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RESEARCH ARTICLE

THE NOISE EXPOSURE EFFECT ON WORK FATIGUE AND STRESS ON WORKERS IN THE OIL AND GAS PROCESSING PLANT OF PT. X

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Abstract

This research aims to determine noise exposure effect on work fatigue and stress on operators in the oil and gas processing plant of PT. X. The method used in this research is descriptive quantitative approach to causality research. The population in this study were all workers in the oil and gas processing plant of PT. X. From this population the sample taken is based on the number of research indicators of 40 so that the minimum number of samples is 5 times the number of indicators estimated or as much as $5 \times 40 = 200$. Study analysis was carried out using (SEM: Structural Equation Model) analysis with the help of the Lisrel 8.0 program. The results showed that there was an effect of noise exposure on work fatigue in workers in the oil and gas processing plant of PT. X and there is the effect of noise exposure on work stress on workers in the oil and gas processing plant of PT. X.

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Introduction:-

The Work Health and Safety (WHS) program in every large and small company needs to get better attention from the corporate management. The importance of Work Health and Safety (WHS) is also a concern of the government. Media reports state that the Work Health and Safety (WHS) aspect must not be ignored when the government is incessantly building infrastructure and facilities to support national productivity. In the development process, the Minister of Manpower, Hanif, cautioned to the company party to continue implementing WHS to prevent casualties due to work accidents. The development program must be supported by the WHS application so that its implementation does not cause problems.

One of the causes of work accidents is the lack of optimal supervision and implementation of WHS and WHS behavior in the workplace. Therefore, real efforts need to be made to reduce and prevent work accidents and occupational diseases. All parties must work together so that the WHS culture is truly realized, WHS must be a part of work culture (Fardiansyah, okezone.com, 2018).

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Similarly, workers who work in oil and gas processing plants of PT. X must be considered the implementation of the Work Health and Safety (WHS) program so that it can be suppressed as much as possible so that work accidents do not occur. Some of the causes that affect the decline in the implementation of Work Health and Safety resulting in workplace accidents include work fatigue and work stress factors experienced by workers who work in oil and gas processing plants at PT. X.

Work fatigue is a fatigue feeling, a decrease in the preparedness and total response of individuals to psychosocial stress experienced in a certain period of time and work fatigue tends to reduce performance, motivation and decrease employee productivity.

Sound produced by a sound source for someone or some people is the preferred voice, but for some others it is considered very disturbing. By definition, unwanted sound can be said to be noisy. Noise that is heard everyday comes from many sources both near and far. Sound can also affect fatigue.

The following is presented data about noise in the oil and gas processing plant of PT. X.

Table 1:- Noise Data of PT X Year of 2019.

Unit	dBA	Remarks
Unit 11	89.1	High
Unit 12	101.4	High
Unit 13	81.8	Low
Unit 14	96.2	High
Unit 15	79.1	Low
Unit 16/17	90.3	High
Unit 18/19	84.6	Medium
Unit 44	83.5	Medium
Unit 45	83.1	Medium
Unit 46	86.6	High
Unit 51	80.4	Low
Unit 52	88.5	High
Unit 61	74.9	Low
Unit 62	84.2	Medium
Unit 63	86.8	High
Unit 64/65	78.5	Low

Based on the noise data it can be seen that there are still many work units in the PT X oil and gas processing plant that still have High noise levels or are above 85 dBA where the maximum limit is 85 dBA. This high noise level can trigger fatigue and work stress.

Besides work fatigue, another factor that can affect the implementation of Work Health and Safety is work stress experienced by workers who work in oil and gas processing plants at PT. X.

Stress is something that involves the interaction between individual and environment that is the interaction between stimulation and response, thus work stress is the consequence of every action and environmental situation that causes excessive psychological and physical demands on a person.

High level noise can cause long-term and short-term effects on hearing. The higher the intensity of noise, the greater the potential for causing various disorders such as temporary to permanent loss, dizziness, drowsiness, high blood pressure, emotional stress that can be followed by heartburn, insomnia, heart disease and loss of concentration (Anizar, 2009). In 2008, WHO (World Health Organization) reported, it was estimated that almost 14 percent of the total workforce of industrial countries exposed to noise exceeded 90 dB. Workers who work in rooms with high noise intensity will experience higher work stress compared to workers who are in lower noise intensity (Roestam, 2004).

Work fatigue and work stress factors experienced by workers can be minimized by a conducive work environment. A safe and comfortable work environment is needed by workers at work to be able to work optimally and productively. Noise is one of the factors of discomfort in the workplace and is one of the causes of work fatigue and work stress on workers who work in oil and gas processing plants at PT. X.

Literature Review:-

Noise:

Noise can be defined as an unwanted sound that can cause discomfort for the listener. Noise can be interpreted as an unwanted sound sourced from natural activities such as speech and man-made activities such as machines usage (Marisdayana et.al, 2016).

