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ERGONOMIC RISK LEVEL OF FITTING PRODUCTION DEPARTMENT WORKERS IN THE PLASTIC PIPE MANUFACTURING INDUSTRY

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Department and determines the level of risk. The analysis method uses analytical methods, including repetitive tasks, push-pulling assessment, and a manual handling assessment chart involving 95 respondents. The results found that 30 activities with ergonomic hazards and one action in the crusher process section had an unacceptable level of ergonomic risk and high levels of risk were found on the shoulders, lower and upper back, and wrists. Companies need to investigate work processes to improve and control ergonomic hazards.

1. INTRODUCTION

The implementation of occupational safety and health is a company's commitment to protect all assets in its activities, where one of the assets in question is humans as workers who carry out the company's business activity processes. Applying ergonomics in the workplace is an activity to protect workers because it can reduce the potential for work accidents and potential health problems such as injuries, aches and pains in body parts, so it can also reduce the potential for environmental incidents and property damage resulting from work accidents from activities carried out. Lack of ergonomics in manual handling results from work accidents causing materials to fall, spill or scatter into the environment or onto production property. It means that applying ergonomics can also improve company performance and productivity by conducting an ergonomic risk assessment, which is used to identify musculoskeletal disorders that can occur in manual material handling activities using the ergonomic risk assessment method (Moshtaghi et al., 2014; Mukti, 2017; Pratiwi & Kalyana, 2022)

WDJ-Rucika is an industry for making plastic pipes and plastic pipe connections where the production process is still semi-automatic, which means manual activities by workers are still carried out, where there are manual handling activities carried out, lifting and carrying additive materials and fitting products, as well as activities pushing and pulling the weight of the basket containing fitting products, apart from that, there is a repetitive movement process in the upper body and arms during the process of cutting and packaging fittings in a standing position. These activities are carried out by workers during 7 hours of work, which is thought to cause discomfort for workers and even health problems in parts of the body, namely called Musculoskeletal Disorders (MSDs), where so far no measurements have been made regarding ergonomic hazards and the level of risk due to disturbances in parts. Workers' bodies can be

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caused or worsened by work activities that do not follow ergonomic principles. It causes fatigue and even injury, which reduces company productivity and negatively impacts the company and its work (Iridiastadi & Yassierli, 2012; Kuswana, 2014).

It is known that the Company has health examination procedures, namely pre-employment examinations and periodic health examinations every year. Companies require regular inspections to determine the impact of work activities that do not comply with ergonomic principles. Therefore, companies need to analyze the level of risk of ergonomic hazards from the activities of Fitting Production Department workers in each part of the production process. These efforts are necessary so that the Company can determine improvement strategies to create safe, comfortable and healthy work processes to support optimal and efficient productivity. This research aims to determine the ergonomic hazards of each activity in the Fitting Production Department and the risk level

2. METHODOLOGY

This research used the Standardized Nordic Questionnaire (SNQ) questionnaire, distributed to 8 process sections in the Fitting Production Department. Respondents were selected deliberately, provided those working in that section have at least one year of work experience. The number of samples in this study was 95 samples of workers.

The data collection stage involves eight process sections in the Fitting Production Department. The required data is obtained through several identifications such as posture and body movements during activities, duration of activities, equipment used and working environment conditions. The data taken includes data describing workers' health status (especially related to physical-mental-social fatigue and MSDs), workers' understanding of sources of danger and accident costs, and subjective assessments of satisfaction with various facilities that support work activities (Iridiastadi & Yassierli, 2012; Kuswana, 2014; Tarwaka, 2014).

The next stage is data processing to determine ergonomic hazards in workers' body parts. The final stage is to analyze the data to determine the severity of ergonomic hazards' risk level using analysis methods, namely: (1) Assessment of Repetitive Tasks (ART) for repetitive movement activities. (2) Manual Handling Assessment Chart (MAC) for lifting and carrying loads. (3) Risk Assessment of Pushing and Pulling (RAPP) for activities of pushing and pulling loads with wheeled equipment or manually (HSE, 2010; HSE, 2016; HSE, 2018).

