggestions from the experts were used to improve the questionnaire. The reliability of the questionnaire was measured by the following processes:

3.7.1 The questionnaire was examined by three experts and revised according to their suggestions. Then a pilot test was conducted on 30 offshore workers who had similar characteristics of the sample required, had experience of working offshore, and did not take part in this research and were not in the sample group.

3.7.2 The responses from the 30 returned questionnaires were analyzed to determine the internal consistency, relationships and reliability using the Cronbach's alpha coefficient and SPSS, which is a software package used for statistical analysis. The test results for validity and reliability of the instrument were as follows:

Section one of the questionnaire included personal factors, work factors, and offshore environmental factors. The Cronbach's alpha coefficient for the attitude towards the job characteristics and the attitude towards the rig recreational area was 0.811. The attitude towards living offshore was 0.802 and the attitude towards the rig communication system with people on shore was 0.890.

Section two of the questionnaire covered occupational stress levels. The Cronbach's alpha coefficient was 0.855.

Section three of the questionnaire covered sleep quality levels. The Cronbach's alpha coefficient was 0.813.

3.8 Ethical Considerations of the Research

Both moral and ethical issues were considered in conducting this research. The project proposal, information sheet, informed consent form and data collection form/ program or activity plan have been reviewed and approved by the Ethical Review Committee for Human Research, Faculty of Public Health, Mahidol University (COA. No. MUPH 2014-134). The purpose, processes and data collection procedures of the research were explained to the sample respondents. They were informed that all data would be kept secret and analyzed statistically using techniques to produce results which would lead to academic benefit. Sample participants were informed that if they were not willing to cooperate or refused to participate in the research, then there would be no negative consequences which might affect them.

3.9 Data Collection

Data were collected as follows:

3.9.1 The researcher explained the purpose, methodology and expected benefits, and asked for approval from the company executive team in order to request their permission and cooperation.

3.9.2 The researcher collected the communication data of all sample respondents.

3.9.3 The researcher prepared an information document explaining the purpose of the research and the questionnaire responses. Cooperation of the sample respondents was requested and their questions were answered. Three methods were used to communicate with the participants depending on convenience: email, telephone or personal visit. All participants completed the questionnaire during the period from October to December 2014, with details as follows:

3.9.3.1 The first section contained questions relating to personal factors, work factors, and offshore environmental factors. All participants answered the questions during the last week of their hitch or working period on the offshore rig, in order to assess the factors studied in the same previous working period.

3.9.3.2 The second section contained questions on the occupational stress levels. All participants answered the questions during the last week of their hitch, in order to evaluate the occupational stress levels in the same previous working period.

3.9.3.3 The third section contained questions relating to the sleep quality level with reference to the PSQI. All participants completed the required questionnaire during the third or fourth week of their hitch, in order to evaluate the sleep quality levels in the same previous working period.

3.9.4 The researcher informed all participants that it was their choice whether to join in the survey or not, and that declining would not affect their employment.

3.9.5 The researcher sent questionnaires to all participants via post or hand delivery with enough time for them to complete the questionnaire. The researcher scheduled appointments to collect the questionnaires, or the participants returned their questionnaires via post without their name on the envelope. They could also return the questionnaire by hand through the company administrator.

3.9.6 The researcher recorded and collected all data from the participants. All returned questionnaires were verified for correct and complete data.

3.9.7 The researcher conducted a statistical analysis of the survey data.

3.10 Data Analysis

The researcher verified the completeness of the data in the questionnaire which were filled in with the participants and counted the scores based on the rating scale which was determined. Then the data were filled into the SPSS analysis and evaluation. The researcher sets the statistical significance level at 0.05. The data were recorded and processed as follows:

3.10.1 Analyzing the data, explaining the characteristics of data and details of variables by using min, max, frequency, percentage, mean, median, first quartile, third quartile and standard deviation.

3.10.2 Testing the hypothesis by using the Chi - square test to measure relationships between variables with $p < 0.05$ as the significance level.

CHAPTER IV
RESULTS

The objective of this survey research was to study the personal factors, the work factors and the offshore environmental factors which are related to the occupational stress and the sleep quality of offshore workers who work in a machinery service company of this case study. A total of 67 questionnaires was returned and can account for a 100% response rate. Concerning the returned questionnaires, 100% were answered with complete data and the inclusion criteria data have been analyzed and evaluated using statistical analysis. The results are presented as follows:

4.1 The factor data of personal, work and offshore environmental

4.2 Evaluation of the occupational Stress level

4.3 Evaluation of the sleep quality level

4.4 The relationship of the factors and the occupational stress level

4.5 The relationship of the factors and the sleep quality level.

4.1 The factor data of personal, work and offshore environmental

The samples were initially required to answer section one of the questionnaire, in order to offer information about personal factors, work factors and offshore environmental factors when working during the last week of their hitch. The results are divided into 7 categories, as follows;

4.1.1 The personal factor data

The data are presented in table 4.1 and described, as follows;

Age: The results displayed that most samples were age group greater than, or equal to 40 years old (at 26.9%), followed by a group of 30 to 34 year olds (25.4%), 25 to 29 year olds (23.8%), 35 to 39 year olds (16.4%) and 20 to 24 year

olds (at 7.5%), respectively. The minimum age was 21 years old and the maximum was 56 years old. The median age of all sample respondents was 34 years old.

Incomes: The results displayed that the median all sample's incomes were 80,000 Thai Baht per month. Most samples earned monthly incomes between 60,000 to 80,000 Thai Baht (53.7%), followed by greater than 100,000 Thai Baht (20.9%), 80,001 to 100,000 Thai Baht (19.4%), and less than 60,000 Thai Baht (6.0%), respectively. The minimum income was 40,000 Thai Baht and the maximum was 260,000 Thai Baht.

From the questionnaire results, we also found some offshore workers had another source of earnings, it is not only earned from the company each month, but it plus extra money from their part-time jobs during time off or staying at home such as Agriculture, Mechanic shop, Food shop, Salesman, Professor and etc. Moreover, the company in this study raised the offshore daily pay for the samples while working on the rigs. Foods and utilities were provided for workers on the rigs without additional charge, including offering normal salaries to the samples when they stayed on shore. The expenses of transportation, food and accommodations were also provided during the samples had to wait on shore before getting on the rigs.

Education level: The results displayed that most samples' education levels was a bachelor degree (at 53.8%), followed by high vocational certificate (22.4%), high school/Vocational Certificate (13.4%) and higher than bachelor degree (10.4%), respectively.

Moreover, The researcher found that the company in this case study had the policy to employ an employee who were equipped with degrees in engineering or those who were experienced in machinery, including the company also provide the trainings about the operation, the control and the safety system in working with machines before being sent to work on the rigs.

Work experience: The results displayed that the median of all sample's work experiences was 6 years. Most sample respondents had work experiences in the group 1 to 5 years (41.8%), followed by 6 to 10 years (32.8%), greater than 10 years (22.4%) and less than 1 years (3%), respectively. The minimum work experiences were 0.84 years and the maximum were 24 years.

Smoking behavior: The results displayed that most sample respondents did not smoke cigarettes (65.7%), and the rest reported smoking (34.3%). For smoking group found that the median was 10 rolls per day and the highest daily roll of smoking cigarettes was in the group of greater than 9 rolls per day (60.9%), followed by a group of 5 to 9 rolls per day (34.8%), then 1 - 4 rolls per day (4.3%), respectively and the minimum daily roll of smoked cigarettes was 2 rolls per day and the maximum was 15 rolls per day.

Caffeine Consumption: The results displayed that most samples drank beverages containing caffeine (measured at 79.1%). The rest reported that they did not drink anything containing caffeine (20.9%). The median number of cups for caffeine consumption was 1 cup per day, and the highest daily cups of caffeine consumed was grouped at between 1 and 2 cups per day (83.0%), followed by a group of 3 to 4 cups (11.3%), and greater than 4 cups (5.7%), respectively. The minimum daily amount of cups containing caffeine consumed was 1 cup per day, and the maximum was 10 cups per day.

Table 4.1 Personal factor data

Personal Factors	Frequency (n)	Percentage (%)
Total of the response sample size	67	100.0
Age (Year)		
20 – 24	5	7.5
25 – 29	16	23.8
30 – 34	17	25.4
35 – 39	11	16.4
>=40	18	26.9
	Median = 34, Q1 = 29, Q3 = 40, Min - Max = 21 - 56	
Incomes (Thai Baht per month)		
< 60,000	4	6.0
60,000 – 80,000	36	53.7
80,001 – 100,000	13	19.4
> 100,000	14	20.9
	Median = 80,000, Q1 = 60,000, Q3 = 100,000, Min - Max = 40,000 - 260,000	

Table 4.1 Personal factor data (Continued)

Personal Factors	Frequency (n)	Percentage (%)
Education level		
High School / Vocational Certificate	9	13.4
High Vocational Certificate	15	22.4
Bachelor Degree	36	53.8
Higher than Bachelor Degree	7	10.4
Work experience (Year)		
< 1	2	3.0
1-5	28	41.8
6-10	22	32.8
> 10	15	22.4
	Median = 6, Q1 = 3, Q3 = 10, Min - Max = 0.84 - 24	
Smoking Behavior		
No smoking	44	65.7
Smoking	23	34.3
Number of smoked cigarettes per day (Roll: Day)		
1 – 4	1	4.3
5 – 9	8	34.8
> 9	14	60.9
	Median = 10, Q1 = 5, Q3 = 10**,** Min – Max = 2 - 15	
Caffeine Consumption		
No drink	14	20.9
Drink	53	79.1
Number of cups per day (Cup: Day)		
1 – 2	44	83.0
3 – 4	6	11.3
> 4	3	5.7
	Median = 1, Q1 = 1, Q3 = 2**,** Min - Max = 1 - 10,	

4.1.2 Work factor data

The company has the pre-mobilization requirement for all offshore workers who will be assigned to work on the offshore drilling rig. All new workers shall be passed the work instruction and safety training program prior to being

assigned into work at the offshore work location in order to provide knowledge and understanding of the machine operation and safety regulation including the refresher training will be annually arranged. The work characteristics of the sample are presented in table 4.2 and described, as follows;

Shift work: The results displayed that most sample respondents worked in day time or the shift work of 06.00 – 18.00 hours (52.2%), followed by night time or the shift work of 12.00 – 24.00 hours (25.4%), and 18.00 – 06.00 hours (22.4%), respectively.

Working hours: The results displayed that more than half of all sample respondents worked overtime or worked more than 12 hours per day (55.2%), and the rest reported that they did not work overtime or work the same as normal working hours (44.8%). The median of all working hours was 12.18 hours per day, with the average being 12.42 ± 0.63 hours per day. The minimum was 12 hours and the maximum 15 hours per day. Of the sample respondents who worked overtimes, they worked overtime of circa 1 to 28 days per hitch, which median was 10 days per hitch and offered overtime of around 1 to 3 hours per day, which median was 2 hours per day.

Current working position: The results displayed that 67.2% of the sample worked in engineer position, while 32.8% was in crew chief position.

Table 4.2 Work factor data

Work Factors	Frequency (n)	Percentage (%)
Total of the response sample size	67	100.0
Shift work		
06.00 – 18.00 hrs.	35	52.2
12.00 – 24.00 hrs.	17	25.4
18.00 – 06.00 hrs.	15	22.4
Working hours: Number of normal working hours and overtime hours (Hours: Day)		
12 hours (No Overtime)	30	44.8
> 12 hours (Overtime)	37	55.2
Mean = 12.42, SD = 0.63, Median = 12.18, Q1 = 12.00, Q3 = 12.54, Min – Max = 12 - 15		

Table 4.2 Work factor data (Continued)

Work Factors	Frequency (n)	Percentage (%)
Number of overtime's days (Day: 28 working days on rig or hitch)		
Median = 10, Q1 = 5, Q3 = 15, Min - Max = 1 - 28		
Number of overtime's hour (Hour: Overtime day)		
Median = 2.00, Q1 =1. 00, Q3 = 2.00**,** Min - Max = 1 - 3		
Current working position		
Crew Chief	22	32.8
Engineer	45	67.2

4.1.3 Offshore environmental factor data

The data are presented in table 4.3 and described, as follows;

Drilling rig types: The results displayed that most sample respondents worked on a tender rig (73.1%), while 26.9% of all sample respondents worked with Jack up rig.

These 2 types of drilling rig have a different physical appearance as follows; Jack up rig was fixed to the seabed by using the support legs and it requires to move the support legs up when rig move. Tender rig was floated on the water surface and have to install with the fixed platform and moreover, in general, these 2 rigs are provided same pattern of living offshore environment (Accommodation, Recreation area, Sport area and etc.) but the condition may differ depending on the size of the rig, year service, maintenance or hygiene [9,14, 66].

A)  B) 

Figure 4.1 Picture of Drilling rig types: A) = Tender rig and B) = Jack up rig, Source: GeoThai.net[64]

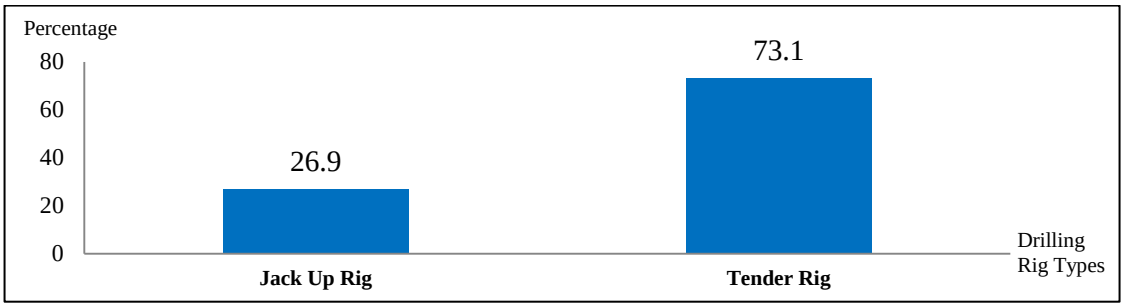


Figure 4.2 Drilling rig type (%)

Living offshore: Accommodation arrangements, the number of occupant, room size and space occupied inside the accommodation have been studied when living offshore. Most samples stayed in permanent accommodation or the offshore worker stays in the same room whenever they work on the rig (56.7%), and the rest stayed in temporary accommodation or no permanent room to stay whenever they work on the rig (43.3%). Concerning the number of occupants, 4 persons per room accounted for 65.7% of all sample respondents, followed by 2 persons per room (23.9%) and 6 persons per room (10.4%), respectively. For room sizes, 3m X 3m (9 m^2) per room accounted for 41.8% of all sample respondents, followed by 4m X 4m (16 m^2) (29.9%), and 2m X 3m (6 m^2) (at 28.3%), respectively. The accommodation areas are outfitted with fully air conditioned, built in furniture, toilet provided inside the room, a bunk bed was provided in the room that has number of occupants more than 1 person per room and the curtains were used for area separation in each bed. For space occupied per person, the space occupied was less than or equal median of space occupied size was 2.25 m^2, which accounted for 52.2% of all sample respondents, while 47.8% had space occupying more than 2.25 m^2 per person. The minimum spaces occupied were 1.5 m^2 and the maximum was 8.0m^2.