Noise is one of the physical factors in the form of noise that can cause adverse effects on work health and safety. Meanwhile, in the decision of the Minister of Health of the Republic of Indonesia states that Noise is all unwanted noise originating from the means of production and or work tools which at some level can cause hearing loss. From the two definitions above it can be concluded that noise is all unwanted sounds or noise that can interfere with health and safety (Anizar, 2009).

According to Suroto (2010), noise sources are basically divided into three types i.e. point sources, plane sources, and line sources. For traffic noise included in the line source criteria. Noise sources according to Prasetyo can be sourced from:

Interior Noise (inside):

Interior Noise or deep noise is a source of noise that comes from humans, household appliances, or building machines.

Outdoor Noise (outside):

Outdoor noise or outside noise is the source of noise that comes from traffic activities, transportation, industry, mechanical devices seen in buildings, construction sites, road repairs, sports activities and others outside the room or building.

According to Tambunan (2005), viewed from the relationship of sound level as time, the noise can be divided into:

1. Continuous Noise
Noise that fluctuates in noise intensity no more than 6 dB with a broad frequency spectrum. For example, like the sound of a saw machine.
2. Halting noise
Noise where the sound hardens and weakens slowly. For example, such as highways and sounds produced by trains.
3. Repeated impulsive noise
Noise where the time needed to reach its peak is no more than 65 ms and the time required for the decrease in intensity to 20 dBA below the peak is not more than 500 ms. For example like the sound of a forging machine in a factory.
4. Steady-state noise
Noise with sound pressure level is stable with time changes and does not experience stable noise. Examples include noise around waterfalls and noise in aircraft interiors when Medium is in the air.
5. Fluctuating noise
Continuous noise that changes on the sound pressure level.
The factors that influence noise according to Mediastika (2005) are divided into two, i.e.:

Accustical Factors:

1. Soundness level
2. Sound Frequency
3. The duration of the sound
4. Fluctuation of loudness
5. Sound frequency fluctuation

6. The time the sound appears

Non-acoustical factors:

1. Experience on Noise
2. Activity
3. Estimation of possible noise
4. Benefits of objects that produce noise
5. Personality
6. Environment and circumstances

The standard measurement tool used to measure noise is the Sound Level Meter (SLM). Sound Level Meter (SLM) itself is a measuring instrument based on an electronic measurement system. According to Buchla and McLachlan (1992), although measurements can be made directly by mechanical means, electronic measurement systems provide many advantages for several measurements, including the speed at which the system picks up, sends, processes, and stores data.

According to KMNHL No. 48 (1996) noise measurement can be done in two ways, i.e.:

Simple Way:

With a Sound Level Meter, it is usual to measure the dBA sound pressure level for 10 minutes for each measurement. The reading is carried out every 5 seconds.

Direct Way:

With an Integrating Sound Level Meter that has an LTMS measurement facility, i.e. Leq with a measurement time every 5 seconds, measurements are carried out for 10 minutes.

According to KMLH No. 48 (1996) the noise calculation can be done with the following formula:

1. $L_s = 10 \log 1/16 \{T_{1.100,1.L1} + \dots + T_{4.100,1.L4}\}$ dB (A).....(1)
2. $L_m = 10 \log 1/8 \{T_{5.100,1.L5} + \dots + T_{7.100,1.L7}\}$ dB (A).....(2)
3. $L_{sm} = 10 \log 1/24 \{16.100,1.L5 + \dots + 8.100,1.L7\}$ dB (A).....(3)

Remarks:

Ls :Leq during days

Lm :Leq during night

Lsm :Leq during the days and the night

According to Babba (2007) noise with High intensity can have a bad impact on health including:

1. Physiological disorders
2. Psychological disorders
3. Organic pathological disorders
4. Communication

From the theoretical study described above, it can be synthesized that noise is all unwanted noise originating from production process equipment and/or working tools which at a certain level can cause hearing loss (Ministry of Manpower Regulation No. 5 of 2018).

Work Fatigue:

According to Suma'mur (2009), the word "fatigue" indicates a different physical and mental body condition but all of them result in decreased work power and reduced endurance to work. There are two types of fatigue, i.e. muscle fatigue and general fatigue. Muscle fatigue is characterized in part by tremors or pain in the muscles. General fatigue is indicated by the loss of willingness to work whose cause is a state of central innervation or psychological-psychological conditions. The root causes of general fatigue are monotonous work, intensity and length of mental and physical work that are not in line with the wishes of the workforce concerned, environmental conditions that are different from the original estimate, unclear responsibilities, deep concerns and inner conflicts and conditions of illness suffered by workers.

Work fatigue is one source of problems for workers' health and safety. Fatigue can reduce performance and increase the work errors level that will potentially lead to work accidents. Of course this cannot be left unnoticed, because labor is a corporate asset that can affect company productivity (Irma et al, 2014). The medium according to Setyawati (2010) work fatigue is feeling tired, there is a decrease in the preparedness and total response of individuals to psychosocial stress experienced in a certain period of time and work fatigue tends to reduce performance, motivation and decrease employee productivity.