The MAC, RAPP, and ART assessment guides look similar, but based on how the tools are used, they have some subtle differences. In the measurement guide (HSE, 2010; HSE, 2016; HSE, 2018): At each stage, follow the assessment guide to determine the risk level for each risk factor. The risk level is classified into three levels based on colour, namely Green (Low level of risk), AMBER (Medium level of risk–Examine tasks closely), and RED (High level of risk–Prompt action required). However, under certain conditions, there is often an additional colour band, namely PURPLE (Unacceptable level of risk). The assessment is split into four stages: (1) Stage A: Frequency and repetition of movements; (2) Stage B: Force; (3) Stage C: Awkward postures; (4) Stage D: Additional factors

G = GREEN Low level of risk – Consider the effect on vulnerable groups
A = AMBER Medium level of risk – Examine task closely
R = RED High level of risk – Prompt action needed
P = PURPLE Unacceptable level of risk – serious isk of injury and must be improved

3. RESULTS AND DISCUSSIONS

3.1. Results

In the initial observation session, the questionnaire focused on complaints of pain in the limbs. This observation determined the level of complaints about body parts that workers in the Fitting Production Department often felt. While conducting observations on 95 workers in the Fitting Production Department, researchers used the Standardized Nordic Questionnaire (SNQ), which contains a description of the points on the body parts where pain complaints were felt (Essien et al., 2017; Lop et al., 2019).

The following Table 1 explains the ergonomic hazard conditions and the level of risk from activities in the fittings production department in more detail. Table 1 presents the measurement results for the observed production activities: additive, mixing, pelletizer, dryer, injection moulding, cutting and packing, crusher, and office. Ergonomic hazards and the level of risk from activities in the fitting production department are dominated by the high-level category of ergonomic hazards. The cutting-packing production process has high potential ergonomic hazard activities, except for repeated movements preparing cardboard packaging, which poses a medium risk to the body parts, lower back, and left-right fingers. Another production process with high potential ergonomic hazard activities is the mixing section, namely lifting and dumping the mixed additive into the mixing machine hopper, which poses a high risk to the lower back, hands, and shoulders. Next, the office production process is repetitive movements of working with a computer, which poses a high risk to the upper back, neck, and right wrist.

Table1. Results of Identification of Ergonomic Hazards and Risk Levels from Activities in the Fitting Production Department