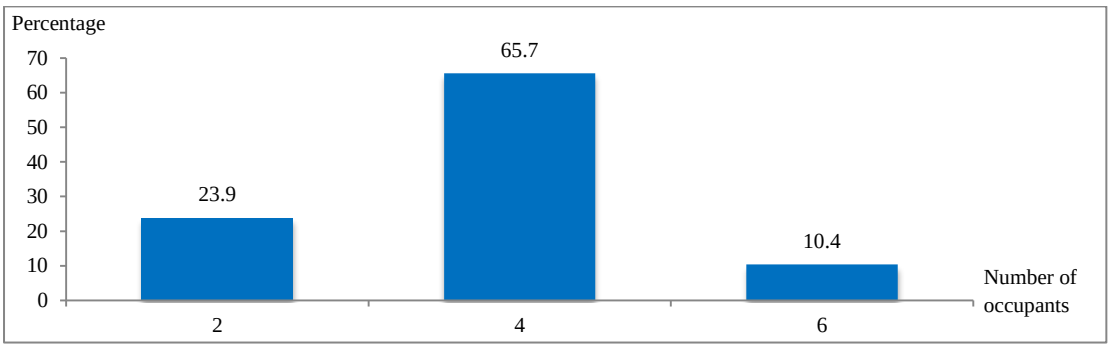


Figure 4.3 The number of occupants (%)

Frequency of usage the service inside rig recreational area during work in 1 hitch: The results displayed that 82.1% of all sample respondents used in the services of the rig recreational area, and that 17.9% of the rest reported no use of those services. Of the samples that used this service, 35.8% used the service around 3 to 4 times per week, followed by around 1 to 2 times (20.9%), greater than, or equal to 7 times (14.9%), and between 5 and 6 times (10.4%), respectively.

Frequency of usage the communication tool with people on shore during work in 1 hitch: The results displayed that 94.0% of all sample respondents used in the services of the rig communication system with people on shore, while 6.0% were not using the service. Of the sample respondents who used this service, 32.8% used the service around 3 to 4 times per week, followed by a round greater than, or equal to 7 times (28.4%), 1 to 2 times (17.9%), and between 5 and 6 times (14.9%), respectively.

Table 4.3 offshore environmental factor data

Offshore Environmental Factors	Frequency (n)	Percentage (%)
Total of the response sample size	67	100.0
Drilling Rig types		
Jack Up Rig	18	26.9
Tender Rig	49	73.1
Living offshore		
Accommodation arrangement		
Permanent	38	56.7
Temporary	29	43.3
Number of occupants (Person: room)		
2	16	23.9
4	44	65.7
6	7	10.4
Room size ($m^{2:}$ room)		
2 x 3 m. (6 m^2)	19	28.3
3 x 3 m. (9 m^2)	28	41.8
4 x 4 m. (16 m^2)	20	29.9

Table 4.3 offshore environmental factor (Continued)

Offshore Environmental Factors	Frequency (n)	Percentage (%)
Averages space occupied per person (m^2: person)		
≤ 2.25	35	52.2
> 2.25	32	47.8
	Median = 2.25, Q1 = 2.25, Q3 = 4.00, Min – Max = 1.50 - 8.00	
Usage the service inside rig recreational area		
Not used	12	17.9
Used	55	82.1
Frequency of usage the service inside rig recreational area		
(Time: week or 7 days during 28 working days on the rig)		
0	12	17.9
1 – 2	14	20.9
3 – 4	24	35.8
5 – 6	7	10.5
≥ 7	10	14.9
Usage the rig communication system with people on shore		
(Time: week or 7 days during 28 working days on the rig)		
Not used	4	6.0
Used	63	94.0
Frequency of usage the communication tools with people on shore		
(Time: week or 7 days during 28 working days on the rig)		
0	4	6.0
1 – 2	12	17.9
3 – 4	22	32.8
5 – 6	10	14.9
≥ 7	19	28.4

4.1.4 Information of congenital disease

100% of all sample respondents did not report that they have congenital disease, as shown in table 4.4.

Table 4.4 Information of congenital disease

Information of congenital disease	Frequency (n)	Percentage (%)
Reported of congenital disease	0	0.0
No reported of congenital disease	67	100.0

4.1.5 Attitude towards job characteristics

Data concerning attitude towards job characteristics are presented in table 4.5, displayed the average scores were 2.01 ± 0.88. Almost 43.3% of all sample respondents had low problem levels regarding their attitude towards the job characteristics, followed by a very low level (23.9%), moderate level (16.4%), no problems at all (10.4%), respectively and the rest were few percentage of all sample respondents who have level of problem at high (6.0%) and very high (6.0%).

The item which suffer greatest average scores and top level of problem occurred through “Work constraints make me bored, tired or fatigue” (2.63 ± 1.36, Moderate level), followed by problem about “Multi-stepped of work make me into trouble” (2.42 ± 1.38, Low level) and “Not clearly identify the role and responsibilities make me work harder than other colleague” (2.21 ± 1.43, Low level), respectively and the rest had very low level of problem that concerned about “I am always happy with my jobs even though under time pressure or hard work” (1.42±1.03) and “I have been working as expected” (1.37±1.04), as shown in table 4.6

Table 4.5 Attitude towards job characteristics

Level of problem (Mean±SD)	Frequency (n)	Percentage (%)
Very high problem (4.40±0.00)	2	3.0
High problem (3.60±0.28)	2	3.0
Moderate problem (2.84±0.20)	11	16.4
Low problem (2.17±0.21)	29	43.3
Very low problem (1.30±0.25)	16	23.9
No any problem (0.54±0.825)	7	10.4
Overall level (2.01±0.88)	**67**	**100**

Table 4.6 Level of problem

Items	Agreement level (n (%))						Mean	SD	Level of Problem
	Disagree	Least Agree	Fair Agree	Moderate Agree	Very Agree	Strongly Agree			
Work constraints make me bored, tired or fatigue.	5 (7.5)	10 (14.9)	12 (17.9)	24 (35.8)	10 (14.9)	6 (9)	2.63	1.36	Moderate
Multi-stepped of work make me into trouble.	9 (13.4)	10 (15.0)	8 (11.9)	26 (38.8)	12 (17.9)	2 (3)	2.42	1.38	Low
Not clearly identify the role and responsibilities make me work harder than other colleague.	14 (20.9)	4 (6)	17 (25.3)	20 (29.9)	10 (14.9)	2 (3)	2.21	1.43	Low
I am always happy with my jobs even though under time pressure or hard work.	2 (3)	1 (1.5)	2 (3)	23 (34.3)	29 (43.3)	10 (14.9)	1.42	1.03	Very low
I have been working as expected.	3 (4.5)	1 (1.5)	1 (1.5)	14 (20.9)	42 (62.6)	6 (9)	1.37	1.04	Very low

4.1.6 Attitude towards living offshore

Data concerning attitude towards living offshore are presented in table 4.7 displayed average scores of 2.37 ± 0.63. Almost 76.1% of all sample respondents had moderate satisfaction level regarding their attitudes towards living offshore, followed by a low to the dissatisfaction level (17.9%) and the rest were 6% of all sample respondents who had high to very high satisfaction level.

To obtain the average score of “Room conditions are appropriate” (1.99 ± 0.95, Moderate satisfaction level) and “The space occupied inside rooms have sufficient and appropriate.” (2.06 ± 0.89, Moderate level) were considered to offer the higher satisfaction levels than the living conditions of “Room facilities are not sufficient and suitable use.” (2.69 ± 1.14, Low level) and “Inconvenience or no privacy in the room.” (2.75 ± 1.04, Low level), as shown in table 4.8

Table 4.7 Attitude towards living offshore

Satisfaction level (Mean±SD)	Frequency (n)	Percentage (%)
Dissatisfaction (4.50±0.00)	1	1.5
Very low (3.88±0.18)	2	3.0
Low (2.86±0.22)	9	13.4
Moderate (2.31±0.22)	51	76.1
High (1.50±0.00)	1	1.5
Very high (0.42±0.14)	3	4.5
Overall (2.37±0.63)	**67**	**100**

Table 4.8 Living conditions

Question	Agreement level (n (%))						Mean	SD	Satisfaction Level
	Disagree	Least Agree	Fair Agree	Moderate Agree	Very Agree	Strongly Agree			
Inconvenience or no privacy in the room.	3 (4.5)	4 (6.0)	14 (20.9)	34 (50.7)	10 (14.9)	2 (3.0)	2.75	1.04	Low
Room facilities are not sufficient and suitable use.	4 (6.0)	7 (10.4)	10 (14.9)	33 (49.3)	11 (16.4)	2 (3.0)	2.69	1.14	Low
The space occupied inside rooms have sufficient and appropriate.	1 (1.5)	2 (3.0)	13 (19.4)	38 (56.7)	10 (14.9)	3 (4.5)	2.06	0.89	Moderate
Room conditions are appropriate.	3 (4.5)	1 (1.5)	4 (6.0)	47 (70.1)	8 (11.9)	4 (6.0)	1.99	0.95	Moderate

4.1.7 The attitude towards rig recreational area

Data concerning attitudes towards rig recreational areas are presented in table 4.9, displayed average scores of 2.37 ± 0.63. Almost 67.2% of all sample respondents had moderate satisfaction level regarding their attitudes towards the rig recreation area, followed by a low to the dissatisfaction level (22.4%) and the rest were 10.4 of all sample respondents who had high and very high satisfaction level (10.4%). For the average score comparisons between each condition of rig recreational and overall recreation, the average score of “A number of equipment or other facilities are sufficient for users.” (1.93 ± 0.93, Moderate satisfaction level) and the “Size of rig

recreational area appropriates for users." (1.97 ± 0.95, Moderate level) were considered to offer greater satisfaction level than the condition for "Inconvenience usage inside the rig recreational area." (2.73 ± 1.05, Low level) and "Bad condition, uncleanliness and damage of equipment or other facilities inside recreational area cause no motivation to use the service." (2.81 ± 0.80, Low level), and this was due to those first 2 conditions having average scores lower than the overall, as shown in table 4.10

Table 4.9 Attitude towards rig recreational area

Satisfaction level (Mean±SD)	Frequency (n)	Percentage (%)
Dissatisfaction (4.25±0.00)	2	3.0
Very low (3.50±0.00)	2	3.0
Low (2.89±0.13)	11	16.4
Moderate (2.27±0.27)	45	67.2
High (1.33±0.20)	6	9.0
Very high (0.50±0.00)	1	1.4
Overall (2.37±0.63)	**67**	**100**

Table 4.10 Condition of rig recreational area

Items	Agreement level (n (%))						Mean	SD	Satisfaction Level
	Disagree	Least Agree	Fair Agree	Moderate Agree	Very Agree	Strongly Agree			
Bad condition, uncleanliness and damage of equipment or other facilities inside recreational area cause no motivation to use the service.	1 (1.5)	1 (1.5)	18 (26.9)	39 (58.1)	6 (9.0)	2 (3.0)	2.81	0.80	Low
Inconvenience usage inside the rig recreational area.	4 (6.0)	3 (4.5)	13 (19.4)	36 (53.7)	9 (13.4)	2 (3.0)	2.73	1.05	Low
Size of rig recreational area appropriates for users.	3 (4.5)	1 (1.5)	7 (10.4)	37 (55.2)	18 (26.9)	1 (1.5)	1.97	0.95	Moderate
A number of equipment or other facilities are sufficient for users.	0 (0.0)	4 (6.0)	12 (17.9)	28 (41.8)	21 (31.3)	2 (3.0)	1.93	0.93	Moderate

4.1.8 The attitude towards rig communication system with people onshore

Rig communication systems include telephone, teleconference, and internet system which the sample can use the service in order to contact outside peoples, both at work and outwork via the provided system in the office, moreover the internet system also provide and available use in the accommodation area. Data concerning attitudes towards a rig communication system with people onshore are presented in table 4.11, displaying average scores of 2.52 ± 0.84. Almost 43.3% of all sample respondents had moderate satisfaction level regarding their attitudes towards rig communication system with people onshore, followed by a low to the dissatisfaction level (41.9%) and the rest were level of high to very high (14.8%).

For the average score comparisons between each individual condition of the rig communication systems and the overall, the average scores of “Communication tools are in good condition without damaged.” (2.19 ± 1.02, Moderate satisfaction level, Moderate level) and “Communication tools are easily accessible and available by user.” (2.28 ± 1.08) were considered to offer greater satisfaction levels than the condition of the “Communication tools are inadequate to meet the demand.” (3.09 ± 1.24, Low level), as showed in table 4.12.

