THE ERGONOMIC ASSESSMENT OF RUBBER INDUSTRY BY USING ERGONOMIC CHECKPOINTS: A CASE STUDY IN THAILAND AND INDONESIA

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ABSTRACT: Thailand and indonesia are the world leader in rubber production and export. The aim of this study was to evaluate the problems of ergonomics and human factors in rubber Manufacturing Company with emphasis on understanding the importance of improving safety, health, and work condition. Data was collected from 4 rubber factories. The 2 rubber factories are form indonesia and others from thailand. Based on the analysis of participants' feedbacks on the implementation work ergonomics environtmental it found that sometime in all factory have same problems likes the operator did not use personal protective equipment, did not have evacuation route, etc.

KEYWORDS: *Musculoskeletal Disorders (MSDs); Ergonomics Check Point; Risk Assessment; Rubber Production; Rubber Industry.*

1.0 INTRODUCTION

The Asian Economic Community (AEC), which began in early 2016, is a condition that shows Indonesia and Thailand cannot avoid competition of labor or product quality with the countries of the world. Free trade requires business practitioners to pay more attention to matters related to the provision of a healthy, comfortable, and safe working environment. Not only for the workers but also all parties related to business activities. The company's safety demands must provide safety equipment for the workforce in every work to be done in the field (Hidayat, 2016). The cause of the work accident can occur due to unsafe action and unsafe condition. A work accident can hinder the achievement of corporate efficiency. So, from that it can be understood, that the occurrence of accidents should be prevented. A significant relationship between the management safety and environment, number of occupational accidents with the level of implementation success of management safety and environment requires management commitment for health and safety work, duties and responsibilities, procedures, communication mechanism, identification, prevention and control of hazards, accident investigation, and training (Rahman, 2015). Ergonomic problems at the workplace and bad work organization are part of the contributing risk factors to the abovementioned occupational safety and health problems (Niu, 2010). The aim of this study was to ~~see~~ ergonomics and human factors awareness, asesstment and wakefulness in rubber manufacturing company with emphasis on understanding the importance of improving safety, health, and work condition.

2.0 METHODS

2.1 Samples

The factory indo-1 is Co, Ltd Lembah Karet, Indo-2 is Co, Ltd Batang Hari Barisan, Thai-1 is Mai Reang which produce Ribbed Smoked Sheet, and the last factory (Thai-2) is Na Kayad which produce rubber pillow. The two companies in Indonesia is a large company with the type limited company which can produce rubber more than 70 tons per day, while the existing rubber company in Thailand is a small company that cooperative type which can only produce 3 tons of rubber per day. The two companies in Indonesia produce SIR 20, and the company in Thailand produces Ribbed smoked sheet and rubber pillow. Both firms in Thailand and Indonesia do not have OHSAS 18001 certification (Standardization for work safety and health management system). The characteristic of the factories can be seen in Table 1.

Table 1. Characteristic of Factory

Characteristic	**Indonesia**		**Thailand**	
	Indo -1	**Indo -2**	**Thai -1**	**Thai -2**
Location	Jl. By Pass Km No.22, Batipuh Panjang, Koto Tangah, Kota Padang, Sumatera Barat	Jl. By Pass No.18, Ps. Ambacang, Kuranji, Kota Padang, Sumatera Barat	Nakhun Sitamarat	Pathalung
Major product	SIR 20 (Standar Indonesian Rubber 20)	SIR 20 (Standar Indonesia Rubber 20)	Ribbed smoked Sheet	Rubber Pillow
Type of Enterprise	Company limited	Company limited	Cooperative	Cooperative
No. of Employees	99 operator	80 operator	15 operator	14 operator
Capacity of Product	83 ton/ day	72 ton/ day	3 ton/day	2-3 ton/day
Market Traget	Indonesia, Japan, Hongkong, China, America.	Indonesia, Japan, Europe, America.	Thailand	Thailand
Number of Accident (2007-2015)	96 accident	75 accident	1 accident	0 accident
Sertification with ISO 9001 (Standardization for quality management)	Yes	Yes	Indonesia	Indonesia
Have emergency and work safety and health team	Yes	Indonesia	Indonesia	Indonesia
Sertification with OHSAS 18001 (Standardization for work safety and health management system)	Indonesia	Indonesia	Indonesia	Indonesia