Production process	Potential Ergonomic Hazard Activities	Ergonomic Dangers of Complaints on Body Parts		Analysis Method
Additive	Lifting additive sacks from the top of the pallet to the weighing table	Neck	Shoulders, Wrists	MAC *Lifting*
	Repeated movements of weighing the additive and then putting it into the mixed additive sack	Right Elbow, Right Wrist, Lower Back		ART
	Repeated movements tie the mixed additive sack	Neck, Left Right Elbow	Lower Back, Shoulders	ART
	Lifting mixed additive sacks from the weighing table onto the pallet	Lower Back, Upper Back, Shoulders		MAC *Lifting*
	Push and pull mixed additive pallets with hand pallets to the mixing area	Upper Back, Neck, Shoulders, Knees, Thighs		RAPP Wheeled Tool
Mixing	Lifting and dumping the mixed additive into the mixing machine hopper	Lower Back, Hands, Shoulders		MAC *Lifting*
Pelletizer	Pulling unlooped material sacks to the extruder machine	Wrist		Wheeled Toolless RAPP
	Pushing the output pellet basket from the pelletizer machine with a trolley	Lower Back, Neck, Shoulders		RAPP Wheeled Tool
	Lifting the pellet basket load from the pelletizer machine to the pellet silo bunker	Lower Back, Upper Back, Elbows, Shoulders		MAC *Lifting*
	Lifting extruder dust from the pelletizer machine	Lower Back, Shoulders		MAC *Lifting*
	Carries extruder dust to the mixing hopper	Wrists	Knees, Thighs	MAC *Carrying*
Dryer	Draws dust from the somos filter to the crusher area	Wrists	Knees	Wheeled Toolless RAPP
Injection Molding	Push and pull empty metal baskets from the loading area	Elbows, Shoulders, Knees		RAPP Wheeled Tool
	Push and pull the iron basket containing fittings to the loading area	Elbows, Shoulders, Lower Back, Upper Back, Thighs, Knees		RAPP Wheeled Tool
	Lifting sacks of PPR material into the trolley and hopper of the injection molding machine	Lower Back, Upper Back, Elbows, Shoulders		MAC *Lifting*
	Pushing PPR material from the silo dryer area with a trolley	Knee		RAPP Wheeled Tool
	Repeated movements assemble the metal insert fitting	Right Wrist, Right Left Shoulder, Neck, Upper Back		ART
Cutting & Packing	Repeated movements prepare cardboard packaging	Lower Back, Left Right Fingers		ART
	Push and pull the fitting basket to the cutting area	Upper Back, Neck, Shoulders, Elbows, Thighs, Knees		RAPP Wheeled Tool
	Repetitive motion of cutting sprue fittings	Right Left Fingers, Right Wrist, Right Elbow, Neck, Lower Back, Knees, Ankles		ART
	Pushing plastic boxes with a trolley to the packing area	Upper Back, Shoulders, Elbows		RAPP Wheeled Tool
	Lifting the plastic box onto the packing table	Lower Back, Upper Back, Shoulders, Elbows, Wrists		MAC *Lifting*
	Repeated movements of packing fittings into cardboard	Right and Left Wrists, Right Left Fingers, Right Left Wrists, Right Left Elbows, Lower Back, Neck, Knees, Ankles		ART

	Lifting the cardboard from the packing table	Lower Back, Shoulders, Wrists	MAC *Lifting*
	Lifting cardboard onto the conveyor	Lower Back, Shoulders, Wrists	MAC *Lifting*
	Lifting cardboard from the conveyor onto the pallet	Lower Back, Upper Back, Shoulders, Wrists	MAC *Lifting*
Crusher	Lifting the material basket to the crusher machine	Neck, Shoulders, Lower Back, Upper Back, Elbows, Wrists, Thighs, Knees, Ankles	MAC *Lifting*
	Lifting empty baskets in the crusher loading area	Lower Back, Upper Back, Wrists, Elbows, Shoulders, Neck, Knees	MAC *Lifting*
	Activity of carrying crusher dust sacks	Lower Back, Wrists, Knees	MAC *Carrying*
Office	Repetitive movements of working with a computer	Upper Back, Neck, Right Wrist	ART

Information:

Amber	Ergonomic Hazard Risk Level is Medium
Red	High Ergonomic Hazard Risk Level
Purple	Ergonomic Hazard Risk Level Unacceptable

In the long term, these ergonomic hazards result in problems with workers' health due to unnatural work attitudes or postures, one of which is musculoskeletal disorders (MSDs) (Burton, 2008; Lop et al., 2019; Mukti, 2017; Pille, 2016; Sadeghi et al., 2019). From the conditions above, management needs to strive to reduce or eliminate the risk level of danger. Efforts such as ergonomic risk evaluation to ensure operator safety are based on statutory regulations that have been implemented along with relevant technical standards and are one of the most comprehensive tools for ergonomic risk assessment (Carrivick et al., 2005; Chander & Cavatorta, 2017; Lowe et al., 2019; Moshtaghi et al., 2014; Sadeghi et al., 2019; Takala et al., 2010).

3.1.2 Assessment of Repetitive Tasks (ART)

Referring to Table 1, the level of classification of ergonomic hazards from complaints on body parts using the Assessment of Repetitive Tasks (ART) analysis method. Based on the ART assessment, several categories of ergonomic risk levels were obtained for repetitive tasks. The observation process begins with the work step of taking the sprue fitting from the iron basket and cutting each part, which is done in a standing position for 7 hours of work. The results of observations on the repetitive movement activity of cutting sprue fittings in the cutting packing process are shown in Figure 1.