Table 4.11 Attitude towards rig communication system with people on shore

Satisfaction level (Mean±SD)	Frequency (n)	Percentage (%)
Dissatisfaction (4.67±0.39)	4	6.0
Very low (3.75±0.17)	4	6.0
Low (2.85±0.27)	20	29.9
Moderate (2.24±0.15)	29	43.3
High (1.41±0.28)	9	13.4
Very high (067±0.00)	1	1.4
Overall (2.52±0.84)	**67**	**100**

Table 4.12 Condition of rig communication system

Question	Agreement level (n (%))						Mean	SD	Satisfaction Level
	Disagree	Least Agree	Fair Agree	Moderate Agree	Very Agree	Strongly Agree			
Communication tools are inadequate to meet the demand.	2 (3.0)	8 (11.9)	4 (6.0)	29 (43.3)	16 (23.9)	8 (11.9)	3.09	1.24	Low
Communication tools are easily accessible and available by user.	3 (4.5)	6 (9.0)	13 (19.3)	32 (47.8)	11 (16.4)	2 (3.0)	2.28	1.08	Moderate
Communication tools are in good condition without damaged.	2 (3.0)	6 (9.0)	11 (16.4)	33 (49.2)	14 (20.9)	1 (1.5)	2.19	1.02	Moderate

4.2 Evaluation of the Occupational stress level

The evaluation of results concerning occupational stress levels was measured by using the offshore stress questionnaire[6], and overall and 32 questions result is presented in Table 4.13 The results displayed that the average score of occupational stress was 2.07 ± 1.01 and most sample respondents were experienced with moderate to low stress level at 59.8%, followed by least to no stress level (32.8%) and The rest that has fewer sample respondents were experienced from stress between high to extreme level (7.4%), as shown in Figure 4.4.

Concerning the 32 questions which led to occupational stress occurring amongst the sample respondents. The stress factors[9] could be divided and ranked as follows: 1) Role stress, 2) Stress intrinsic to the job, 3) Being in the organizational structure and climate, 4) Career stress and 5) Home/work interface, respectively as shown in Table 4.13.

The top ranked stress factor was role stress (2.44±1.15) as the result of making mistakes (3.00±1.67) came in the first caused of stress. The stress intrinsic to the job (1.92±1.12) was the second stress factor caused by work overload (2.39±1.29), followed by stress factor of being in the organizational structure and climate (1.58±1.18) which caused by the unsympathetic boss (1.70±1.39), career stress (1.46±0.75) caused by the threat of job loss (2.79±1.76) and home/work interface (1.43±1.38) caused by job characteristics and family relationship (1.54±1.50), respectively.

Table 4.13 the causes of stress

The causes of Stress divided by stress factor and level (Mean±SD)	Categorized by each level (n (%))						Average Stress Level
	No	Least	Low	Moderate	High	Extreme	
(1) Role stress (2.44±1.15)	**7 (10.4)**	**9 (13.5)**	**12 (17.9)**	**21 (31.3)**	**17 (25.4)**	**1 (1.5)**	**Low**
Making mistakes (3.00±1.67)	10 (14.9)	5 (7.5)	5 (7.5)	14 (20.9)	21 (31.3)	12 (17.9)	Moderate
Relationships with colleagues (2.73±1.61)	10 (14.9)	9 (13.4)	3 (4.5)	19 (28.4)	19 (28.4)	7 (10.4)	Moderate
Relationships with bosses (2.67±1.54)	10 (14.9)	8 (11.9)	4 (6.0)	22 (32.8)	18 (26.9)	5 (7.5)	Moderate
Work under time pressure (2.48±1.43)	8 (11.9)	10 (14.9)	11 (16.4)	23 (34.3)	10 (14.9)	5 (7.5)	Low
Relationships and coordination with head office staff (2.40±1.54)	14 (20.9)	5 (7.5)	8 (11.9)	23 (34.3)	14 (20.9)	3 (4.5)	Low
The company's managing people or crew change management (2.00±1.54)	19 (28.4)	7 (10.4)	8 (11.9)	23 (34.3)	8 (11.9)	2 (3.0)	Low
New technology or complicated mechanisms of machine operation (1.82±1.38)	18 (26.9)	10 (14.9)	11 (16.4)	22 (31.8)	6 (9.0)	0 (0.0)	Low
(2) Stress intrinsic to the job (1.92±1.12)	**13 (19.4)**	**14 (20.8)**	**17 (25.4)**	**20 (29.9)**	**1 (1.5)**	**2 (3.0)**	**Low**
Work Overload (2.39±1.29)	9 (13.4)	6 (9.0)	14 (20.9)	28 (41.8)	8 (11.9)	2 (3.0)	Low
Work under load (2.27±1.33)	11 (16.4)	5 (7.5)	18 (26.9)	23 (34.4)	8 (11.9)	2 (3.0)	Low
Travelling during onshore and offshore times (2.15±1.51)	14 (20.9)	11 (16.4)	8 (11.9)	22 (32.8)	9 (13.4)	3 (4.5)	Low
Work overtime/Long working hours (2.06±1.52)	18 (26.9)	6 (9.0)	10 (14.9)	21 (31.3)	11 (16.4)	1 (1.5)	Low
Work inspiration and motivation (2.01±1.57)	17 (25.4)	11 (16.4)	10 (14.9)	14 (20.9)	13 (19.4)	2 (3.0)	Low
Demands of work and private life (1.67±1.49)	20 (29.9)	16 (23.9)	8 (11.9)	13 (19.4)	9 (13.4)	1 (1.5)	Least
Lower levels of competency or knowledge about role and responsibilities (1.67±1.41)	23 (34.3)	6 (9.0)	12 (17.9)	23 (34.3)	2 (3.0)	1 (1.5)	Least
Higher levels of competency/ knowledge than required duties (1.60±1.47)	26 (38.8)	7 (10.4)	7 (10.4)	22 (32.8)	5 (7.5)	0 (0.0)	Least
Feeling undervalued (1.43±1.52)	29 (43.3)	7 (10.4)	14 (20.9)	9 (13.4)	6 (9.0)	2 (3.0)	Least
(3) Being in the organizational structure and climate (1.58±1.18)	**21 (31.3**	**10 (15.0)**	**22 (31.8)**	**11 (16.4)**	**2 (3.0)**	**1 (1.5)**	**Least**
Unsympathetic boss (1.70±1.39)	22 (32.8)	4 (6.0)	19 (28.4)	17 (25.4)	4 (6.0)	1 (1.5)	Low
Work with incompetent boss (1.60±1.37)	21 (31.3)	12 (17.9)	13 (19.4)	15 (22.4)	6 (9.0)	0 (0.0)	Least
Meeting attendance (1.52±1.38)	21 (31.3)	15 (22,4)	12 (17.9)	15 (22.4)	2 (3.0)	2 (3.0)	Least
The debrief meeting attendance (1.48±1.43)	25 (37.3)	11 (16.4)	12 (17.9)	13 (19.4)	5 (7.5)	1 (1.5)	Least
(4) Career stress (1.46±0.75)	**14 (20.9)**	**24 (35.8)**	**26 (38.8)**	**3 (4.5)**	**0 (0.0)**	**0 (0.0)**	**Least**
Threat of job loss (2.79±1.76)	13 (19.4)	3 (4.5)	9 (13.4)	17 (25.4)	10 14.9)	15 (22.4)	Moderate
Key performance indicators (KPI) related to compensation (2.66±1.53)	10 (14.9)	6 (9.0)	9 (13.4)	20 (29.9)	16 (23.9)	6 (9.0)	Moderate

Table 4.13 the causes of stress (Continued)

The causes of stress divided by stress factor and level (Mean±SD)	Categorized by each level (n (%))						Average Stress Level
	No	Least	Low	Moderate	High	Extreme	
Rate of pay or sufficient salary	13	6	7	17	18	6	Moderat
(2.58±1.64)	(19.4)	(9.0)	(10.4)	(25.4)	(26.9)	(9.0)	e
Promotional prospects and increases in salary	12	8	8	20	12	7	Low
(2.49±1.61)	(17.9)	(11.9)	(11.9)	(29.9)	(17.9)	(10.4)	
Training attendance & skills improvement	14	3	16	24	5	5	Low
(2.27±1.47)	(20.9)	(4.5)	(23.9)	(35.8)	(7.5)	(7.5)	
Skills in international language	14	7	11	22	10	3	Low
(2.24±1.50)	(20.9)	(10.4)	(16.4)	(32.8)	(14.9)	(4.5)	
Unrealistic objectives & targets	14	8	10	28	5	2	Low
(2.12±1.40)	(20.9)	(11.9)	(14.9)	(41.8)	7.5)	(3.0)	
Company welfare, benefits and the management system	18	6	10	22	7	4	Low
(2.09±1.57)	(26.9)	(9.0)	(14.9)	(32.8)	(10.4)	(6.0)	
Competition for promotion	18	3	15	24	4	3	Low
(2.03±1.47)	(26.9)	(4.5)	(22.4)	(35.8)	(6.0)	(4.5)	
In-house or public training attendance	29	8	10	15	4	1	Least
(1.40±1.46)	(43.3)	(11.9)	(14.9)	(22.4)	(6.0)	(1.5)	
(5) Home/work interface.(1.43±1.38)	**25**	**17**	**9**	**9**	**5**	**2**	**Least**
	(37.3)	**(25.4)**	**(13.4)**	**(13.4)**	**(7.5)**	**(3.0)**	
Job characteristics and family relationships	22	18	7	11	7	2	Least
(1.54±1.50)	(32.8)	(26.9)	(10.4)	(16.7)	(10.4)	(3.0)	
Family, partner and friend attitudes about the job	29	12	9	12	2	3	Least
(1.33±1.48)	(43.3)	(17.9)	(13.4)	(17.9)	(3.0)	(4.5)	
Overalls stress level	**9**	**13**	**20**	**20**	**3**	**2**	Low
(2.07±1.01)	**(13.4)**	**(19.4)**	**(29.9)**	**(29.9)**	**(4.4)**	**(3.0)**	

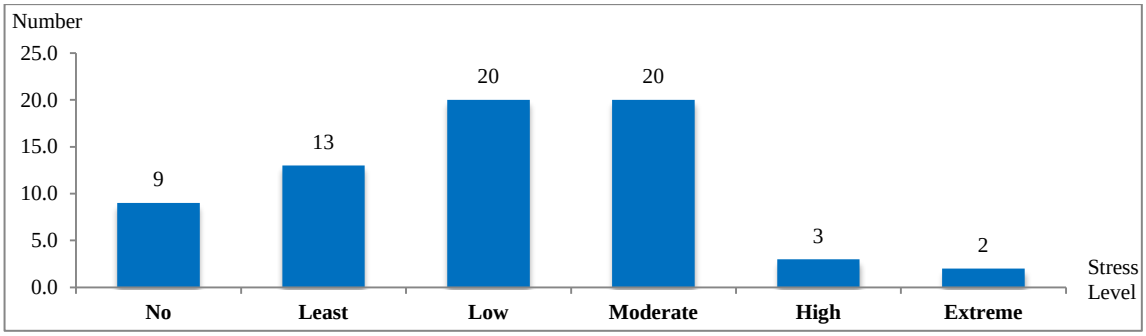


Figure 4.4 The occupational stress levels (n)

4.3 Evaluation of the sleep quality level of the Pittsburgh Sleep Quality Index (PSQI).

The evaluation of results concerning sleep quality level was measured by using the PSQI, and the results displayed in table 4.14. The sleep quality levels displaying the PSQI global scores of greater than five indicate poor sleep quality and

scores lower than or equal to five indicate good sleep quality. The results displayed that the mean score of sleep quality is 6.04 ± 3.90 or that the average of the sample respondents experience poor sleep quality. The proportion of the sample respondents that had poor sleep quality (8.91±3.16) was higher than good sleep quality (2.91±1.42) by 52.2% and 47.8%.

Table 4.14 Result of the sleep quality level

Sleep Quality Level (Mean±SD)	**Frequency (n)**	**Percentage (%)**
Poor sleep quality (8.91±3.16)	35	52.2
Good sleep quality (2.91±1.42)	32	47.8
Overall (6.04±3902)	**67**	**100**

This questionnaire also shown the sleep habits of all sample respondents are described, as follows;

The number of minutes used to fall asleep of all sample respondents have been described that median of time that all sample respondents used to fall asleep was 30 minutes. Most sample respondents spent about 16 to 30 minutes (59.7%) to fall asleep, followed by a group of less than or equal 15 minutes (25.4%), 31 to 60 minutes (13.4%), and more than 60 minutes (1.5%), respectively, as shown in Table 4.15.

Table 4.15 The number of minute used to fall asleep.

Time (Minute)	**Frequency(n)**	**Percentage (%)**
≤ 15	17	25.4
16 – 30	40	59.7
31 – 60	9	13.4
> 60	1	1.5
	Median = 30**,** Q1 = 15, Q3 = 30, Min - Max = 0 - 120	

The actual sleep duration of all sample respondents has been described that the median of sleep duration was 7 hours per day. Most sample respondents had an actual sleep durations more than 7 hours per day (34.3%), followed by a group of 6

to 7 hours per day (32.3%), 5 to 6 hours (28.4%) and less than 5 hours (4.5%), respectively, as shown in table 4.16

Table 4.16 Actual sleep duration

Time (Hour per day)	Frequency(n)	Percentage (%)
>7	23	34.3
6 – 7	22	32.8
5 – 6	19	28.4
<5	3	4.5
	Median = 7, Q1 = 6, Q3=8, Min – Max = 2 - 10	

Trouble of sleep for all sample respondents has been described that the highest percentage of the sample who perceived the trouble with sleeping more than 1 time per week which occurred from their 'getting up to use the bathroom' (38.8%), followed by 'waking up in the middle of the night or too early' (35.8%), 'cannot get to sleep within 30 minutes' (34.3%), 'feel too cold' (26.9%), 'coughing or loud snoring' (17.9%), 'feel too hot' (16.4%), 'experiencing pain' (14.9%) and 'have bad dreams' (10.5) during their sleep respectively, as shown in Table 4.17

Table 4.17 Trouble of sleep

Subject	Categorized by times per week (n (%))			
	Never	< 1	1 – 2	≥ 3
Getting up to use the bathroom	29(43.3)	12(17.9)	18(26.9)	8(11.9)
Waking up in the middle of the night or too early	31(46.3)	12(17.9)	14(20.9)	10(14.9)
Cannot get to sleep within 30 minutes	37(55.2)	7(10.5)	14(20.9)	9(13.4)
Feel too cold	38(56.7)	11(16.4)	10(15.0)	8(11.9)
Coughing or loud snoring	41(61.2)	14(20.9)	5(7.5)	7(10.4)
Feel too hot	44(65.7)	12(17.9)	7(10.4)	4(6.0)
Experiencing pain	45(67.2)	12(17.9)	7(10.4)	3(4.5)
Have bad dreams	48(71.6)	12(17.9)	3(4.5)	4(6.0)