2.2 The Ergonomics Checkpoints

Checkpoints are a quick and simple way to evaluate and assess the ergonomics and usability of a certain product, user-interface or a whole system. The new version includes 132 revised checkpoints while the first edition contained 128 items. The newly developed items relate to computer workstations, forklift driving and driving cabins, work at height, cold work environments, air-conditioning systems, office work areas, labelling of containers of hazardous chemicals, waste recycling, confined spaces, fire extinguishers, evacuation plans, physical exercise, full participation of women and men workers, migrant workers, young workers, cultural issues and risk management systems.

2.3 Assessment Procedure

The first thing to 3oi s to ask the permission of the four factories to collect some data there. There are two factories from Indonesia and two factories from in Thailand. We were walking through the work area accompanied by the worker to see the production process. After that we interview workers with the questions related to the production systems and related to the workers' works and environment.

3.0 RESULTS AND DISCUSSIONS

3.1 Assessment results

There are nine modes of area for production process improvement in the ergonomic checklist. Some ergonomic problems are shown in Figure . There are much problem found about work organization. The total number of ergonomic problems in each factory can be seen in Table 2. The total problem in each mode can be seen in Figure .

Indo -1

Indo -2

Thai -1

Thai -2

Figure 1: Examples of some ergonomic problems in Indonesia and Thailand

Table 2: Number of Ergonomic Problems in Each Factory

Mode	Indo-1	Indo-2	Thai-1	Thai-2	Total
Material Storage and Handling	1	1	5	4	11
Hand Tools	1	2	5	1	9
Machine Safety	2	6	3	4	15
Workstation Design	2	2	5	2	11
Premises	1	4	6	4	15
Hazardous Substance and Agents	3	4	3	2	12
Welfare Facilities	7	4	7	5	23
Work Organization	6	3	1	1	11

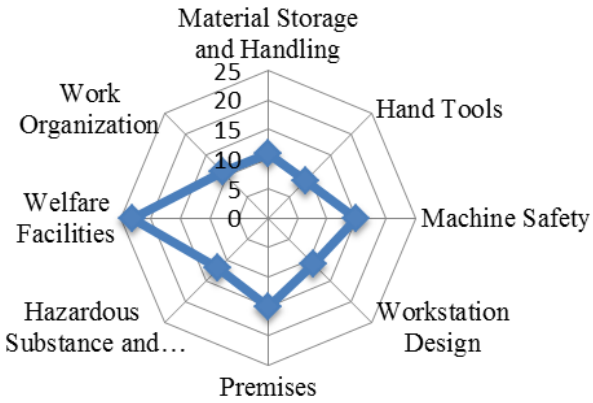

Figure 2: Number of Ergonomic Problems in Each Mode

3.2 Suggestion for Improvement

There are some suggestion for improvement material storage and handling problems given like for Thai-1 and Thai-2 factory such as asphalt and clean transport routes, using conveyors, adjust the height of the mold, and make same height tubs with consideration of anthropometric worker's data and for both Indonesian companies are encouraged to mark all areas of routes for forklifts. Thai-1 factory does not have the problem about hand tools but for Indo-2, it is recommended to provide vices, clams, and gloves while for Indo-1 companies provide hand tools with grips and for Thai-2 provide a room for tools. In the view of machine safety, Indo-2 factory are advised to make emergency controls clearly visible and easily accessible and make different controls like color or shape, and for Thai-1 and Thai-2 companies it is recommended to make some display and signals such us warning sign and safety guidance. For workstation design problems Thai-1 and Thai-2 companies are encouraged to adjust the height of tubs with consideration of anthropometric data, provide chairs for worker, for Indo-1 and Indo-2 are encouraged to allow workers to alternate standing and sitting at work. The problems about lighting for Indo-2 and Thai 1 companies, it is recommended to use lighter color for walls, give more light in corridors, and provide more lighting in the building while Indo-1 and Thai-2 companies did not experience any problems regarding lighting. Premises issues for Thai-1 and Thai-2 companies are encouraged to keep the work area clean, provide more fire extinguishers, escape route marks, and propose evacuation plans. About hazardous substance and agents issues for Indo-1 and Indo-2, it is recommended to cover the washing machine and for the four companies make sure that workers use gloves. The welfare facilities for Indo-1, Indo-2 and Thai-1 are reccommended to provide sanitary, drinking, first-aid