Figure 1. Repetitive Movement Activity Process for Cutting Sprue Fittings

Table2. Results of Ergonomic Hazard Risk Assessment in Repetitive Movement Activities Cutting Sprue Fittings

Risk Factor	***Activity Score***			
	Left Arm		**Right Arm**	
	Color	Score	Color	Score
A1. Arm movement patterns		6		6
A2. Frequency of technical actions		3		6
B. Strength level		0		1
C1. Head/neck posture		2		2
C2. Back posture		1		1
C3. Arm posture		0		0
C4. Wrist posture		2		4
C5. Hand/finger grip		0		4
D1. Time off		6		6
D2. Work tempo		0		0
D3. Physical work environment factors		0		1
	Total Activity Score	20		30
D4. Duration multiplier factor		x 0,75		x 0,75
	Exposure Score	15		22,5
	Exposure Level	*Medium*		*High*
D5. Psychosocial factors: High level of attention and concentration				

Information:

Exposure Score	***Exposure Level***	
0 – 11	Low	Consider individual circumstances
12 – 21	Medium	Further investigation is needed
22 >	High	Further investigation is needed immediately

The results of the ART method analysis on the risk level of ergonomic hazards in the repetitive movement activity of cutting sprue fittings are shown in Table 2. Based on the results of the observations, the activities with high scores are the risk factors for high-value left and right arm movement patterns, the frequency of technical actions of the right arm, and wrist posture. Right hand, right hand/finger grip, and high-value rest time. It is because the right arm carries out the most movement patterns with twisting and tilting movements and exerts pressure on the cutting pliers when cutting the sprue with high movement frequency conditions.

Apart from that, position your head slightly lowered when cutting activities and focus on looking at the sprue to be cut. At the same time, bend your body when picking up the sprue in the middle to the bottom of the basket. This activity is carried out in a standing body position for 4 hours; after a 1-hour break, the work is continued for 3 hours. If assessed by the score, the risk of exposure to ergonomic hazards on the right and left arms is still low. At the same time, activities with a high risk of ergonomic hazards occur in the body on the right and left fingers, right wrist, right elbow, neck, knees and ankles.

Lifting weights in awkward positions or repetitive lifting carries the risk of ergonomic hazards. Unergonomic working postures make harvesters vulnerable to musculoskeletal diseases (Bartlett, 2014; Berlin & Adams, 2017). Not only that, ergonomic and personal risk factors result in occupational low back pain (LBP), but psychosocial factors can influence LBP disability (Lop et al., 2019; Mukti, 2017; Tamašauskaitė & Vainauskas, 2020; Zaini, 2021).

3.1.3 Manual Handling Assessment Chart (MAC)

Based on the assessment results shown in Table 1, it is known that there is a level of ergonomic risk in lifting activities, namely the risk of ergonomic danger from the activity of lifting material baskets to the crusher machine in the crusher process section. The stages in the work process carried out in lifting activities are lifting plastic baskets containing fittings, sprues or rejected products, which must be poured onto the crusher conveyor. Figure 2 shows the activity of lifting the material basket to the crusher machine.

Table 3 shows the results of the MAC analysis on Lifting, where the risk factor of load weight per

frequency of Lifting has an unacceptable risk category (unacceptable). This activity must be stopped, and repairs must be made because it can cause serious injury to workers. Meanwhile, the risk factor of hand distance from the lower back, the vertical lifting zone factor, the torso twisting factor, and bending to the side have a score with a high ergonomic hazard risk level. It is because the load being lifted is very heavy, reaching 80 kilograms with an interval between lifts of around 5 minutes. Also, when lifting the basket, your body must be squatting at a slight angle with both hands supporting each other. The next activity is to push the basket straight up by slowly standing up.

Based on the results of observations, this activity has a critical or unacceptable risk of ergonomic hazards. In this condition, workers have the potential for serious injury to the neck, shoulders, lower back, upper back, elbows and wrists when the worker uses a lifting force that is not recommended with very strong force.