Usage of sleeping-pill for all samples have been described that most sample did not take the sleeping-pill during the past month when they worked on the

rig (77.6%), followed by they took the sleeping-pill less than 1 time per week (13.4%), and more than one time per week (9%), as shown in table 4.18

Table 4.18 Usage of sleeping-pill

Subject	Categorized by times per week (n (%))			
	Never	< 1	1 – 2	≥ 3
Usage of sleeping-pill	52 (77.6)	9 (13.4)	3 (4.5)	3 (4.5)

Dysfunctional Body or Mind During Working Time: All sample respondents described that most sample respondents did not experience trouble staying awake during daily activities (67.2%), followed by having trouble sleeping around 1 to 2 times per week (16.4%), less than 1 time (10.4%), and more than 3 times (6%), respectively. Concerning problems about maintaining enthusiasm to get things done, 53.7% of all sample respondents had no problem with this at all, followed by very slight (31.3%), somewhat (9%) and very big problems (6%), respectively, as shown in Table 4.19

Table 4.19 Dysfunctional Body or Mind during Working Time

Subject	Categorized by times per week (n (%))			
	Never	< 1	1 – 2	≥ 3
Trouble staying awake during daily activities	45 (67.2)	7 (10.4)	11 (16.4)	4 (6.0)
Maintaining enthusiasm to get things done	36 (53.7)	21 (31.3)	6 (9.0)	4 (6.0)

Evaluation of Individual Sleep Quality: Most samples had fairly good individual sleep quality (50.8%), followed by very good (32.8%), fairly bad (10.4%), and very bad (6%), respectively, as shown in Table 4.20

Table 4.20 Evaluation of individual sleep quality

Subject	Categorized by each level (n (%))			
	Very good	**Fairly good**	**Fairly bad**	**Very bad**
Individual Sleep Quality	22 (32.8)	34 (50.8)	7 (10.4)	4 (6.0)

Sleep Habits for Shift Work from 06.00 – 18.00 hours: 35 samples or 52.2% of all sample respondents worked on this shift. Most sample respondents went to bed before or at 21.00 hours (60.0%), and the rest went later than 21.00 hours (40%); 65.7% of sample respondents spent approximately 16 to 30 minutes to fall asleep. Most sample respondents woke up later than 04.00 hours (94.3%), and concerning actual sleep duration 37.1% of all sample respondents experienced sleep durations of circa 6 to 7 hours per day, followed by more than 7 hours (34.5%), 5 to 6 hours (22.9%), and less than 5 hours (5.7%), respectively with the minimum 2 hours and the maximum 8 hours, as shown in Table 4.21

Sleep habit for shift work from 12.00 – 124.00 hours, 17 samples or 25.4% of all sample respondents worked on this shift. Most sample respondents went to bed time before or at 21.00 hours (94.1%); 47.1% of sample respondents spent time approximately 16 to 30 minutes to fall asleep. Most sample respondents woke up later than 10.00 hours (58.8%), and concerning actual sleep duration 47.1% of all sample respondents experienced sleep durations more than 7 hours per day, followed by 5 to 6 hours (29.4%), 6 to 7 hours (23.5%) and no one had slept duration less than 5 hours, respectively; the minimum 5 hours and the maximum 10 hours, as shown in table 4.21

Sleep habit for shift work from 18.00 – 06.00 hours, 15 samples or 22.4% of all sample respondents worked on this shift. Most sample respondents went to bed before or at 08.00 hours (80.0%); 60.0% of sample respondents spent approximately 16 to 30 minutes to fall asleep. Most sample respondents woke up later than 16.00 hours (60.0%), and concerning actual sleep duration 40.0% of all sample respondents experienced sleep durations of circa 5 to 6 hours per day, followed by 6 to 7 hours (33.3%), more than 7 hours (20.0%), and less than 5 hours (6.7%), respectively; the minimum 4 hours and the maximum 8 hours, as shown in table 4.21

Table 4.21 Sleep habit in each shift work

Subject	Categorized by Shift ((n (%))		
	06.00 – 18.00 hrs.	**12.00 – 24.00 hrs.**	**18.00 – 06.00 hrs.**
Number of sample size	35	17	15
Number of minute used to fall asleep.			
≤ 15	9 (25.7)	7 (41.2)	1 (6.7)

Table 4.21 Sleep habit in each shift work (Continued)

Subject	Categorized by Shift ((n (%))					
	06.00 – 18.00 hrs.		**12.00 – 24.00 hrs.**		**18.00 – 06.00 hrs.**	
16 – 30	23 (65.7)		8 (47.1)		9 (60.0)	
31 – 60	3 (8.6)		2 (11.8)		4 (26.7)	
>60	0 (0.00)		0 (0.00)		1 (6.7)	
	Median = 30		Median = 20		Median = 30,	
	Min - Max = 0 – 60		Min- Max = 5 - 60,		Min-Min = 10-120,	
Actual sleep duration (Hour per day)						
> 7	12 (34.3)		8 (47.1)		3 (20.0)	
6 – 7	13 (37.1)		4 (23.5)		5 (33.3)	
5 – 6	8 (22.9)		5 (29.4)		6 (40.0)	
< 5	2 (5.7)		0 (0.00)		1 (6.7)	
	Median = 7		Median = 7		Median = 7	
	Min-Max = 2 - 8		Min – Max = 5 - 10		Min-Max = 4-8	
Usual time to go to bed.	Before or equal 21.00 hrs.	Late more than 21.00 hrs.	Before or equal 02.00 hrs.	Late more than 02.00 hrs.	Before or equal 08.00 hrs.	Late more than 08.00 hrs.
	21 (60.0)	14 (400)	16 (94.1)	1 (5.9)	12 (80.0)	3 (20.0)
Usually wake up times	Before or equal 04.00 hrs.	Late more than 04.00 hrs.	Before or equal 10.00 hrs.	Late more than 10.00 hrs.	Before or equal 16.00 hrs.	Late more than 16.00 hrs.
	2 (5.7)	33 (97.3)	7 (10)	10 (58.8)	9 (60.0)	6 (40.0)

4.4 The relationship of personal factors, working factors, offshore environmental factors and the occupational stress level.

The relationships between results were analyzed by using the Chi-square test and are presented in table 4.22, as follows;

Age and the occupational stress levels: The results displayed that age is not significantly associated with the stress at 95% CI. (P = 0.729)

Income and the occupational stress levels: The results displayed that income is not significantly associated with the stress at 95% CI. (P = 0.122)

Education level and the occupational stress levels: The results displayed that education level is not significantly associated with the stress at 95% CI. (P = 0.981)

Work experience and the occupational stress levels: The results displayed that work experience is not significantly associated with the stress at 95% CI. (P = 0.921)

Smoking behavior and the occupational stress levels: The results displayed that smoking behavior is not significantly associated with the stress at 95% CI. (P = 0.400)

Caffeine consumption and the occupational stress levels: The results displayed that caffeine consumption is not significantly associated with the stress at 95% CI. (P = 0.630)

Attitude towards job characteristic and the occupational stress levels: The results displayed that attitude towards job characteristic is significantly associated with the stress at 95% CI (P = <0.001). There was found that 80.2% of all sample respondents who experienced the moderate to very high levels of problem will suffer the stress at moderate to extreme levels and 75.0% of all sample respondents who experienced no to low level of problems will suffer the stress at no to low levels. The relationship described that higher levels of problem conformed to the level of occupational stress, increased as well.

Attitude towards living offshore and the occupational stress levels: The results displayed that attitude towards living offshore is not significantly associated with the stress at 95% CI. (P = 0.330)

Attitude towards rig recreational area and the occupational stress levels: The results displayed that attitude towards rig recreational area is significantly associated with the stress at 95% CI (P = <0.001). There was found that 80.0% of all sample respondents who experienced low satisfaction to dissatisfaction levels will suffer the stress at moderate to extreme levels and 75.0% of all sample respondents who experienced the moderate to very high satisfaction level will suffer the stress at no to low levels. The relationship described that higher levels of satisfaction conformed to the level of occupational stress, decreased conversely.

Attitude towards rig communication system with people onshore and the occupational stress levels: The results displayed that attitude towards a rig communication system with people on shore is significantly associated with the stress at 95% CI (P = 0.020). There was found that 53.6% of all sample respondents who

experienced low satisfaction to dissatisfaction levels will suffer the stress at moderate to extreme levels and 74.4% of all sample respondents who experienced the moderate to very high satisfaction level will suffer the stress at no to low levels. The relationship described that higher levels of satisfaction conformed to the level of occupational stress, decreased conversely.

Shift work and the occupational stress levels: The results displayed that shift work is not significantly associated with the stress at 95% CI. (P = 0.592)

Working hour and the occupational stress levels: The results displayed that the working hour is not significantly associated with the stress at 95% CI. (P = 0.682)

Current working position and the occupational stress levels: The results displayed that current working position is not significantly associated with the stress at 95% CI. (P = 0.670)

Drilling rig type and the occupational stress levels: The results displayed that drilling rig type is not significantly associated with the stress at 95% CI. (P = 0.061)

Living Offshore and the occupational Stress Levels: The results displayed that accommodation arrangements (p = 0.927), number of occupants (p = 0.229), room sizes (p = 0.610) and average space occupied per person (p = 0.122) are not significantly associated with the stress at 95% CI.

Table 4.22 Relationship results between factors and occupational stress level

Variables	Occupational Stress Level (n (%))		Value (χ^2)	P-Value
	Extreme to Moderate	Low to No		
Personal Factors				
Age (Year)			0.120	0.729
< 34	13 (39.4)	20 (60.6)		
≥ 34	12 (35.3)	22 (64.7)		
Income (Thai Baht)			2.394	0.122
< 80,000	15 (46.9)	17 (53.1)		
≥ 80,000	10 (28.6)	25 (71.4)		
Education level			0.001	0.981
Lower than Bachelor Degree	9 (37.5)	15 (62.5)		
Higher than Bachelor Degree	16 (37.2)	27 (62.8)		
Work experience (Year)			0.010	0.921
< 6	11 (36.7)	19 (63.3)		
≥ 6	14 (37.8)	23 (62.2)		

Table 4.22 Relationship results between factors and occupational stress level (Continued)

Variables	Occupational Stress Level (n (%))		Value (χ^2)	P-Value
	Extreme to Moderate	Low to No		
Smoking behavior			0.708	0.400
Non-Smoking	18 (40.9)	26 (59.51)		
Smoking	7 (30.4)	16 (69.6)		
Caffeine consumption			0.233	0.630
Not drink	6 (42.9)	8 (57.1)		
Drink	19 (35.8)	34 (64.2)		
Attitude towards job characteristic – Level of job problem			15.056	<0.001*
Very High to Moderate	12 (80.20)	3 (20.0)		
Low to No	13 (25.0)	39 (75.0)		
Attitude towards living offshore – Satisfaction Level			0.948	0.330
Dissatisfaction to Low	3 (25.0)	9 (75.0)		
Moderate to Very high	22 (40.0)	33 (60.0)		
Attitude towards rig recreational area – Satisfaction Level			15.056	<0.001*
Dissatisfaction to Low	12 (80.0)	3 (20.0)		
Moderate to Very high	13 (25.0)	39 (75.0)		
Attitude towards rig communication system with people onshore – Satisfaction Level			5.436	0.020*
Dissatisfaction to Low	15 (53.6)	13 (46.4)		
Moderate to Very high	10 (25.6)	29 (74.4)		
Work Factors				
Shift work*			0.287	0.592
Day Time	12 (34.3)	23 (65.7)		
Night Time	13 (40.6)	19 (59.4)		
Working hours			0.168	0.682
12 hours (No OT)	12 (40.0)	18 (60.0)		
>12 hours (OT)	13 (35.1)	24 (64.9)		
Current working position			0.181	0.670
Crew Chief	9 (40.9)	13 (59.1)		
Engineer	16 (35.6)	29 (64.4)		
Offshore Environmental Factors				
Drilling Rig types			3.502	0.061
Jack Up Rig	10 (55.6)	8 (44.4)		
Tender Rig	15 (30.6)	34 (69.4)		
Living offshore;				
Accommodation arrangement			0.008	0.927
Permanent accommodation	14 (36.8)	24 (63.2)		
Temporary accommodation	11 (37.9)	18 (62.1)		
Number of occupants (Person: room)			1.446	0.229
< 4	8 (50.0)	8 (50.0)		
≥ 4	17 (33.3)	34 (66.7)		

Table 4.22 Relationship results between factors and occupational stress level (Continued)

Variables	Occupational Stress Level (n (%))		Value (χ^2)	P-Value
	Extreme to Moderate	Low to No		
Room Size (m*m: room)			0.260	0.610
<3 x 3 m	8 (42.1)	11 (57.9)		
≥3 x 3 m	17 (35.4)	31 (64.6)		
Average space occupied per person (m2: person)			2.394	0.122
≤2.25	10 (28.6)	25 (71.4)		
>2.25	15 (46.9)	17 (53.1)		

*Statistically Significant

*Shift work: Day Time means 06.00 – 18.00 hrs., Night time means 12.00 – 24.00 hrs. and 18.00 – 06.00 hrs.

4.5 The relationship of the personal factors, the work factors and the offshore environmental factors and the sleep quality level.

The relationships between results were analyzed using the Chi-square test and are presented in table 4.23, as follows;

Age and the sleep quality levels: The results displayed that age is not significantly associated with the sleep quality levels at 95% CI. (P = 0.544)

Income and the sleep quality levels: The results displayed that income is not significantly associated with the sleep quality levels at 95% CI. (P = 0.530)

Education level and the sleep quality levels: The results displayed that education level is not significantly associated with the sleep quality levels at 95% CI. (P = 0.813)

Work experience and the sleep quality levels: The results displayed that work experience is not significantly associated with the sleep quality levels at 95% CI. (P = 0.071)

Smoking behavior and the sleep quality levels: The results displayed that smoking behavior is not significantly associated with the sleep quality levels at 95% CI. (P = 0.299)

Caffeine consumption and the sleep quality levels: The results displayed that caffeine consumption is significantly associated with the sleep quality levels at 95% CI. (P = 0.009)

There can be described that 78.6% of all sample respondents who did not drink anything containing caffeine will have good sleep quality levels and in conversely, 60.4% of all sample respondents who drank beverages containing caffeine will suffer poor sleep quality level.