Fatigue is a body's protective mechanism so that the body is protected from further damage resulting in recovery after rest. Fatigue is regulated centrally by the brain. In the nervous system there is an activation system (sympathetic) and inhibition (parasympathetic). The term fatigue usually shows different conditions in each individual but all lead to loss of efficiency and decreased work capacity and endurance (Tarwaka, 2015).

There are several opinions about the type of fatigue due to work. According Muchinsky quoted by Priscillia et al (2015) states there are four types of fatigue, i.e.:

1. Mental fatigue associated with monotonous work activities. This fatigue can make individuals lose control of their thoughts and feelings, individuals become less friendly in interacting with others, thoughts and feelings that should be suppressed because it can cause conflicts with other individuals become more easily expressed. This fatigue is overcome by redesigning the work to make employees more excited and challenged to get the job carried out.
2. Emotional fatigue resulting from intense stress and is generally characterized by boredom. This fatigue comes from external factors in the workplace, the company can overcome this fatigue by providing counseling services for employees so that emotional fatigue felt by employees can be overcome and increased employee performance.
3. Muscle fatigue caused by activities that require a lot of physical exertion and last a long time. This type is associated with biochemical changes in the body and is felt by individuals in the form of acute pain in the muscles. This fatigue can be reduced by planning new work procedures that protect individuals from work that is too heavy, for example by redesigning equipment or finding new tools and taking a more efficient work attitude.
4. Skills fatigue associated with decreased attention to certain tasks such as the pilot task or air traffic controller. In this fatigue type the standard of accuracy and work performance decreases progressively. This decrease is estimated to be the main cause of car and airplane accidents, so employees must always be monitored and strived to avoid this fatigue by providing adequate rest periods.

From the the theory study described above, it can be synthesized that work fatigue is a decrease in physical and mental strength resulting from the consequences and a continuous level of information that results in fatigue feeling and a tendency to be lazy to work.

Work Stress:

Hasibuan (2012: 204) states that work stress is a condition that affects emotions, a person's thinking processes and condition, stressed people become nervous and feel chronic anxiety. Gregson (2011: 29) states that work stress is a status that is experienced when a mismatch arises between the demands faced with abilities owned.

There are four causes of work stress according to Gibson et al. (2011: 343) i.e.:

Physical environment: Causes of work stress from the physical environment in the form of light, sound, temperature, and polluted air.

Individual: Individual pressure as a cause of work stress consists of:

1. Role conflict: Stressors or stressor that increase when a person receives messages that are not appropriate regarding the appropriate role behavior. For example there is pressure to get along well with people who are not suitable.
2. Dual roles: To be able to work well, workers need certain information about whether they are expected to do or not do something. The dual role is the absence of understanding from someone about the rights, special rights and obligations in doing a job.
3. Work overload: There are two types of overload, i.e. quantitative and qualitative. Having too much to do or not enough time to complete a job is an overload that is quantitative. A qualitative overload occurs

when individuals feel they do not have the skills needed to complete their work or the performance standard required is too high.

4. Lack of control: A major stressor experienced by many workers is the absence of control over a situation. So work steps, work sequence, decision making, right time, quality standard setting and schedule control are important.
5. Responsibilities: Each type of responsibility can be a burden for some people, but different types show different functions as stressors.
6. Working conditions.
1. Groups: The effectiveness of each organization is influenced by the nature of the relationships between groups. Group characteristics become a strong stressor for some individuals. The mistrust of the work partners is positively related to the high dual role, which leads to communication gaps between people and low job satisfaction or in other words there is a bad relationship with friends, superiors, and subordinates.
2. Organizational: The existence of a bad organizational structure design, bad politics and the absence of specific policies.

If the individual experiences stress, then the individual shows symptoms both physically and psychologically as well as symptoms that appear and behavior, these symptoms can be said also as a result and stress that is experienced. Robbins (2012) states that individuals who are experiencing stress will exhibit the following symptoms:

1. Physiological symptoms, that stress can create changes in metabolism, increase the rate of heart rate, and breathing, cause headaches, and cause heart attacks.
2. Psychological symptoms, stress related to work can cause dissatisfaction at work. And in the work appear tension, anxiety, irritability, boredom, reduced concentration and procrastinating work.
3. Behavioral Symptoms, include changes in life habits, anxiety, smoking, excessive appetite, and sleep disorders.

The stress types in terms of the cause or stressor according to Lazarus quoted by Rahman (2009: 124) can be divided into three, i.e.:

1. Catalysmic Stressor, which is stress that occurs to a group of people at the same time. This Catalysmic stressor cannot be predicted because it can have power that affects the community, for example: natural disasters, war, technological disasters.
2. Personal Stressor, which is stress that affects a person's individual cannot be predicted and sometimes more difficult to overcome because it requires self-motivation, for example: divorce, unemployment, not passing the test.
3. Background Stress, this type of stress will be more dangerous than catalysmic and personal stressors. Because if an individual fails to find a solution then the impact will be dangerous, for example: noisy workplaces, darkness.

There are 4 approaches to work stress, i.e.: social support, meditation, and personal health programs. The approach is in accordance with the opinion of Davis and Jhon in Mangkunegara (2010: 348) which states:

Social Support Approach:

This approach is carried out through activities aimed at providing social satisfaction to employees, for example playing games, jokes and work bodies.