Next, analyze the Manual Handling Assessment Chart (MAC) on carrying activities, namely extruder dust to the mixing hopper. The following Figure 3 shows the process of carrying sacks containing extruder machine dust to the hopper area of the mixing machine.

Figure 2. Activity Process of Lifting Material Baskets to the Crusher Machine

Table3. Ergonomic Hazard Risk Levels in the Activities of Lifting Material Baskets to the Crusher Machine and Carrying Extruder Dust to the Mixing Hopper

Risk Factor	**Ribbon Color (G, A, R, P)**		**Numerical Score (For Comparison)**	
	Lifting	***Carrying***	***Lifting***	***Carrying***
Load Weight/Frequency			10	0
Distance of Hands from Lower Back			6	0
Vertical Lift Zone			3	0
Torso Twists and Bends to the Side			2	0
Postural Constraints			0	0
Hand Grips on Weights			1	2
Floor Surface			0	0
Mileage			0	2
Obstacles on the Route			0	3
Environmental factor			0	0
	TotalScore:		21	8

Information:

Green	Low Ergonomic Risk Level
Amber	Ergonomic Hazard Risk Level is Medium
Red	High Ergonomic Hazard Risk Level
Purple	Unacceptable Level of Ergonomic Hazard Risk

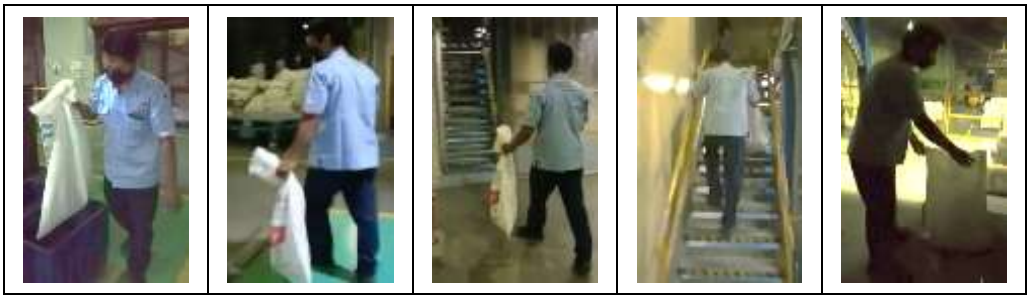

Figure 3. Activity Process for Bringing Extruder Dust to the Mixing Hopper

Table 3 shows that the risk factor for hand grip on loads, distance, and obstacle factors on the route have a high-risk score. It is because workers carry sacks by gripping the top. Workers carry the sacks a distance of 35 meters and climb a ladder 4 meters high, which is done twice per shift. Based on the assessment results using the manual handling assessment chart (MAC) method, this activity has a moderate ergonomic risk level.

The risk occurs in the wrist part of the body, which is used to hold the sack. At the same time, work activities are risky for the knees and thighs because workers have to walk a distance of 35 meters and then go up and down stairs with a high level of ergonomic risk. Therefore, it is important to prioritize worker welfare and safety in activities like this so that workers can avoid injuries and health problems related to ergonomics (Berlin & Adams, 2017; Chander & Cavatorta, 2017; Kuswana, 2014; Widodo et al., 2019).

3.1.3 Risk Assessment of Pushing & Pulling (RAPP)

The results of the assessment using the Risk Assessment of Pushing & Pulling (RAPP) analysis method, as shown in Table 1, show that there is a level of risk of ergonomic hazards in the activity of pushing and pulling loads (pushing & pulling) both with wheeled equipment and manually. One of the findings that there is a risk of ergonomic danger is pushing and pulling an iron basket containing fittings from the injection moulding to the loading area in the injection moulding process. Based on Figure 4, if analyzed using the RAPP method for the Wheeled Equipment indicator, it is known that the iron basket is included in the medium type of equipment because it has four castor wheels. Figure 4 shows the process of pushing and pulling an iron basket containing fittings to the loading area.