Attitude towards job characteristic and the sleep quality levels: The results displayed that attitude towards job characteristic is not significantly associated with the sleep quality levels at 95% CI. (P = 0.204)

Attitude towards living offshore and the sleep quality levels: The results displayed that attitude towards living offshore is not significantly associated with the sleep quality levels at 95% CI. (P = 0.148)

Attitude towards rig recreational area and the sleep quality levels: The results displayed that attitude towards rig recreational area is not significantly associated with the sleep quality levels at 95% CI. (P = 0.063)

Attitude towards rig communication system with people onshore and the sleep quality levels: The results displayed that attitude towards rig communication system with people onshore is not significantly associated with the sleep quality levels at 95% CI. (P = 0.239)

Shift work and the sleep quality levels: The results displayed that shift work is not significantly associated with the sleep quality levels at 95% CI. (P = 0.108)

Working hours and the sleep quality levels: The results displayed that working hour is not significantly associated with the sleep quality levels at 95% CI. (P = 0.514)

Current working position and the sleep quality levels: The results displayed that current working position is not significantly associated with the sleep quality levels at 95% CI. (P = 0.437)

Drilling rig type and the sleep quality levels: The results displayed that drilling rig type is not significantly associated with the sleep quality levels at 95% CI. (P = 0.742)

Living offshore and the sleep quality levels: The results displayed that the accommodation arrangement (p = 0.570), number of occupants (p = 0.713), room

sizes (p = 0.616) and average space occupied per person (p = 0.263) are not significantly associated with the sleep quality levels at 95% CI.

Table 4.23 Relationship results between factors and sleep quality levels

Variables	Sleep Quality level (n (%))		Value (χ^2)	P-Value
	Poor (≥ 5)	Good (<5)		
Personal Factors				
Age (Year)			**0.367**	**0.544**
< 34	16 (48.5)	17 (51.5)		
≥ 34	19 (55.9)	15 (44.1)		
Income (Thai Baht)			**0.395**	**0.530**
< 80,000	18 (56.3)	14 (43.7)		
≥ 80,000	17 (48.6)	18 (51.4)		
Education level			**0.056**	**0.813**
Lower than Bachelor Degree	13 (54.2)	11 (45.8)		
Higher than Bachelor Degree or equal	22 (51.2)	21 (48.8)		
Work experience (Year)			**3.261**	**0.071**
< 6	12 (40.0)	18 (60.0)		
≥ 6	23 (62.2)	14 (37.8)		
Smoking behavior			**1.077**	**0.299**
Non-Smoking	25 (56.8)	19 (43.2)		
Smoking	10 (43.5)	13 (56.5)		
Caffeine consumption			**6.734**	**0.009***
Not drink	3 (21.4)	11 (78.6)		
Drink	32 (60.4)	21 (39.6)		
Attitude towards job characteristic – Level of job problem			**1.612**	**0.204**
Very High to Moderate	10 (66.7)	5 (33.3)		
Low to No	25 (48.1)	27 (51.9)		
Attitude towards living offshore – Satisfaction Level			**2.094**	**0.148**
Dissatisfaction to Low	4 (33.3)	8 (66.7)		
Moderate to Very high	31 (56.4)	24 (43.6)		
Attitude towards rig recreational area – Satisfaction Level			**3.447**	**0.063**
Dissatisfaction to Low	11 (73.3)	4 (26.7)		
Moderate to Very high	24 (46.2)	28 (53.8)		
Attitude towards rig communication system with people on shore – Satisfaction Level			**1.385**	**0.239**
Dissatisfaction to Low	17 (60.7)	11 (39.3)		
Moderate to Very high	18 (46.2)	21 (53.8)		

Table 4.23 Relationship results between factors and sleep quality levels (Continued)

Variables	Occupational Stress Score (n (%))		Value (χ^2)	P-Value
	Poor (≥ 5)	Good (<5)		
Work Factors				
Shift work*			**2.585**	**0.108**
Day Time	15 (42.9)	20 (57.1)		
Night Time	20 (62.5)	12 (37.5)		
Working hours			**0.427**	**0.514**
12 hours (No OT)	17 (56.7)	13 (43.3)		
>12 hours (OT)	18 (48.6)	19 (51.4)		
Current working position			**0.604**	**0.437**
Crew Chief	10 (45.5)	12 (54.5)		
Engineer	25 (55.6)	20 (44.4)		
Offshore Environmental Factors				
Drilling Rig types			**0.109**	**0.742**
Jack Up Rig	10 (55.6)	8 (44.4)		
Tender Rig	25 (51.0)	24 (49.0)		
Living offshore;				
Accommodation arrangement			**0.322**	**0.570**
Permanent accommodation	21 (55.3)	17 (44.7)		
Temporary accommodation	14 (48.3)	15 (51.7)		
Number of occupants (Person: room)			**0.136**	**0.713**
< 4	9 (56.3)	7 (43.7)		
≥ 4	26 (51.0)	25 (49.0)		
Room Size (m*m: room)			**0.252**	**0.616**
<3 x 3 m	9 (47.4)	10 (52.6)		
≥3 x 3 m	26 (54.2)	22 (45.8)		
Average space occupied per person (m2: person)			**1.250**	**0.263**
≤2.25	16 (45.7)	19 (54.3)		
>2.25	19 (59.4)	13 (40.6)		

*Statistically Significant

*Shift work: Day Time means 06.00 – 18.00 hrs., Night time means 12.00 – 24.00 hrs. and 18.00 – 06.00 hrs.

CHAPTER V
DISCUSSION

The objective of this survey research is to study the factors related to the levels of occupational stress and sleep quality of offshore workers in a machinery services company of this case study. The questionnaire results from 67 samples were collected between October 2014 and December 2014. The discussion consists of the following topics:

5.1 Research discussion

5.2 Limitation of research

5.1 Research discussion

5.1.1 Occupational stress levels: According to this study, 19.4% of the samples had least level of occupational stress, while 29.9% had low levels of stress and 29.9% had a moderate level of stress. Of the remaining percentage with stress, 4.4% had high levels of stress and 3% had an extreme level of stress. 13.4% of samples did not report any stress or reported having no occupational stress.

The results of the stress level analysis demonstrated that 31.8% of all sample respondents who had either no stress or the lowest level of stress may have given false replies which do not correspond to reality. They may be sluggish and lack motivation in their lives and work, and thus the motivation programs should be applied to this sample group. Conversely the sample respondents who experienced high and extreme levels of stress (7.4%) can potentially face serious or critical problems/ illness and there may be remarkable changes in their bodies, minds and behavior, which may be harmful to their job when working in the high risk offshore work environment.[25] Therefore, high risk jobs should not be assigned to them until the level of the problem is decreased. The company should conduct periodic monitoring of their level of stress.

The findings about the causes of stress were divided by stress factors.[9] The results found that making mistakes was the top ranked cause of stress in terms of role stress factors and had the top average scoring (3.00±1.67) for the overall cause of stress, with 49.2% of all sample respondents having high and extreme levels of stress. Work overload was the top ranked cause of stress in terms of stress intrinsic to the job stress factors, with 14.9% reporting high and extreme stress levels. Job characteristics and family relationship (home/work interface stress factors), unsympathetic boss (being in the organizational structure and climate stress factors), and the threat of job loss (career stress factors) were also top ranked causes for each stress factor (with 13.4%, 7.5% and 0.0% for high to extreme stress levels, respectively). Although no one had high and extreme stress levels for the threat of job loss, it was found that this was second in average scoring for overall causes of stress and 25.4% of all sample respondents had a moderate stress level. This result demonstrated that the sample respondents started reacting to stress, so this cause must be eliminated or prevented before it leads to higher levels of stress.[25, 26] These findings demonstrated that even if most of the sample respondents had low or moderate stress levels, they still suffered from stress, while there were also other causes and factors that could cause stress, such as the offshore environment and the need for work to be operated continuously on the rigs, etc.

Such findings were in accordance with the research of Anne et al. (2013)[6] who studied stress, fatigue, situation awareness and safety in offshore workers, as well as the research results and data collection of Rundmo et al. (1998)[5] who studied organizational factors, safety attitudes and workloads of offshore workers. Their research revealed that the stress levels of offshore workers on the rigs were similar and that the characteristics of work on the rig involved substantial risk, which could cause occupational stress and might cause the sample respondents to become less aware of their surroundings, which could lead to accidents, near misses or unsafe behavior. [6]

As for the prevention and reduction of stress, the company should provide a safe working environment and other remedies, such as implementing an appropriate system for work administration, human resources improvement and management of offshore workers, the organization of recreational activities and the implementation of

a communication system with people onshore, etc. All these measures are aimed to build confidence and security at work, to reduce the distance between those who work on the rigs and those onshore, as well as to create a feeling of satisfaction and safety in employees' work and lives. Therefore, they help to alleviate or reduce the workers' stress.

5.1.2 Sleep quality level: The results of the study indicated that the Pittsburgh sleep quality indices (PSQI) of 47.8% of the samples were lower than or equal to 5. This group was considered the sample respondents good sleep quality. The remaining 52.2% had PSQI of higher than 5. They were considered the sample respondents poor sleep quality. All the sample respondents had an average PSQI of 6.04±3.90, which meant that they had poor sleep quality associated with the inability to fall asleep immediately after going to bed. The sample respondents took about 30 minutes to fall asleep after lying down. Other causes included the samples needing to get up to use the bathroom and the issue of waking up in the middle of the night or waking up too early.

This finding is in accordance with the study of Siri et al. (2013)[13] who studied sleep and health in offshore workers before and after a two week period offshore. Their results discovered that most of the offshore workers had poor sleep quality and an average PSQI of 5.7±2.7. It could be said that the workers who worked on the rigs had similar sleep quality. The results could also be compared to those of studies that researched other industries or other types of work with irregular working environments and high risks similar to working on the rigs, such as the study of Napakkawat Buathong (2003)[34] who studied the quality of sleep and mental health among cabin attendants. Those results illustrated that most cabin attendants had poor sleep quality, as well. It could be explained that people whose jobs required working in irregular environments and with high risk as the result of the characteristics of the work or environment, such as in the air or away from the shore, tended to have poor sleep quality.

5.1.3 Factors and relationship with the occupational stress levels

Income: According to the results of the study, the sample respondents had average incomes of 89,470.90 ± 39,880.53 Baht per person per month. Most sample respondents had incomes between 60,000 and 80,000 Baht, followed by those who had incomes of more than 100,000 Baht. It was also discovered that income was not related to the level of occupational stress in this group of sample respondents. Such a finding is not in accordance with the research of Pimporn Rung-aya (2005)[42] which studies about factor affecting stress of bus drivers" or the research of Suchada Kamsuchart (2012)[68] who studied the stress level of professional nurses and association with selected factors. Their results demonstrated that income was related to the level of stress.

When comparing the incomes of the samples in this study with the data of Thai population's incomes in 2013, which showed that Thai citizens had an average monthly income per person of 8,180 Baht and an average monthly income per household of 24,528 Baht (The National Statistical Office (2013)) [43], it was discovered that the average incomes that the samples in this study received each month were considerably higher. As a result, the samples likely did not have income problems. Besides, the company in this study provided additional securities or extra income for the samples, further reducing the effects or minimizing the impact in terms of income. For example, the company raised the offshore daily pay for the samples while working on the rigs. Foods and utilities were provided for workers on the rigs without additional charge. Additionally, the company covered the expenses of transportation to work, food and accommodations in the event the samples had to wait onshore before getting into the rigs. Moreover, the company offered normal salaries to the samples when they stayed onshore. According to data from the questionnaires regarding income, it was discovered that some of the samples had other sources of earnings while staying onshore apart from the remuneration received from the oil rig company. The reason why the samples earned high incomes might be partly because they worked in the oil and gas industry, which involved work and environments with high risks. As a result, they received high remuneration, supplemental income and additional securities compared to Thai citizens in other occupations and businesses.

Education level: Most of the samples completed at least a bachelor's degree or above, while some had lower education levels. When considering the levels

of occupational stress for the samples in both groups, it was discovered that their levels of stress were not different and that both groups tended to have lower levels of stress. Such a finding is in accordance with the research of Surasawadee Tanudsintumm (2007)[51] who studied job stress among polishing workers using Demand-Control Model whose results pointed out that the education level of most polishing workers was primary education and that those with higher education levels had lower stress.

When considering and comparing the results of the samples in this case study with the results of the polishing workers, it was discovered that all of the samples who worked on the rigs had higher education levels than primary education, although a relationship between education level and stress level was not found. Still, the stress level tended to decrease when the education level was higher. In addition, the company in this case study had a policy of employing samples who were equipped with degrees in engineering, which was higher than primary education, or those who were experienced with machinery. The company also had a regulation to provide training for all samples about the operation, the control and the safety system in working with machines so that they were informed and knowledgeable about how to control the machines safely before being sent to work on the rigs. As a result, the level of education was not related to the level of stress from work in this case.

Attitude towards job characteristics: This research studied the attitude of the sample respondents towards job characteristics on the rigs in terms of topics related to the working process, responsibilities, workload, happiness, tiredness and expectations towards work. According to the study's results, it was discovered that the factors which had an impact on attitudes towards job characteristics were those arising from work constraints which made the respondents feel bored, tired or fatigued, which could lead to occupational stress. Therefore, attitude towards job characteristics was related to the level of stress.

Additionally, when considering each aspect of job characteristics, it could be seen that when respondents faced greater problems in their work, their level of stress would also rise. Such a result is in accordance with the research of Valerie J. Sutherland and Cary L. Cooper (1996)[9] who studied stress prevention in offshore environments. Their results indicated that offshore workers who faced increased

problems with job characteristics could become stressful and exhibit lower performance levels.

It could be explained that the characteristics of the sample respondents' work involved the operation, inspection and maintenance of heavy machinery on the rigs. Such machinery had complicated working processes and was operated in a high-risk environment. When the machinery worked abnormally during operation, the sample respondents had to perform repairs immediately to support the offshore production, which was normally operated 24 hours per day. When such a problem occurred, the sample respondents might have become worried, which could lead to stress.