Biofeedback Approach:

This approach is done medically. Through the guidance of doctors, psychiatrists, and psychologists, it is hoped that employees can relieve the stress they experience.

Personal Health Approach:

This approach is an preventative approach before stress. In this case employees continuously check their health, do muscle relaxation, manage nutrition, and exercise regularly.

1. Medical approach

2. This approach is carried out through the calming of the mind, dzikir, tafakur, to Allah SWT, the midnight prayer, and breathing exercises (yoga, mahatma, kalimasada).

From the theory study described above it can be synthesized that work stress is a tension condition that creates a physical and psychological imbalance, which affects emotions, thinking patterns and the condition of an employee.

The Conceptual frameworks:

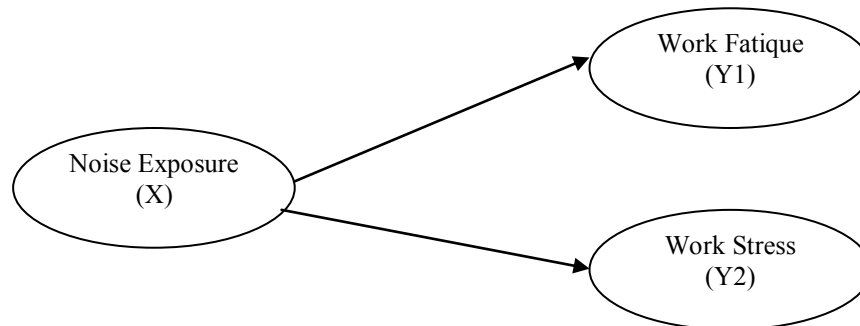


Figure 1:- Conceptual Framework.

Research Hypothesis:

Based on the description of the theory above, the most extensive research and framework of thinking can be proposed a hypothesis as follows:

- H1. There is an effect of noise exposure on work fatigue in workers at the oil and gas processing plant of PT. X.
- H2. There is an influence of noise exposure on work stress on workers in the oil and gas processing plant of PT. X

Research Methods:-

The method used in this research is quantitative research with a causality approach.

Research variables:

1. Noise Variable
Noise is all unwanted sounds originating from production process equipment and / or work tools which at a certain level can cause hearing loss.
2. Work Fatigue Variable
Work fatigue is a reduction in physical and mental strength resulting from the consequences and a continuous level of information that results in fatigue feelings and a tendency to be lazy to work.
3. Work Stress Variable
Work stress is a tension condition that creates physical and psychological imbalances, which affect emotions, thinking patterns and the condition of an employee.

Population and Sample:

The population in this study were all workers in the oil and gas processing plant of PT. X. In this study, the number of research indicators was 40 so the minimum number of samples was 5 times the estimated number of indicators or as many as $5 \times 40 = 200$.

Method of collecting data:

Data collection is carried out by means of a questionnaire that is a data collection technique by submitting a list of questions to the parties directly related to the problem to be examined and filled out by the respondents themselves and aims to obtain data in the form of answers from respondents where the questions given are in accordance with the subject in research that is about exposure to noise, work fatigue and work stress in the oil and gas processing plant of PT. X.

Analysis Method:

To analyze the effect of noise exposure on work fatigue and work stress in the oil and gas processing plant of PT. X which is carried out by using SEM (Structural Equation Model) analysis with the help of Lisrel 8.0 program.

Results and Research Discussion:-**Validity Test and Reliability on SEM:**

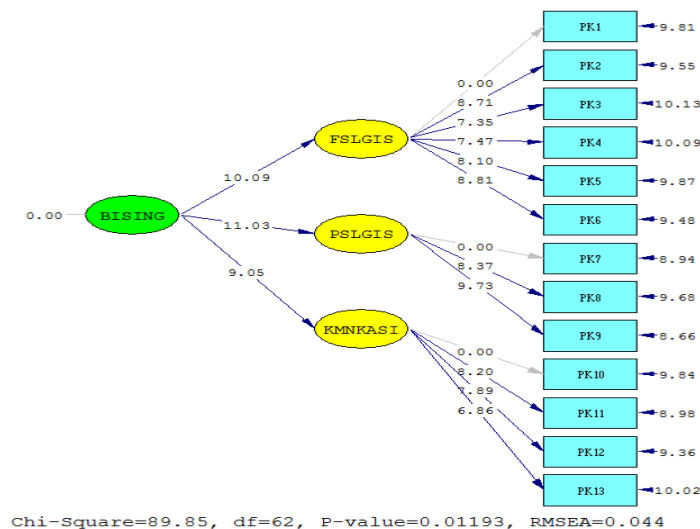
Validity testing is carried out using second order confirmatory factor analysis (2nd CFA), and each item statement must have a loading factor ≥ 0.40 . Hair et al (2010) states the loading factor based on a total sample of 200 is 0,40.

Noise Exposure:**Table 2:-** Validity of Noise Exposure.