Table 4 shows three factors in the high ergonomic hazard risk level category (in red): posture risk factor, travel distance factor and high-value equipment condition factor. The causative factor is that when workers push and pull iron baskets containing fitting products, their body position and arms move tilted forward and backwards with a distance of up to 48 meters every 1 hour. This condition was made worse by the presence of obstacles on the route, which had several turns, and the condition of the equipment, which needed maintenance. As a result, the iron basket became difficult and heavy when moving and manoeuvring

Each operator is responsible for operating six injection moulding machines, or at the same time, there are six activities of pushing and pulling iron baskets containing fitting products. So it can be determined that this activity has a risk of ergonomic danger to the lower back, lower back, elbows and shoulders. The potential risk of ergonomic hazards can occur because workers have to make powerful and focused movements every time they push and pull the iron basket containing the fitting product until the body is in position, the arms move at an angle, bend forward and backwards. At the same time, the body's thighs and knees act as other powerful supports that move in pushing and pulling forces (Chander & Cavatorta, 2017; HSE, 2016; Legault et al., 2014; Lop et al., 2019).

Figure 4. Process Activities of Pushing and Pulling Iron Baskets Containing Fittings to the Loading Area

Table4. Results of Assessing the Risk Level of Ergonomic Hazards in Pushing and Pulling Iron Baskets Containing Fittings to the Loading Area

Factor	Medium Equipment	
	Ribbon Color (G,A,R, P)	Numerical Score
A1. Payload Weight		0
A2. Posture		6
A3. Holding hands		0
A4. Work Patterns		0
A5. Travel Distance		3
A6. Equipment Condition		4
A7. Floor Surface		0
A8. Obstacles On Route		2
A9. Other Factors		0
Skor total		15
Pay attention to individual capabilities, for example, vulnerable workers or psychosocial problems		

Information:

Green	Low Ergonomic Risk Level
Amber	Ergonomic Hazard Risk Level is Medium
Red	High Ergonomic Hazard Risk Level
Purple	Unacceptable Level of Ergonomic Hazard Risk

Figure 5 shows the process of carrying out sacks containing dust from the Somos filter to the crusher area, where workers carry out activities of pushing and pulling loads manually or without wheeled equipment, namely pulling dust from the Somos filter to the crusher area in the dryer and processing section.

If analyzed using the RAPP method without wheeled equipment, namely the action of dragging a load in Table 5, the risk factor for travel distance is high because the distance traveled reaches 84 meters. This activity is carried out only once per shift. So it can be determined that this activity has a risk of ergonomic danger to the body at the wrist with a moderate level of risk of ergonomic danger due to holding and dragging the sack by gripping it on the top side of the sack with resistance across the transverse part of the machine. Apart from that, this activity has a risk of ergonomic danger to the knee area with a high level of risk due to walking up to 84 meters, starting with squatting and then standing up to pick up the sack.

Figure 5. Activity Process for Bringing Somos Filter Dust to the Crusher Area

Table 5. Results of Ergonomic Hazard Risk Assessment in the Activity of Attracting Somos Filter Dust to the Area

Faktor	Dragging	
	Ribbon Color (G,A,R)	Numerical Score
B1. Load Weight		0
B2. Posture`		0
B3. Holding hands		1
B4. Work Patterns		0
B5. Travel Distance		3
B6. Floor Surface		0
B7. Obstacles On Route		2
B8. Other Factors		0
Skor Total		7
Pay attention to individual capabilities, for example, vulnerable workers or psychosocial problems		

Information:

Green	Low Ergonomic Risk Level
Amber	Ergonomic Hazard Risk Level is Medium
Red	High Ergonomic Hazard Risk Level
Purple	Unacceptable Level of Ergonomic Hazard Risk

3.2 Discussions

Lower back, shoulder and upper back complaints are the top three complaints most frequently reported by workers. At the same time, based on the activity identification and analysis of ergonomic hazard risk levels, 30 activities were found to have ergonomic hazards in all parts of the process in the Fitting Production Department. The risk levels for ergonomic hazards found in the field include unacceptable, high-risk, and moderate risks. Monotonous work, repetitive movements and awkward body postures are the most prominent physical risk factors in the workplace. This condition contributes most to the emergence of a level of ergonomic risk (Chander & Cavatorta, 2017; Dzikrillah & Yuliani, 2015; Zaini, 2021).