Attitude towards rig communication system with people on shore: This section demonstrated satisfaction levels towards the convenience, availability, sufficiency and quality of communication equipment. It was found that the level of satisfaction in this factor was related to the level of occupational stress and that most respondents were moderately satisfied with the communications systems. Inadequate communication tools were the top ranked problem which had an impact on their satisfaction which could lead to occupational stress. Such a result is in accordance with the research results of Valerie J. Sutherland and Cary L. Cooper (1996)[9] who studied stress prevention in offshore environments and found that communication with onshore people was associated with stress. Knowledge about the situation of the family, other relatives or significant people on shore could affect employees' work performance and safety at work.

It could be explained that the offshore work characteristics are on a rotational schedule of 28 days of work on an offshore drilling rig, and 28 days of onshore rest. During the 28 days of work on the rig in a location away from family, relatives or other significant people, communication is limited and constrained by the communication system. Therefore, the communication tools on the rigs must be made available and a sufficient number of communication tools must be available for use. This solution would help the workers feel relaxed after their hard work on the rig. They could also catch up with the news from outsiders, which would allow them to reduce worries and anxiety, leading to stress relief about their issues.

Drilling rig types: According to the results of the study, the drilling rig types were not related to the level of stress. This result is not in accordance with the data collection and data analysis of Valerie J. Sutherland and Cary L. Cooper (1996)[9] who studied stress prevention in offshore environments. They concluded that the drilling rig type would affect the level of occupational stress.

It could be explained that the sample respondents in this case study had the same type of work in terms of working processes and job characteristics, including having to stay in high risk work environments with a limited area, both for working and living accommodation, even though these two types of rig are different in terms of structure and stability. These reasons might explain why the results of this study were not in accordance with those of other researchers.

Other factors: Other factors included age, Smoking behavior, caffeine consumption, work experience, working hours, shift work, current work position and living offshore in the topics that were related to accommodation arrangement, number of occupants, room size and the average space occupied inside the accommodation, as well as the factors concerning attitude towards living offshore and rig recreational areas.

According to this research, a relationship between these factors and the level of occupational stress was not found. The literature review did not show the study of such a relationship among the groups of offshore worker who service the machines and equipment operated in the treatment and improvement of the quality of drilling mud process on the offshore drilling rig, either. It could be considered that these factors might be indirect factors, which did not directly affect or did not have a direct relationship with the level of occupational stress. Thus, this research is cross-sectional using the questionnaire as a research instrument. At a certain period, it was not possible to find a relationship between the variables.

5.1.4 Factors and relationship with the sleep quality levels

Income: The results of the study revealed that the proportion of samples with good sleep quality whose incomes were lower than 80,000 Baht per month was around 0.8 times higher than that of samples with poor sleep quality. Moreover, the proportion of sample respondents who incomes were higher than 80,000 Baht per

month and who had good sleep quality was higher than those who had poor sleep quality. It should be noted that the proportions of both groups of samples were few differences. In addition, the results of the study about the relationship revealed that income was not related to sleep quality. This was because the samples who worked in this type of business had quite high incomes, as explained earlier in topic number 5.1.3 regarding income was not related to the level of occupational stress.

Caffeine consumption: The study revealed that caffeine consumption was related to sleep quality. It was discovered that the sample respondents who did not consume drinks with caffeine had good sleep quality, while the respondents who did consume drinks with caffeine had poor sleep quality.

It could be explained that most respondents would drink no more than 4 cups of beverages containing caffeine per day on average, which equalled the consumption of drinks with no more than 200 mg of caffeine per day according to the announcement of the Ministry of Public Health (Volume 214) B.E. 2543 which allowed no more than 50 mg of caffeine in one unit of drink (Food and Drug Administration, 2004).[48] These data demonstrated that the amount of caffeine that the sample respondents consumed was high enough to activate the body and reduce sleeplessness while working, in accordance with the study and data collection of Pattareeya Babun (2008).[49] She concluded that the consumption of beverages with 40 mg of caffeine and above stimulate the body and ward off drowsiness and this result is also in accordance with the research of Napakkawat Buathong (2003)[34] who studied the quality of sleep and mental health among cabin attendants. The results pointed out that the consumption of drinks with caffeine was related to sleep quality. The cabin attendants had to work in a high-risk environment and not on the ground, just like the sample respondents who worked on the offshore drilling rigs. Further, most of the cabin attendants who consumed beverages containing caffeine had poor sleep quality. Therefore, it could be said that caffeine consumption affected sleep quality.

Shift work: According to the results of the study, it was indicated that shift work was not related to the sleep quality levels. The relationship results found that the proportion of sample respondents who performed their shift work during the daytime (06.00 – 18.00 hrs.) and who had good sleep quality was higher than those who had poor sleep quality at 57.1% and 42.9% respectively. Conversely, the

respondents who worked during the night time (12.00 – 24.00 hrs. and 18.00 – 06.00 hrs.) had a much higher proportion of poor sleep quality at 62.5%, compared to 37.5% who had good quality sleep. Moreover, it was also discovered that most sample respondents who worked across different shifts had similar periods of sleep, averaging more than 7 hours of sleep per day, compared to the sleeping hours of normal adults of 7-8 hours a day. [35] Such data indicated that the hours of sleep for most sample respondents were normal.

This finding is in accordance with the research of Siri et al. (2013)[13] who studied sleep and health in offshore workers during the periods before and after a two week period offshore. Their results showed that the proportions of sleep quality of 2 groups of workers who worked during the day shift and the night shift were similar and revealed few differences.

Drilling rig types: The results of the study indicated that the drilling rig types were not related to sleep quality, as the proportions of good sleep quality and poor sleep quality of the sample respondents who worked on the jack-up drilling rigs and the tender drilling rigs were similar. Such a finding is not in accordance with the research of Steffen Hope et al. (2010)[59] who studied the associations between sleep, risk and safety climates in offshore workers. Their results revealed that the rigs' risk and safety systems were related to sleep quality.

It could be explained that the sample respondents had more than 6 months of work experience on the offshore drilling rigs and the company in this case study would not move the respondents to work on different types of rigs. Such results demonstrated that the sample respondents were familiar with the environment on the offshore drilling rigs and accommodation. As a result, they were less worried, generally unaffected and able to fall asleep more easily. [55]

Other Factors: Other factors included age, education level, smoking behavior, work experience, working hours, current work position, living offshore and attitude towards job characteristics, living offshore, rig recreational area and rig communication system with people on shore.

According to this research, a relationship between these factors and the level of sleep quality was not found. The literature review did not show the study of such a relationship between the groups of offshore workers who service the machines

and equipment operated in the treatment and improvement of the quality of drilling mud process on the offshore drilling rig, either. It could be considered that these factors might be indirect factors, which did not directly affect or did not have a direct relationship with the level of sleep quality. Thus, this research is cross-sectional research using the questionnaire as a research instrument. At a certain period, it was not possible to find a relationship between the variables.

5.2 Limitation of research

5.2.1 This research is a cross-sectional study, which conducted a survey at a certain period. Therefore, there were limitations in finding causal correlation since it might not be possible to conclude that the related factors were the real causes. However, it revealed the prevalence of the population in this case study, which could be used as preliminary data for further studies.

5.2.2 In the answering of the subjective questionnaire, some sample respondents might have exaggerated or downplayed their answers to avoid possible consequences after completing the questionnaire. Furthermore, their answers may have been dependent upon the period of time and their feelings when they were answering the questionnaire. The researcher solved this problem by explaining the objectives of the research and reassuring the respondents that the information in this case study would be voluntary. Further, there would not be any effect upon their employment or the company for which the employees were working.

5.2.3 The researcher collected data from respondents who worked on the offshore drilling rigs continuously until the completion of one hitch, or 28 days working on the rig, which was an element of the inclusion criteria. During the data collection, the researcher did not record the weather conditions, which was one of the factors that may cause the respondents to be unable to work on the rigs continuously and may also affect the level of occupational stress and sleep quality according to the criteria set up, especially in the case of bad weather such as storms, strong waves and wind. These factors cannot be controlled. The researcher solved this problem by checking with the crew chief and the rig coordinators about absences due to bad weather conditions which made it inappropriate for working on the rigs. If there was

any rig that stopped operating to wait for bad weather to pass, the researcher would collect data from respondents in the next hitch instead.

5.2.4 It may not be possible to use the results of this case study to refer to or compare with the characteristics of work in other businesses since this research is a case study of occupational stress and sleep quality for offshore workers in a machinery service company. Therefore, the factors considered in this case study may be unique according to the characteristics of work and business specific to this case, such as the factors concerning drilling rig type, etc.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This case study used questionnaires to collect the data from 67 offshore workers who work in one machinery service company. The 67 participants returned completed questionnaires within the required timeframe during the last week of their hitch with 100% completion. The age of participants ranged from 21 to 56 years old, with a median age of 34 years. They had an income between 40,000 to 260,000 Thai Baht per month, with a median of 80,000 Thai Baht. Most of the participants graduated with a bachelor's degree (53.8%). They had worked offshore for periods ranging from 10 months to 24 years, with a median of 6 years. 65.7% did not smoke and 79.1% drank caffeine beverages. Most participants had low levels of attitude towards job characteristics (43.3% of all sample respondents) and the same result of moderate satisfaction levels were recorded for attitude towards living offshore (76.1% of all sample respondents), rig recreational areas (67.2% of all sample respondents) and the rig communication system with people on shore (43.3% of all sample respondents). The proportion of sample respondents holding the position of engineer was higher than the crew chief position (67.2% and 32.8% respectively). Most participants in daytime shift, the shift from 06.00 – 18.00 hours (52.2%). Working hours varied from 12 to 15 hours per day with an average of 12.42±0.63 hours. The proportion of sample respondents who worked on the tender rig was higher than the jack up rig (73.1% and 26.9% respectively). 56.7% of sample respondents had their own bedroom or permanent accommodation. Most shared a bedroom with three others (65.7%), 41.8% lived in a room space of 9 m^2 and the median size of the space occupied was 2.25 m^2 per person.

The overall occupational stress was low level (2.07±1.01). Most sample respondents (59.8%) suffered occupational stress between low (29.9%) to moderate (29.9%) levels and 7.4% of all sample respondents suffered stress between high

(4.4%) to extreme (3.0%) levels. The top ranked cause of stress in each of the stress factor categories were making mistakes (role stress), followed by work overload (stress intrinsic to the job), unsympathetic boss (being in the organizational structure and climate), the threat of job loss (career stress) and job characteristics and family relationship (home/work interface).

The overall sleep quality was poor (6.04±3.90). The proportion of sample respondents who had poor sleep quality was higher than those who had good sleep quality (52.2% and 47.8%, respectively). The participants had a median actual sleep duration of 7 hours per day and most of them took around 16 - 30 minutes to fall asleep (59.7%). Most participants had no problems in keeping awake during daily activities and had enough energy to get the job done (67.2% and 53.7%, respectively) without the need for sleeping pills (77.6%). The top three problems that caused sleep reduction were using the bathroom during the night, waking up in the middle of the night or waking early and not getting back to sleep within 30 minutes, respectively.

The relationship analysis indicated that three variables were related concerning the occupational stress levels at p-value < 0.05; attitude towards job characteristics, attitude towards the rig recreational area, and attitude towards the rig communication system with people on shore. The result of the relationship between attitude towards job characteristics, rig recreational area, the rig communication system with people on shore and the occupational stress level showed that higher levels of problems stemming from their job characteristics would also result in increased levels of occupational stress, whereas higher levels of satisfaction served in contrast to decrease the level of stress.

For the relationship analysis between the factors and the sleep quality levels, it indicated that one variable was significantly related concerning the sleep quality levels at p-value < 0.05; caffeine consumption. The relationships between caffeine consumption and sleep quality levels showed that the participants who drank beverages containing caffeine suffered poorer sleep quality than those who did not consume caffeine.

6.2 Recommendations

6.2.1 A recommendation from this study: According to the results helps to understand the levels of occupational stress and sleep quality, including the relationships between the related factors and the levels of occupational stress and sleep quality. The research would recommend as follows;

6.2.1.1 To use the research findings as a guideline to implement preventive and corrective measures or avoid the exploratory factors which are related to occupational stress and problem which affect sleep quality, including enabling the company to implement an appropriate system for administration and human resource management of offshore workers.

6.2.1.2 The company should pay attention to the group of offshore workers who showed no stress or low level occupational stress so that the motivation program could be applied to them. Conversely, the sample respondents who suffer from high to extreme levels of occupational stress should be allocated work which has a lower risk, and the company should periodically monitor their levels of stress.

6.2.1.3 An efficient work procedure with close consultants (on call specialist) should be provided in order to decrease employees' work pressure, work mistakes and stress, which can occur during abnormal operation and maintenance of machinery, and to increase the sleep quality level.

6.2.1.4 Good conditions and adequate facilities inside the rig recreation area and an adequately functioning communication system should be offered in order to increase the workers' level of satisfaction, to release stress after periods of hard work, and to reduce the negative effects which arise from the onshore relation factor.

6.2.1.5 Training and communication concerning occupational stress reduction and the enhancement of sleep quality among offshore workers should be arranged to reduce anxiety on the offshore drilling rigs and mitigate factors which can lead to occupational stress and sleep problems, such as caffeine consumption. This would help to build good attitudes towards the job characteristics and the offshore environment.

6.2.1 Recommendation for future studies.

6.2.2.1 The relationships between occupational stress, sleep quality and factors of all other occupations such as roustabouts, drillers and crane operators who work together on the offshore rigs should be studied in order to ensure that the research results are representative of all offshore work disciplines.

6.2.2.2 Scientific instruments to measure the quantitative data should be used together with the questionnaire. For example, cortisol hormone changes, blood pressure levels and heart beat measurements relate to stress. Polysomnography (PSG) and body movement measurements relate to sleep quality. These measurements may help to reduce deviation or defects from the questionnaire answers.

6.2.2.3 The results of factors related to occupational stress and sleep quality should be measured and compared between time ‘off’, onshore and time ‘on’, offshore in order to study the different characteristics and results in these two opposite periods. Results from each period should be measured and compared with the results of the study in order to test whether the results obtained are similar.

6.2.2.4 The relationships between occupational stress and sleep quality compared with the rates of incidents, near misses and unsafe behavior should also be focused on for future studies.