Variables		Standardized Loading Factor $\geq 0,40$	Remarks
1stCFA FSLGIS	PK1	0,63	Valid
	PK2	0,68	Valid
	PWHS	0,55	Valid
	PK4	0,56	Valid
	PK5	0,62	Valid
	PK6	0,69	Valid
PSLGIS	PK7	0,69	Valid
	PK8	0,61	Valid
	PK9	0,72	Valid
KMNKASI	PK10	0,59	Valid
	PK11	0,70	Valid
	PK12	0,66	Valid
	PK13	0,55	Valid
Variables		Standardized Loading Factor $\geq 0,40$	Remarks
2ndCFA Noise Exposure	FSLGYCL	1,00	Valid
	PSLGYCL	0,97	Valid
	COMMU	0,98	Valid

Source: Lisrel 8.8 Calculation

Based on Table 2. it is known that standardized factor loading has values above 0.40, so it can be concluded that the dimensions and indicators of noise exposure variables are valid.



Source: Lisrel 8.8 Processing

Figure 2:-Values T-Values 2ndCFA of Noise Exposure.

Based on Figure 2 above, it can be seen the dominant dimensions and indicators affecting noise exposure variables. The biggest t-values are the psychological disturbance dimension (PSLGIC) of 11.03, then the physiological disturbance dimension (FSLGIC) is 10.09 and the lowest t-value is the communication disturbance dimension (COMMU) of 9.05.

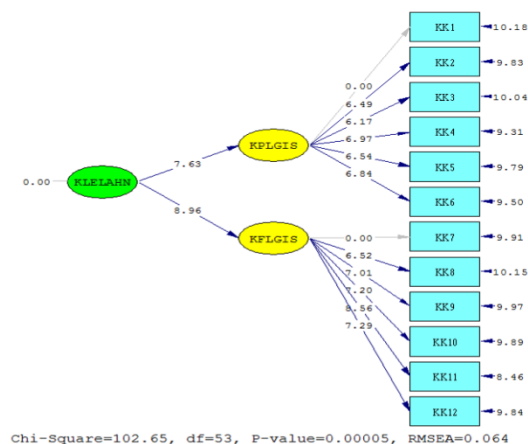
Work Fatigue:

Table 3:- Validity of Work Fatigue.

Variables		Standardized Loading Factor $\geq$ 0,40	Remarks
1stCFA KPLGIC	KK1	0,51	Valid
	KK2	0,60	Valid
	KWHS	0,55	Valid
	KK4	0,68	Valid
	KK5	0,61	Valid
	KK6	0,66	Valid
KFLGIC	PK7	0,58	Valid
	PK8	0,52	Valid
	PK9	0,57	Valid
	PK10	0,59	Valid
	PK11	0,76	Valid
	PK12	0,60	Valid
Variables		Standardized Loading Factor $\geq$ 0,40	Remarks
2ndCFA WorkFatigue	KPLGIC	1,01	Valid
	KFLGIC	0,99	Valid

Source: Lisrel 8.8 Calculation

Based on Table 3. it is known that standardized factor loading has values above 0.40, so it can be concluded that the dimensions and indicators of work fatigue variables are valid.



Source: Lisrel 8.8 Processing

Figure 3:-Values of T-Values 2ndCFA of Work Fatigue

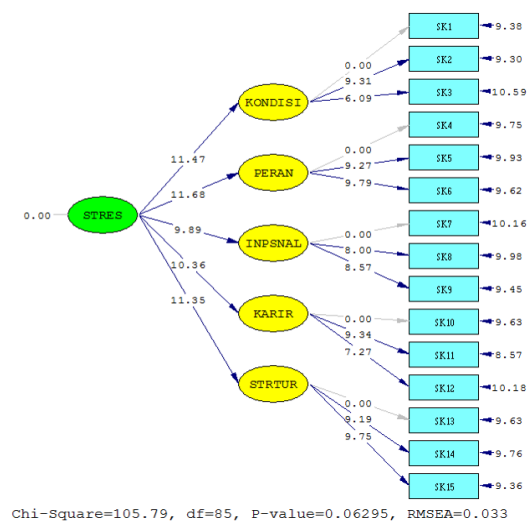
Based on Figure 3. above, it can be seen the dominant dimensions and indicators affecting work fatigue variables. The biggest t-value is the physiological fatigue dimension (KFLGIC) of 8,96 and the lowest t-value is the psychological fatigue dimension (KPLGIC) of 7,43.

Work Stress:**Table4:-**validity of WorkStress.