Prolonged posture will cause static load on the soft tissues and cause discomfort. Excessive standing for long periods. Standing for a long period allows blood and various body fluids to build up in the feet, causing changes in posture if the back is bent and swelling of the feet if the shoes worn, are not suitable (Astuti et al., 2020; Lowe et al., 2019; Zaini, 2021).

The main risk factors for Musculoskeletal Disorders (MSDs) related to manual handling activities in a job are force, posture, repetition, and duration of task (Abedini et al., 2013; HSE, 2018). Therefore, based on the results of the assessment of the activity process of lifting material baskets to the crusher machine, to reduce the danger of ergonomic risks, it is necessary to provide assistive equipment in the form of a portable conveyor to avoid being in a bent position for too long and to minimize manual handling activities during the loading process (Anita et al., 2014; Burciaga-Ortega & Santos-Reyes, 2010).

Overall, the results of observations from the manual handling assessment chart (MAC) and the risk assessment of push pulling (RAPP) show that this activity has a Medium category of ergonomic risk. Manually carrying dust to the mixing hopper using various methods, such as carrying dust sacks, dragging, pushing, pulling, and climbing stairs, can result in various dangers and ergonomic risks. The following are some of the dangers and risks that may arise:

1. Back Injuries: Lifting or dragging heavy dust sacks can cause back injuries. Improper body position or incorrect lifting technique can damage the muscles and spine.
2. Hand and Arm Injuries: Activities such as pulling or pushing dust bags can increase the risk of injury to the hands, shoulders and elbows. This job requires the use of strong-arm muscles.
3. Risk of Slips: Activities such as pulling or pushing dust sacks on floors that may be slippery can increase the risk of slips or falls.
4. Posture Disorders: Activities that involve lifting dust bags or pulling and pushing weights can disrupt posture and cause muscle and joint strain.
5. Physical Fatigue: Repetitive activities like these can cause excessive physical fatigue, resulting in decreased performance and increased risk of injury.
6. Risk of Dust Pollution: Raising or managing dust can increase the risk of exposure to harmful dust or particles that can harm respiratory health.

7. Psychological Stress: Jobs that involve heavy physical activity or risk of injury can cause psychological stress in workers.

To reduce this risk, companies should take ergonomic precautions such as (1) Training workers on safe lifting techniques. (2) Providing auxiliary tools such as trollies or appropriate transportation equipment to assist workers in moving heavy loads. (3) Provide safe stairs with sturdy handrails and non-slip surfaces. (4) Using respiratory protection equipment or adequate ventilation to deal with dust and air pollution. (5) Arrange a work schedule that allows workers to take regular breaks to avoid experiencing physical fatigue

4. CONCLUSION

Based on the results of research in the Fitting Production Department, it was concluded that there was an activity with an unacceptable level of ergonomic risk that was found in the crusher process section, so this activity must be stopped because it will cause serious injury or even injury to the worker's limbs from all parts of the body—carrying out movement styles with strong force and attitudes that are not recommended in ergonomic principles. Activities with high ergonomic risk also occur in the shoulders, lower back, upper back, and wrists. Many activities are found in bent, sideways positions with the arms extended forward or upward in carrying out repetitive movement activities with a fast movement frequency, than in carrying out weight lifting activities, load carrying activities, pushing and pulling weight activities. These results, when compared with the results of initial observations using the Standardized Nordic Questionnaire (SNQ), showed a straight comparison that the three most common complaints were in the lower back, shoulders, and upper back, which were also the most common body complaints found with an unacceptable level of ergonomic risk. Acceptable and high based on the results of the research analysis carried out. In its final section, the study recommends that workers report LBP as early as possible and seek medical advice if workplace exposure harms them. The combined effect of the medical community, labor, and management is needed to impact this problem.

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