equipment and rest facilities and for Thai-1 and Thai-2 are recommended to mark area requiring the use of personal protective equipment and make SOP for worker. About work organization problems, Indo-1 companies are encouraged to make a meeting discuss about workstation design, propose a training, provide library, involve both managers and workers and make a sharing time for workers and for Thai-1, Thai-2 and Indo-1 is recommended for propose training for safe and efficient operation.

4.0 CONCLUSION

Ergonomic checkpoints is helpful to discover the area for production process improvement for each company. The result of ergonomic checkpoints is based on observations, interviews, and analysis. The ergonomic checklist contained 132 items. Co, Ltd. Lembah Karet has 23 checkpoints, Co, Ltd. Batang Hari Barisan has 26 checkpoints, Mai Reang (RIB Smoke Sheet Factory) has 35 checkpoints, and Na Kayad (Rubber Pillow Factory) has 23 checkpoints. Based on the result, the major area for production process improvement for Co, Ltd. Lembah Karet are welfare facilities and work organization, for Co, Ltd. Batang Hari Barisan is machine safety, for Mai Reang (RIB Smoke Sheet Factory) are premises and welfare facilities, and the last for Na Kayad (Rubber Pillow Factory) is walfare facilities. Each checklist for every company was analised. Some suggestion for improvement for each checklist were given.

5.0 REFERENCES

International Labour Office and International Ergonomic Assosiation. (2010). *Ergonomic Cheskpoints Practical and easy to implement solution for improving safety, health and working condition. 2nd edition.* International Labour Office and International Ergonomic Assosiation.

Alppay, C., & Hedge, A. (2015). Developmnet of an ergonomic checklist for the evaluation of medical tablet personal computers. *6th International Conference on Applied Human Factors and Ergonomics (AHFE 2015) and the affiliated conferences*, *3*, pp. 21-28.

Chantuma, A., Kunarasiri, A., & Chantuma, P. (2012). Rubber New Planting in Thailand: Towards the World Affected on Climate Change. *Rubber Thai Journal*, 40-47.

Destranj, F., & Helali, F. (2016). Implementing "Job Enrichment" with using Ergonomic Checkpoints in an 'Appreciative Way' at a Manufacturing Company in an Industrially Developing Country and its Meta-Reflection. *Journal of Ergonomics, 6*(4), 1-14.

Hidayat, A. (2016). *Identifikasi Bahaya, Penilaian dan Pengendalian Risiko dengan Pendekatan Job Safety Analysis di PT. Batang Hari Barisan Tahun 2016.* Padang: Andalas University.

Niu, S. (2010). Ergonomics and occupational Safety and Health: An ILO perspective. *Applied Ergonomics, 4*(1), 744-753.

Rahman, A. (2015). *Penilaian Risiko Pekerjaan Menggunakan Metode Job Safety Analysis di PT. P&P Lembah Karet Padang Tahun 2015.* Padang: Andalas University.

Tekasakul, P., & Tekasakul, S. (2006). Environmental Problems Related to Natural Rubber Production in Thailand. , 21(2). *Journal Aerosol Res., 21*(2), 122-129.

Viswanathan, P. K. (2008). Emerging Smallholder Rubber Farming System in India and Thailand: A Comparative Economic Analysis. *Asian Journal of Agricuture and Development, 5*(2).

Yazid, M. Y., Alamsyah, Z., & Mulyana, A. (2016). Determinant Analysis for Rubber Export in Indonesia. *International Journal of Scientific and Research Publications, 6*(9), 478-481.