Variables		Standardized Loading Factor $\geq 0,40$	Remarks
1stCFA CONDITION	SK1	0,65	Valid
	SK2	0,66	Valid
	SK3	0,41	Valid
	SK4	0,67	Valid
ROLE	SK5	0,65	Valid
	SK6	0,69	Valid
	SK7	0,59	Valid
INPSNAL	SK8	0,61	Valid
	SK9	0,68	Valid
	SK10	0,63	Valid
CARRIER	SK11	0,72	Valid
	SK12	0,53	Valid
	SK13	0,67	Valid
STRTURE	SK14	0,66	Valid
	SK15	0,70	Valid
	SK16	0,70	Valid
2ndCFA Work Stres	CONDI	1,05	Valid
	ROLE	1,03	Valid
	INPSNAL	1,05	Valid
	CARRIER	1,00	Valid
	STRTURE	1,01	Valid

Source:Lisrel 8.8 Calculation

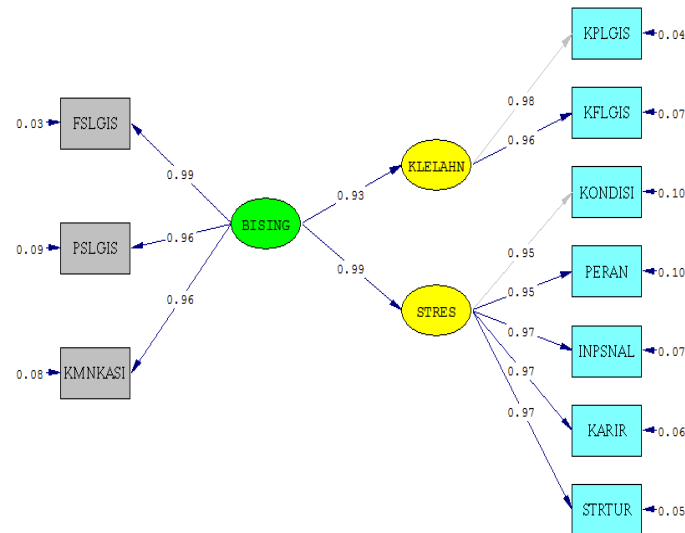
Based on Table 4. it is known that standardized factor loading has values above 0.40, so it can be concluded that the dimensions and indicators of work stress variables are valid.

**Source:**Lisrel 8.8 Processing.**Figure 4:-**Values of T-Values 2ndCFA of Work Stress.

Based on Figure 4.3. above can be known dimensions and indicators that predominantly influence work stress variables. The biggest t-value is the role dimension (ROLE) of 11.68 and then value of t-value of the work condition (CONDITION) is 11.47 and the lowest t-value is the interpersonal dimension (INPSNAL) of 9,89.

The Model Feasibility Test:

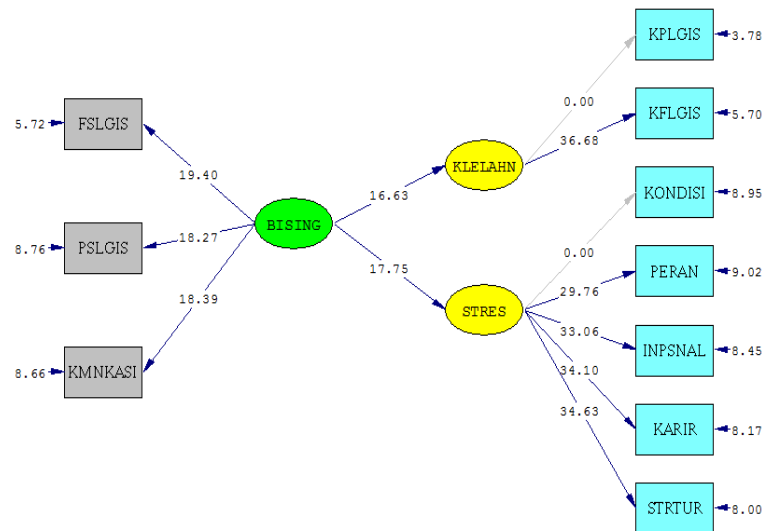
Model feasibility test is carried out in order to achieve a good model and meet the GOF requirements in Structural Equation Modeling, the full SEM model can be seen in the following Figure.



Chi-Square=252.96, df=33, P-value=0.00000, RMSEA=0.183

Source: Data Processing Results of Lisrel 8.80

Figure 5:-Diagram of Full Model Path (Standardized Solution)



Chi-Square=252.96, df=33, P-value=0.00000, RMSEA=0.183

Source: Data Processing Results of Lisrel 8.80.

Figure 6:- Diagram of Full Model Path.

In the estimation results of the t-values in Figure 6, there is a variable that does not have a trajectory that is the relationship of FATIGUE variable to the KPLGIC dimension and the relationship of STRES variable to the

CONDITION dimension. This is because the variable has been determined to be a variance reference which means that the manifest variable is significantly related to its latent variable (Wijanto, 2015).

In Structural Equation Modeling there is no single statistical test tool to measure or test the model made, generally there are various types of Fit indexes used to measure the degree of fit between the hypothesized model and the data presented. Accordingly, based on the full model path diagram model above, then to be able to analyze the hypothesis of this study it is necessary to test the suitability of the whole model (Goodness of Fit Index Full Structural Model). GOF evaluation of the research model can be seen in the following Table.

Table 5:- Goodness of Fit Index Full Model.