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APPENDICES

APPENDIX A
LIST OF EXPERTS

The experts who examined the questionnaire about the content coverage, content validity and reliability, sentences and use of language and its suitability for sampling as follows,

1. Dr. Malinee Sombhopcharoen
   Lecturer at Department of Health and Behavioral Sciences
   Faculty of Public Health
   Mahidol University

2. Mr. Pakorn Leksakul
   HSE Specialist
   Chevron Thailand Exploration and Production, Ltd.

3. Asso. Prof. Chaermchai Chaikittiporn
   Department of Occupational Health and Safety
   Faculty of Public Health
   Mahidol University

APPENDIX B

CERTIFICATE OF APPROVAL ETHICAL

Certificate of Approval
Ethical Review Committee for Human Research
Faculty of Public Health, Mahidol University

COA. No. MUPH 2014-134

Protocol Title :	FACTOR RELATED TO OCCUPATIONAL STRESS AND SLEEP QUALITY: CASE STUDY OF OFFSHORE WORKER OF MACHINERY SERVICE COMPANY
Protocol No. :	84/2557
Principal Investigator :	Miss Paktaranart Ruankaew
Affiliation :	Master of Science Program in Industrial Hygiene and Safety Faculty of Public Health, Mahidol University
Approval Includes :	1. Project proposal 2. Information sheet 3. Informed consent form 4. Data collection form/Program or Activity plan
Date of Approval :	23 June 2014
Date of Expiration :	22 June 2015

The aforementioned project have been reviewed and approved according to the Declaration of Helsinki by Ethical Review Committee for Human Research, Faculty of Public Health, Mahidol University.

S. Nanthamongkolchai

(Assoc. Prof. Dr. Sutham Nanthamongkolchai)
Chairman of Ethical Review Committee for Human Research

(Assoc. Prof. Dr. Phitaya Charupoonphol)
Dean of Faculty of Public Health

420/1 Rajvithi Road, Bangkok, Thailand 10400
Tel. (662) 3548543-9 ext. 1127, 7404 Fax. (662) 6409854

APPENDIX C
INFORMED CONSENT FORM

เอกสาร จธ 4

หนังสือยินยอมตนให้ทำการวิจัย

โครงการวิจัยเรื่อง ปัจจัยที่มีความสัมพันธ์กับความเครียดจากการทำงาน และ คุณภาพการนอนหลับ: กรณีศึกษาพนักงาน ผู้ให้บริการทางด้านเครื่องจักรบนแท่นขุดเจาะน้ำมันนอกชายฝั่งของบริษัทแห่งหนึ่ง

วันที่ให้คำยินยอม วันที่ ..... เดือน ..... พ.ศ. .....
ข้าพเจ้า (นาย/นาง/นางสาว) .....ขอทำหนังสือนี้ไว้ต่อหัวหน้าโครงการเพื่อเป็นหลักฐานแสดงว่า

ข้อ 1. ก่อนลงนามในใบยินยอมตนให้ทำการวิจัยนี้ ข้าพเจ้าได้รับการอธิบายจากผู้วิจัยให้ทราบถึงวัตถุประสงค์ของการวิจัย กิจกรรมการวิจัย ความเสี่ยง รวมทั้งประโยชน์ที่อาจเกิดขึ้นจากการวิจัย อย่างละเอียด และมีความเข้าใจดีแล้ว

ข้อ 2. ผู้วิจัยรับรองว่าจะตอบคำถามต่างๆ ที่ข้าพเจ้าสงสัยด้วยความเต็มใจ ไม่ปิดบัง ซ่อนเร้น จนข้าพเจ้าพอใจ

ข้อ 3. ข้าพเจ้าเข้าร่วมโครงการวิจัยนี้โดยสมัครใจ และข้าพเจ้ามีสิทธิที่จะบอกเลิกการเข้าร่วมในโครงการวิจัยนี้เมื่อใดก็ได้ และการบอกเลิกการเข้าร่วมวิจัยนี้จะไม่มีผลกระทบต่อหน้าที่การงาน ชีวิตประจำวัน และสิทธิประโยชน์ใดๆ ที่ข้าพเจ้าจะพึงได้รับต่อไป

ข้อ 4. ผู้วิจัยรับรองว่า จะเก็บข้อมูลเฉพาะเกี่ยวกับตัวข้าพเจ้าเป็นความลับ และจะเปิดเผยได้เฉพาะในรูปที่เป็นสรุปผลการวิจัย การเปิดเผยข้อมูลเกี่ยวกับตัวข้าพเจ้าต่อหน่วยงานต่างๆ ที่เกี่ยวข้อง กระทำได้เฉพาะกรณีจำเป็นด้วยเหตุผลทางวิชาการเท่านั้น

ข้อ 5. ผู้วิจัยรับรองว่า หากมีข้อมูลเพิ่มเติมที่ส่งผลกระทบต่อการวิจัย ข้าพเจ้าจะได้รับการแจ้งให้ทราบทันทีโดยไม่ปิดบัง ซ่อนเร้น

ข้าพเจ้าได้อ่านข้อความข้างต้นแล้วมีความเข้าใจดีทุกประการ และได้ลงนามในใบยินยอมนี้ด้วยความเต็มใจ

ลงชื่อ .....ผู้เข้าร่วมการวิจัย
(.....)

ลงชื่อ ..... ผู้วิจัย
(นางสาว ภักตรนาฏ รื่นแก้ว)

Version 9 June 2014

คณะกรรมการพิจารณาเรื่องการ...
คณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล
COA. No. MUPH 2014-134
วันที่รับรอง 23 มิ.ย. 57

APPENDIX D
INSTRUMENTS IN THIS STUDY

แบบสอบถาม

เรื่อง : ปัจจัยที่มีความสัมพันธ์กับความเครียดจากการทำงาน และคุณภาพการนอนหลับ : กรณีศึกษาพนักงานผู้ให้บริการทางด้านเครื่องจักรบนแท่นขุดเจาะน้ำมันนอกชายฝั่งของบริษัทแห่งหนึ่ง

คำชี้แจง :

1. แบบสอบถามนี้เป็นส่วนหนึ่งของงานวิจัย ตามหลักสูตรปริญญาวิทยาศาสตร์มหาบัณฑิต สาขาวิชาสุขศาสตร์อุตสาหกรรมและความปลอดภัย (ภาคพิเศษ) คณะสาธารณสุขศาสตร์ มหาวิทยาลัยมหิดล
2. มีวัตถุประสงค์เพื่อใช้ในการศึกษาปัจจัยที่มีความสัมพันธ์กับความเครียดจากการทำงาน และคุณภาพการนอนหลับ
3. ทางผู้วิจัย จึงขอความร่วมมือจากท่าน ในการให้ข้อมูลในแบบสอบถาม ตามความเป็นจริงที่สอดคล้องกับตัวท่านมากที่สุด โดยข้อมูลที่ท่านได้ตอบคำถามนั้น ผู้วิจัยจะเก็บเป็นความลับและคำตอบของท่านจะไม่มีผลกระทบใดๆ ต่อท่านอย่างเด็ดขาด และทางผู้วิจัย ขอขอบพระคุณเป็นอย่างยิ่งที่ท่านตอบคำถามได้อย่างสมบูรณ์ ครบถ้วน
4. แบบสอบถามแบ่งออกเป็น 3 ส่วน ดังนี้

   ส่วนที่ 1 แบบสอบถามข้อมูลด้านส่วนบุคคล การทำงาน และสิ่งแวดล้อม 16 ข้อใหญ่

   ส่วนที่ 2 แบบสอบถามวัดระดับความเครียดจากการทำงาน จำนวน 32 ข้อ

   ส่วนที่ 3 แบบประเมินคุณภาพการนอนหลับของ Pittsburgh Sleep Quality Index (PSQI) จำนวน 9 ข้อ

แบบสอบถาม ส่วนที่ 1

แบบสอบถามข้อมูลส่วนบุคคล การทำงาน และสิ่งแวดล้อม

คำชี้แจง : ทำเครื่องหมาย / ลงในตาราง หรือเติมคำลงใน (_____) ให้ตรงกับความเป็นจริงของตัวท่านมากที่สุด โดยประเมินขณะที่ท่านทำงานบนแท่นใน 28 วันทำงานที่ผ่านมา

ข้อมูลส่วนบุคคล

1 อายุ : _____ ปี

2 รายได้ :

2.1 รายได้จากบริษัท เฉลี่ยต่อเดือน _____ บาท

2.2 รายได้อื่นๆ (ที่ไม่ได้รับจากบริษัทฯ เฉลี่ยต่อเดือน
เช่น งานพิเศษ หรือรายได้พิเศษที่ทำระหว่างพักอยู่บ้าน) _____ บาท

3 ระดับการศึกษาสูงสุด :

(_) มัธยมศึกษาตอนปลาย/ปวช. (_) อนุปริญญา/ปวส.

(_) ปริญญาตรี (_) สูงกว่าปริญญาตรี

4 ประสบการณ์การทำงาน :

4.1 ท่านเคยทำงาน Offshore มาแล้วกี่ปีก่อนที่เข้ามาทำงานกับบริษัทนี้ _____ ปี

4.2 ท่านทำงานกับบริษัทนี้มาแล้วกี่ปี _____ ปี

5 โรคประจำตัว :

(_) ไม่มี (_) มีโรคประจำตัว ระบุโรคข้างล่าง;

[_] โรคเบาหวาน [_] โรคระบบหมุนเวียนโลหิต/หัวใจ

[_] โรคระบบทางเดินหายใจ [_] โรคหอบหืด

[_] ระบบทางเดินปัสสาวะอักเสบ [_] อื่นๆ โปรดระบุ_____

6 จำนวนการสูบบุหรี่ :

โดยปกติท่านสูบบุหรี่หรือไม่

(_) ไม่สูบ (_) สูบ : ปริมาณการสูบเฉลี่ยกี่มวนต่อวัน _____ มวน

7. จำนวนการดื่มเครื่องดื่มที่มีคาเฟอีน เช่น ชา กาแฟ น้ำอัดลม เครื่องดื่มชูกำลัง เป็นต้น

โดยปกติท่านดื่มเครื่องดื่มที่มีคาเฟอีนหรือไม่

(_) ไม่ดื่ม (_) ดื่ม : ปริมาณการดื่มเฉลี่ยกี่แก้วต่อวัน _____ แก้ว

ข้อมูลด้านการทำงาน

8 กะการทำงาน :

(_) 06.00 – 18.00 น. (_) 12.00 – 24.00 น.

(_) 18.00 – 06.00 น. (_) อื่นๆโปรดระบุ (_____)

9 ระยะเวลาการทำงานในช่วง 28 วันทำงานที่ผ่านมา :

9.1 ท่านได้ทำงานล่วงเวลา (Overtime) หรือไม่

(_) ไม่ได้ทำ *(ข้ามไปทำข้อ 10 เลย)* (_) ทำ *(ทำข้อ 9.2 ต่อ)*

9.2 ในกรณีที่ท่านทำงานล่วงเวลา ;

A. ท่านทำงานล่วงเวลากี่วัน (_____) วัน

B. ท่านทำงานล่วงเวลาเฉลี่ยกี่ชั่วโมงต่อวัน (_____) ชั่วโมง : วัน

10 ตำแหน่งงานปัจจุบัน :

(_) หัวหน้างาน (Crew Chief/Lead) (_) วิศวกร (Engineer)

11 ทัศนคติต่อลักษณะงาน

คำชี้แจง : ทำเครื่องหมาย / ลงในตาราง ให้ตรงกับระดับความเห็นด้วย/ยอมรับตามความเป็นจริงที่ตรงกับตัวท่านมากที่สุด โดยประเมินขณะที่ท่านทำงานบนแท่นใน 28 วันทำงานที่ผ่านมา

คำถาม	ระดับความเห็นด้วย/ยอมรับ (/)					
	มากที่สุด	มาก	ปานกลาง	น้อย	น้อยมาก	ไม่เลย
11.1 ท่านได้ทำงานตามที่คาดหวัง หรือที่ต้องการ						
11.2 ท่านมีความสุขในการทำงานอยู่เสมอไม่ว่าจะทำงานในช่วงเวลาไหนหรือมีงานหนักเพียงใดก็ตาม						
11.3 ท่านรู้สึกเบื่อหน่าย หรือเหนื่อยล้า เมื่องานที่ทำมีแต่ปัญหาและอุปสรรค						
11.4 ไม่มีการแบ่งหน้าที่ความรับผิดชอบในการทำงานอย่างชัดเจน ทำให้ท่านต้องทำงานมากกว่า/เหนื่อยกว่าคนอื่น						
11.5 ลักษณะงานหรือกระบวนการทำงาน มีหลายขั้นตอนทำให้ยุ่งยาก						

อมูลด้านสิ่งแวดล้อม

12 ลักษณะแท่น :

(_) แบบยกขาตั้ง (Jack up rig) (_) แบบเทนเดอร์ (Tender)

13 ห้องพักบนแท่น :

13.1 การจัดการห้องพัก

(_) มีห้องพักประจำ (_) ไม่มีห้องพักประจำ

13.2 พื้นที่ครอบครองในห้องพัก

A. ขนาดห้องพัก *(กว้าง X ยาว)*

(_) 2 X 3 เมตร (_) 3 X 3 เมตร

(_) 4 X 4 เมตร (_) อื่นๆโปรดระบุ (_____)

B. จำนวนเพื่อนร่วมห้องของท่าน

(_) 2 คน ต่อ ห้อง (_) 4 คน ต่อ ห้อง (_) 6 คน ต่อ ห้อง

14 ทัศนคติต่อห้องพักบนแท่น

คำชี้แจง : ทำเครื่องหมาย / ลงในตาราง ให้ตรงกับระดับความเห็นด้วย/ยอมรับตามความเป็นจริงที่ตรงกับตัวท่านมากที่สุด โดยประเมินขณะที่ท่านทำงานบนแท่นใน 28 วันทำงานที่ผ่านมา