No	GOF Dimesion	Fit Level	Results	Conclusion
1	Chi-Square (χ^2) P > 0,05	Expected small P ≥ 0,05	252,96 P = 0,05	Marginal
2	RMSEA	≤ 0,08	0,18	Marginal
3	NFI	≥ 0,90	0,95	Good
4	NNFI	≥ 0,90	0,94	Good
5	PNFI	Expected High	0,70	Good
6	CFI	≥ 0,90	0,96	Good
7	IFI	≥ 0,90	0,96	Good
8	RFI	≥ 0,90	0,94	Good
9	GFI	≥ 0,90	0,80	Marginal

If seen in Table 5. all estimated values of structural goodness fit models have good values even though there are some marginal ones such as Chi-Square and GFI but overall the estimated structural models are acceptable, so it can be said that the relationships of various constructs on this variable are structural relationships. This can be justified in the opinion of Hair (2010) that the use of 4-5 goodness of fit criteria is considered sufficient to assess the feasibility of a model, provided that each criterion of goodness of fit is absolute fit indices, incremental fit indices, and parsimony fit indices represented.

Hyphotesis Test:

Hypothesis testing is carried out to find out whether the research results that has been done can answer the research hypotheses submitted previously. The overall results of the hypothesis testing can be seen briefly as follows:

Table 6:- Summary of Hyphotesis Testing Results.

Hyphotesis	Path	T _{count}	T _{Table}	Remarks
H ₁	PK → KK	16,63	1,96	Accepetable
H ₂	PK → SK	17,75	1,96	Acceptable

Based on the above Table of the two hypotheses proposed in this study all of them can be accepted, both directly and indirectly. The medium of the structural equation results from the research variables can be seen from the lisrel output on Structural Equations.

Substructure Equation 1

FATIGUE = 0.93*NOISE, Errorvar.= 0.14 , R² = 0.86

SubstructureEquation 2

STRESS = 0.99*NOIUSE, Errorvar.= 0.021 , R² = 0.98

For substructure equation 1, i.e. work fatigue is significantly affected by noise exposure. The contribution of noise exposure to work fatigue is 86%, so there are still 14% of other factors that affect work fatigue but in this study were not examined.

For substructure equation 2, i.e. work stress is significantly affected by noise exposure. The contribution of noise exposure to work stress is 98%, so there are still 2% of other factors that affect work stress but this research was not examined.

Discussion:-**Effects of Noise Exposure on Work Fatigue:**

Based on the research results obtained $t\text{-value } 16.63 > 1.96$ so that H_0 is rejected and H_1 is accepted, which means that there is an effect of noise exposure on work fatigue in the workforce at the oil and gas processing plant of PT. X.

Noise is one of the pollutants and in general is a byproduct of the use of technology by humans (Ministry of Health, Republic of Indonesia, 1999). The main influence of noise on humans is damage to the sense of hearing that causes progressive deafness and this effect is known and generally accepted for centuries (Suma'mur, 2009).

Work fatigue is a fatigue feeling, a decrease in individual preparedness and total response to psychosocial stress experienced in a certain period of time and work fatigue tends to reduce performance, motivation and decrease employee work productivity (Setyawati, 2010).

Noise exposure received by workers in a sufficiently long period of time can cause psychological, physiological disturbance and disruption of communication between workers. Physiological disorders can occur in the body's internal system, hearing threshold and irregular sleep patterns. Psychological disorders cause excessive worry, uncontrolled emotions and lack of work comfort. Interruption of communication can cause disruption between workers to be disrupted and information conveyed by the leadership becomes less clear. As a result of psychological, physiological and communication disorders, it can ultimately result in work fatigue. It can be concluded that noise exposure can affect work fatigue in workers in the oil and gas processing plant of PT. X.

The results of this study are in line with research conducted by Effendi, Tarwaka and Darnoto (2013), Laziardy (2017), Makalalag, et al (2017), Hebrew, et al (2018) who stated that noise affects work fatigue.

Effect of Noise Exposure on Work Stress:

Based on the research results obtained $t\text{-value } 17.75 > 1.96$ so that H_0 is rejected and H_2 is accepted, which means that there is an effect of noise exposure on work stress on workers in the oil and gas processing plant of PT. X.

Stress is an adaptive response, connected by individual characteristics or psychological processes that are a consequence of any external actions, situations or events that place special psychological and physical demands on someone (Kreitner and Kinicki, 2014). Stress is something that involves the interaction between individuals and the environment that is the interaction between stimulation and response, thus job stress is the consequence of every action and environmental situation that causes excessive psychological and physical demands on a person.

Workers working on a room with high intensity noise will experience work stress is higher compared with workers who are in lower noise intensity (Roestam, 2004).

Noise exposure received by workers in long time period can resulting in physiologic, psychological disturbances and communication between workers. Physiological, psychological and communication disorders can cause work stress. It can be concluded that noise exposure can affect work stress on workers in the oil and gas processing plant of PT. X.

The results of this study are in line with research conducted by Ardiansyah, Salim and Susihono (2013), which states that noise affects work stress.

Conclusion and Suggestion:**Conclusion:-**

Based on the results of the research and discussion in the previous chapters, several conclusions can be made as follows:

1. There is an effect of noise exposure on work fatigue in workers in the oil and gas processing plant of PT. X. The results of this study are in line with research conducted by Effendi, Tarwaka and Darnoto (2013), Laziardy (2017), Makalalag, et al (2017), Hebrew, et al (2018) who stated that noise affects work fatigue.

2. There is an effect of noise exposure on work stress on workers in the oil and gas processing plant of PT. X. The results of this study are in line with research conducted by Ardiansyah, Salim and Susihono (2013), which states that noise affects work stress.

Suggestion:-

Based on the conclusions the study results can be put forward some suggestions that are expected to be useful as follows:

1. Noise sources are suggested to be managed better, for example the generator engine room is provided a silencer, noise sources from outside or jobs that cause noise so workers are required to wear ear protection.
2. For workers given guidance, training and knowledge about the use of ear protection equipment and also provide information about the importance of these tools for worker health and safety. In certain places banners were posted about the importance of work health and safety. Company routinely checks the workers health, especially for hearing.
3. For other researchers, it is expected to be able to add a number of variables that can affect work fatigue and work stress and expand research object in order to obtain maximum results.

References:-

1. Abidin, F., Suwondo, A. dan Suroto, 2015. Hubungan Paparan Debu Asbes Terhadap Kapasitas Vital Paru Pada Pekerja Pembuat Asbes di Area Finishing Line Pt. X Jawa Tengah. *Jurnal Kesehatan Masyarakat*, 3 (1), pp.364 – 374.
2. Anizar. 2010. *Teknik Keselamatan dan Kesehatan Kerja di Industri*. Yogyakarta: Graham Ilmu.
3. Ardiansyah, M. Rian, Ja'far Salim dan Wahyu Susihono. 2013. Pengaruh Intensitas Kebisingan Terhadap Tekanan Darah dan Tingkat Stres Kerja. *Jurnal Teknik Industri*, Vol.1, No.1, Maret 2013, pp.7-12.
4. Babba J. 2007. Hubungan Intensitas Kebisingan di Tempat Kerja dengan Peningkatan Tekanan Darah. Tesis. Semarang. Universitas Diponegoro.
5. Gibson, James L., Donnelly Jr, James H., Ivancevich, John M., Konopaske, Robert 2011. *Organizationa Behavior, Structure, Processes*, Fourteenth Edition (International Edition). 1221 Avenue of The Americas, New York, NY 10020: McGraw-Hill.
6. Hasibuan, Malayu. 2012. *Manajemen Sumber Daya Manusia*. Jakarta: PT Bumi. Aksara.
7. Hebrani, Okto, Sandra Madonna dan Prisma Nursetyowati. 2018. The Effect Of Noise On Work Fatigue In An Oil And Gas Industry. *Indonesian of Journal Urban and Environment Technology*. Pp. 110-123.
8. Irma, Syamsiar S. R., dan Andi, W. 2014. Faktor yang Berhubungan dengan Kelelahan Kerja pada Unit Produksi Paving Block CV. Sumber Galian Kecamatan Biringkanaya Kota Makassar.
9. Kreitner Robert dan Kinicki Angelo, 2014, *Perilaku Organisasi*, Edisi 9, Buku ke2, Jakarta: Salemba Empat.
10. Lazuardy, M. 2017. Kebisingan terhadap Kelelahan Kerja pada Pekerja Logam Bagian Produksi. *HIGEIA (Journal of Public Health Research and Development)*, 1 (2), 58-64.
11. Makalag, R.N. Amalia, Angela F.C Kalesaran dan Paul A.T Kawatu. 2017. Hubungan Antara Intensitas Kebisingan Dengan Kelelahan Kerja Pada Tenaga Kerja Ground Handling Pt. Garuda Angkasa Bandar Udara Internasional Sam Ratulangi Kota Manado. *Jurnal Fakultas Kesehatan Masyarakat Universitas Sam Ratulangi Manado*.
12. Marisdayana R. 2016. Hubungan Intensitas Paparan Bising Dan Masa Kerja Dengan Gangguan Pendengaran Pada Karyawan PT. X. *Jurnal Kesehatan Lingkungan Indonesia*.
13. Robbins, Stephen. 2012. *Perilaku organisasi*. Jakarta: Penerbit Salemba Empat.
14. Setyawati. 2010. *Selintas Tentang Kelelahan Kerja*. Yogyakarta: Asmara Books.
15. Suma'mur. 2009. *Higene Perusahaan dan Kesehatan Kerja*. Jakarta: PT Toko Gunung Agung.
16. Tambunan, STB. 2005. *Kebisingan di Tempat Kerja (Occupational Noise)*. Yogyakarta : C.V. Andi Offset.
17. Tarwaka. 2014. *Keselamatan dan Kesehatan Kerja, Manajemen Implementasi WHS di Tempat Kerja*. Surakarta: Harapan Press.
18. Wijanto, Setyo Hari. 2009. *Structural Equation Modeling dengan Lisrel 8.8*. Yogyakarta : Graha Ilmu.
19. World Health Organization. 1998. *Laboratory services in tuberculosis control*. WHO/TB/98.258.