คำถาม	ระดับความเห็นด้วย/ยอมรับ (/)					
	มากที่สุด	มาก	ปานกลาง	น้อย	น้อยมาก	ไม่เลย
14.1 สภาพห้องพักที่ท่านพัก เช่น ความเก่า/ใหม่ กลิ่น หรืออื่นๆ นั้นมีความเหมาะสม						
14.2 ขนาดพื้นที่ใช้สอยในห้องพักของท่านมีความเพียงพอและเหมาะสม						
14.3 อุปกรณ์หรือสิ่งอำนวยความสะดวกภายในห้องพัก เช่น ทีวี เฟอร์นิเจอร์ มีจำนวนไม่เพียงพอหรือไม่เหมาะสมกับการใช้งาน						
14.4 ท่านไม่ได้รับความสะดวกสบาย หรือไม่มีความเป็นส่วนตัวในการใช้ห้องพัก						

15 ทัศนคติต่อพื้นที่พักผ่อนบนแท่น เช่น ห้องออกกำลังกาย ห้องดูหนัง เป็นต้น

15.1 โดยปกติท่านใช้บริการพื้นที่พักผ่อนที่แท่นจัดเตรียมไว้เพื่อให้พักผ่อน/ผ่อนคลายหรือไม่

(_) ไม่ใช้ *(ข้ามไปทำข้อ 15.3 เลย)* (_) ใช้ *(ทำข้อ 15.2 ต่อ)*

15.2 ในกรณีที่ท่านใช้บริการพื้นที่พักผ่อนที่แท่นจัดเตรียมไว้ ท่านใช้บริการกี่ครั้ง ต่อ สัปดาห์

(_) 1 - 2 ครั้ง: สัปดาห์ (_) 3 - 4 ครั้ง: สัปดาห์

(_) 5 - 6 ครั้ง: สัปดาห์ (_) ≥ 7 ครั้ง: สัปดาห์

15.3 ทัศนคติต่อพื้นที่พักผ่อนบนแท่น

คำชี้แจง : ทำเครื่องหมาย / ลงในตาราง ให้ตรงกับระดับความเห็นด้วย/ยอมรับตามความเป็นจริงที่ตรงกับตัวท่านมากที่สุด โดยประเมินขณะที่ท่านทำงานบนแท่นใน 28 วันทำงานที่ผ่านมา

คำถาม	ระดับความเห็นด้วย/ยอมรับ (/)					
	มากที่สุด	มาก	ปานกลาง	น้อย	น้อยมาก	ไม่เลย
15.3.1 ขนาดพื้นที่พักผ่อนมีความเหมาะสมกับจำนวนคนที่ใช้บริการ						
15.3.2 จำนวนอุปกรณ์หรือสิ่งอำนวยความสะดวกนั้นเพียงพอต่อการใช้บริการ						
15.3.3 พื้นที่ อุปกรณ์หรือสิ่งอำนวยความสะดวกนั้นสกปรก ไม่สะอาด ชำรุด ขาดการดูแล ทำให้ท่านขาดแรงจูงใจในการใช้งาน						
15.3.4 ท่านไม่ได้รับความสะดวกสบายในการใช้พื้นที่พักผ่อน (-)						

16 ทัศนคติต่อช่องทางการสื่อสารกับบุคคลภายนอกบนแท่น เช่น อินเตอร์เน็ต โทรศัพท์ เป็นต้น

16.1 โดยปกติท่านใช้อุปกรณ์สื่อสารกับบุคคลภายนอก เช่น ครอบครัว แฟน เพื่อน หลังเลิกงานหรือไม่

(_) ไม่ใช้ *(ข้ามไปทำข้อ 16.3 เลย)* (_) ใช้ *(ทำข้อ 16.2 ต่อ)*

16.2 ในกรณีที่ท่านใช้อุปกรณ์สื่อสารกับบุคคลภายนอก <u>ท่านใช้บริการกี่ครั้ง ต่อ สัปดาห์</u>

(_) 1 - 2 ครั้ง: สัปดาห์ (_) 3 - 4 ครั้ง: สัปดาห์

(_) 5 - 6 ครั้ง: สัปดาห์ (_) ≥ 7 ครั้ง: สัปดาห์

16.3 ทัศนคติต่อช่องทางการสื่อสารกับบุคคลภายนอกบนแท่น

คำชี้แจง : ทำเครื่องหมาย / ลงในตาราง ให้ตรงกับระดับความเห็นด้วย/ยอมรับตามความเป็นจริงที่ตรงกับตัวท่านมากที่สุด โดยประเมินขณะที่ท่านทำงานบนแท่นใน 28 วันทำงานที่ผ่านมา

คำถาม	ระดับความเห็นด้วย/ยอมรับ (/)					
	มากที่สุด	มาก	ปานกลาง	น้อย	น้อยมาก	ไม่เลย
16.3.1 ท่านสามารถเข้าถึงอุปกรณ์สื่อสารได้อย่างสะดวก						
16.3.2 อุปกรณ์สื่อสารมีความพร้อมใช้ ไม่ชำรุด						
16.3.3 ช่องทาง/อุปกรณ์การสื่อสารไม่เพียงพอต่อความต้องการใช้งาน						

แบบสอบถาม ส่วนที่ 2

แบบวัดระดับความเครียดจากการทำงานบนแท่น

คำชี้แจง : ทำเครื่องหมาย / ลงในช่องตาราง ให้ตรงกับระดับความเครียด/ความกังวลที่ท่านสัมผัสหรือได้รับตามคำถามในแต่ละข้อข้างล่างนี้ โดยประเมินขณะที่ท่านทำงานบนแท่นใน 28 วันทำงานที่ผ่านมา

ท่านมีความเครียด หรือ กังวล เกี่ยวกับเรื่องดังต่อไปนี้อยู่ในระดับใด	ระดับความเครียด/ความกังวล(/)					
	มากที่สุด	มาก	ปานกลาง	น้อย	น้อยมาก	ไม่เลย
1. ท่านเครียด เมื่อท่านรู้สึกเหนื่อย เนื่องจากท่านทำงานหรือรับผิดชอบงานมากเกินไป						
2. ท่านเครียด เมื่อท่านไม่ค่อยมีงานทำ						
3. งานที่ท่านทำนั้นต้องทำอย่างเร่งรีบเพื่อให้เสร็จตามกำหนด ทำให้ท่านเครียด						
4. ท่านเครียดเมื่อต้องเดินทางไปทำงานที่มีความลำบากในการเดินทาง เช่น ต้องต่อรถ ต่อเครื่องบิน รวมทั้งต้องไปให้ทันเวลาขึ้นรถ หรือขึ้นเครื่องบิน						
5.ท่านเครียดเมื่อต้องใช้เวลาในการทำงานเป็นระยะเวลานาน หรือต้องทำงานเกินเวลาปกติ (Overtime) เพื่อให้งานเสร็จ						
6.ท่านขาดกำลังใจหรือแรงจูงใจในการทำงาน ทำให้ท่านเครียด/กังวล						
7. ท่านเครียด/กังวลเมื่อต้องเข้าร่วมประชุม เช่น ประชุมก่อนเริ่มงาน ประชุมกับบริษัทอื่นๆ ที่ทำงานด้วยกัน						
8.ระบบการบริหารจัดการหรือสวัสดิการของบริษัทที่ท่านทำงานอยู่ไม่เป็นไปตามที่ท่านต้องการหรือที่ท่านคาดหวัง ทำให้ท่านเครียด						
9. ท่านกังวลเมื่อต้องทำงานกับเครื่องจักรที่มีกลไกการทำงานที่ยุ่งยากซับซ้อน						
10. ท่านกลัวตกงาน						
11. ท่านต้องแข่งขันกับเพื่อนร่วมงานในการสร้างผลงาน เพื่อหวังเลื่อนตำแหน่ง หรือได้เงินเดือนเพิ่ม						
12. ท่านเครียด/กังวล เพราะท่านมีความสามารถ/ความรู้น้อยกว่าหน้าที่ความรับผิดชอบในการทำงาน						
13. ท่านเบื่อหน่ายในการทำงาน เพราะท่านมีความสามารถหรือความรู้สูงเกินกว่าหน้าที่ความรับผิดชอบในการทำงาน						
14. ท่านไม่ได้รับการส่งเสริมหรือสนับสนุนในการเข้าร่วมอบรมเกี่ยวกับการทำงานเพื่อการพัฒนาตนเอง						

ท่านมีความเครียด หรือ กังวล เกี่ยวกับเรื่องดังต่อไปนี้อยู่ในระดับใด	ระดับความเครียด/ความกังวล(/)					
	มากที่สุด	มาก	ปานกลาง	น้อย	น้อยมาก	ไม่เลย
15. ท่านเครียด/กังวลเพราะท่านไม่เก่งหรือไม่มีความสามารถในการใช้ภาษา เพื่อใช้ในการพูดคุยกับเพื่อนร่วมงานหรือเจ้านายชาวต่างชาติ						
16. หัวหน้างานไม่สนใจหรือใส่ใจดูแลท่าน ทั้งเรื่องงาน/ส่วนตัว						
17. หัวหน้างานของท่านไม่มีความน่านับถือเชื่อถือ/ไม่สามารถให้คำปรึกษาหรือพึ่งพาอาศัยได้						
18. บริษัทจะเพิ่มเงินเดือน หรือขึ้นตำแหน่งให้ท่าน โดยวัดจากความสามารถ/ประสิทธิภาพการทำงาน						
19. บริษัทตั้งเป้าหมายในการทำงานของท่านเกินจริงหรือเกินความสามารถที่ท่านจะทำได้						
20. ครอบครัว/แฟน/เพื่อน ไม่เข้าใจลักษณะการทำงานของท่าน ทำให้เกิดปัญหาในครอบครัวหรือความสัมพันธ์						
21. ลักษณะการทำงานมีผลกระทบต่อความสัมพันธ์กับครอบครัว/แฟน/เพื่อน ของท่าน						
22. ปริมาณงานที่รับผิดชอบหรือลักษณะงานมีผลกระทบต่อชีวิตความเป็นอยู่ส่วนตัวของท่าน						
23. ความสัมพันธ์และการประสานงานกับเพื่อนร่วมงานของท่าน						
24. ความสัมพันธ์และการประสานงานกับหัวหน้างานของท่าน						
25. ความสัมพันธ์และการประสานงานกับพนักงานที่สำนักงานใหญ่						
26. ท่านมีความกังวลมากหากท่านทำงานผิดพลาด						
27. ท่านรู้สึกว่าตนเองไม่มีคุณค่าหรือไม่มีประโยชน์						
28. ท่านมีความกังวลต่อโอกาสในการเลื่อนตำแหน่งงานหรือเงินเดือนของท่าน						
29. ท่านมีความกังวลต่อความเพียงพอของรายได้/เงินเดือนที่ท่านได้รับ						
30. ท่านมีความกังวลต่อการจัดระบบคนทำงาน (Crew Change) ของบริษัท						
31. ท่านมีความกังวล เมื่อท่านเข้าร่วมประชุมหลังเลิกการทำงาน (Debrief)						
32. ท่านมีความกังวล เมื่อท่านเข้าอบรมร่วมกับเพื่อนร่วมงานคนอื่น/บริษัทอื่น						

แบบสอบถาม ส่วนที่ 3

แบบประเมินคุณภาพการนอนหลับ The Pittsburgh Sleep Quality Index (PSQI)

<u>คำชี้แจง</u> : ทำเครื่องหมาย / ลงในตาราง หรือเติมคำลงใน (_____) ให้ตรงกับความเป็นจริงของตัวท่านมากที่สุด โดยประเมินขณะที่ท่านทำงานบนแท่นใน 28 วันทำงานที่ผ่านมา

1 ท่านเข้านอนเวลากี่โมง (_____) น.

2 ท่านต้องใช้ระยะเวลานานประมาณกี่นาที ตั้งแต่เริ่มเข้านอนจนกระทั่งหลับไป (_____) นาที

3 ท่านตื่นนอนกี่โมง (_____) น.

4 ท่านใช้เวลาในการนอนหลับได้กี่ชั่วโมง (จำนวนชั่วโมงนี้ คือจำนวนชั่วโมงนอนหลับจริงถึงตื่นนอน ไม่รวมระยะเวลาในข้อ 2) (_____) ชั่วโมง

5. ท่านมีปัญหาเกี่ยวกับการนอนหลับ เนื่องจากสาเหตุเหล่านี้บ่อยเพียงใด	ไม่มีปัญหาเลย	มีปัญหา < 1 ครั้ง:สัปดาห์	มีปัญหา 1-2 ครั้ง:สัปดาห์	มีปัญหา ≥ 3 ครั้ง:สัปดาห์
5.1 นอนไม่หลับหลังจากที่เข้านอนไปแล้ว > 30 นาที				
5.2 ตื่นกลางดึก หรือตื่นเร็วกว่าปกติ				
5.3 ตื่นเข้าห้องน้ำ ระหว่างนอนหลับ				
5.4 หายใจติดขัด ระหว่างนอนหลับ				
5.5 ไอ หรือ กรน เสียงดัง				
5.6 รู้สึกหนาวเกินไป ระหว่างนอนหลับ				
5.7 รู้สึกร้อนเกินไป ระหว่างนอนหลับ				
5.8 ฝันร้าย				
5.9 เจ็บ หรือปวดตามตัว ระหว่างนอนหลับ				
5.10 สาเหตุอื่นๆ ถ้ามีระบุ……				
6. ท่านต้องใช้ยานอนหลับ (จะโดยแพทย์สั่ง/ซื้อเอง) เพื่อช่วยทำให้ท่านนอนหลับบ่อยครั้งเพียงใด				
7. ท่านรู้สึกง่วงนอนในระหว่างการทำกิจกรรม เช่น กินอาหาร ทำงาน นั่งคุย เป็นต้น บ่อยครั้งเพียงใด				

8. ท่านเคยมีปัญหาบ้างไหม ในการสร้างความกระตือรือร้นเพื่อให้ตนเองทำงานได้สำเร็จลุล่วงไปด้วยดี	ไม่เป็นปัญหา	เป็นปัญหาบ้างเล็กน้อย	เป็นปัญหาพอสมควร	เป็นปัญหามาก

9. ท่านคิดว่าคุณภาพการนอนหลับโดยภาพรวมของท่านเป็นอย่างไร	ดีมาก	ดี	ไม่ค่อยดี	ไม่ดีเลย

BIOGRAPHY

NAME	Paktaranart Ruankaew
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