



Ergonomic Approach to Avoid Product Defects

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ABSTRACT

Working in non-ergonomic conditions will easily tire which then experiences a decrease in work concentration, ultimately there are many errors in work including experiencing product defects. This paper is designed descriptively. This design in data collection uses literature, namely data from various opinions and research results. Then analyzed and discussed also using descriptive. Conclusion, Ergonomic working conditions require the design of work tools that are adjusted anthropometrically so that the work position or work posture is ergonomic, the design of the workplace so that an ergonomic environment is obtained for working, and the work process or system is not repeated back and forth. With these ergonomic conditions, workers do not get tired easily which ultimately does not result in product defects

INTRODUCTION

Working in non-ergonomic conditions will make you tired easily. Thus, there is a decrease in work concentration, and in the end there are many errors in work including product defects. Ergonomics in poor condition in product design can cause product defects and quality problems. This is because it makes the product difficult to use, increasing the risk of injury or accidents.

Many products are defective due to non-ergonomic conditions. This is as Petrus Wibisono et al (2018) said that "the average company in making bottles is 3.73% is the percentage of the number of defects". In line with that, at the Shoe Company, Wibisono et al (2020) said that "in the current production process there is still a lot of waste and product defects that cause operators to have to rework so that production takes longer. Not only that, the condition of the operator's body posture that is not ergonomic due to the incorrect working position can cause the operator to get tired and decrease concentration so that the process time is longer".

Ergonomic hazards in the workplace include various factors that can cause injury or physical discomfort to workers. This is due to poor posture, repetitive movements, lifting heavy loads, irregular work stations, and exposure to vibration and noise. All of these will contribute to the product defect process.

As the results of research by Yodi Prasetyo et al. (2024) that "work posture and layout are the most dominant ergonomic aspects that cause ergonomic hazard risks". Then, non-ergonomic tools make the body uncomfortable, as Boni Malinda Pangaribuan et al. (2016) said that "the most dominant type of defect in the production process is a non-standard dimension of 46.8%, the largest of which is caused by fluid pipes".

Therefore, the workplace must have ergonomic conditions. With ergonomic conditions, both work posture and work environment, work is not easily tired. By working without getting tired, work concentration will be maintained, reducing the occurrence of product defects in the work process.

LITERATURE REVIEW

1. Physical Ergonomics and Workplace Design

1. Several studies emphasize that poor workstation layout leads to awkward postures and repetitive strain injuries, which decrease accuracy and increase defect rates.
2. Hignett & Wilson (2004) found that ergonomic redesign of workstations significantly reduced musculoskeletal disorders and improved product consistency in assembly lines.

Karwowski et al. (2003) showed that minimizing reach distances and optimizing tool placement decreased errors in high-precision tasks.

2. Cognitive Ergonomics

Errors often arise not from a lack of skill, but from cognitive overload or poor information presentation.

1. Wickens & Hollands (2000) explained how improved interface design and information presentation reduce mental fatigue and enhance decision-making, directly lowering the likelihood of product defects.
2. Reason's (1990) Swiss Cheese Model is often cited in ergonomics to illustrate how latent conditions (like poor cognitive ergonomics) contribute to active failures.

3. Organizational Ergonomics

The culture, job design, and training practices within an organization influence the ergonomic environment.

1. Hendrick (1996) introduced macroergonomics, demonstrating that participatory design and feedback loops lower product rejection rates.
2. Niebel & Freivalds (2003) identified that organizations with high ergonomics maturity reported fewer human errors and reworks.

METHODOLOGY

This paper is designed descriptively. With the aim of an ergonomic approach to avoid product defects in the production process. This design in data collection uses literature, namely data from various opinions and research results. Then analyzed and discussed also using descriptive. Furthermore, in the conclusion method used deductively.

RESULTS AND DISCUSSION

Ergonomic Working Conditions, Fatigue, and Product Defects

Ergonomic working conditions are the state of the workplace, equipment, and work tasks designed to suit the needs and abilities of the workforce to reduce the risk of injury, discomfort, and fatigue while working. All of that which is not ergonomic ultimately contributes to many product defects.

How important is the work position, if the work position of the workforce is wrong or not ergonomic, the worker will easily get tired and there will be abnormalities in the shape of the bones, all of which affect performance. This is as per the research results of Tribuana Yogaswara et al (2023) that "anthropometric profiles, work tool design, workplace and worker fatigue have a significant influence on improving performance".

In the application of ergonomics, aspects must be met. This is as according to Puti Dwi Ginanti (2025) that "the application/implementation of ergonomics requires work position, work process, workplace layout, and lifting loads". Then, the application of ergonomics in the production system can reduce product defects. This is as stated by Mohsen Zaere et al (2015) that "the integration of an ergonomic approach in the production system can reduce defects and improve quality in the production process".

Furthermore, there is a relationship between ergonomic status and work fatigue, as stated by Tyas Arbianisa et al (2016) that "the ergonomic status of the work position is related to worker fatigue". In the application of ergonomics, the design of tools based on different anthropometry means that muscle fatigue is also different. This is as per the research results of Tribuana Yogaswara et al. (2023) that "there is a significant difference between anthropometry and fatigue status in workers". Then, according to Hari Purnomo (2007) that "a work system with a total ergonomic approach can reduce workers' musculoskeletal complaints by 87.8%, and reduce worker fatigue by 77.5%". Therefore, in the design of the equipment, the worker's anthropometry must be adjusted to avoid muscle-skeletal complaints and work fatigue.

Based on the discussion above, in ergonomic working conditions, it is necessary to design work tools that are adjusted to anthropometry so that the work position or work posture is ergonomic, the design of the workplace so that the ergonomic environment for work, and the work process or system are not repeated back and forth. With these ergonomic conditions, workers do not get tired easily which ultimately does not result in product defects.

CONCLUSIONS AND RECOMMENDATIONS

Considering the discussion and analysis above, it can be concluded that: Ergonomic working conditions require the design of work tools that are adjusted anthropometrically so that the work position or work posture is ergonomic, the design of the workplace so that an ergonomic environment is obtained for working, and the work process or system is not repeated back and forth. With these ergonomic conditions, the workforce does not get tired easily which ultimately does not result in product defects.

FURTHER STUDY

This research still has limitations so further research is needed on the topic of Ergonomic Approach to Avoid Product Defects in order to perfect this research and increase insight for both readers and writers.

REFERENCES

- Bonitaa Melinda Pangaribuan, Naniek Utami Handayani, 2016, Analisis penyebab cacat produksi roma kelapa pada mesin oven dengan metode failure modes effects analisis (FMEA) (studi kasus pda PT. Mayora indah Tbk, Departen Teknik industry, Fakultas Teknik, Universitas Diponegoro, Semarang.
- Hari Purnomo, Adnya Manuaba, Nyoman Adiputra, 2007, Sistem kerja dengan pendekatan ergonomic total mengurangi keluhan musculoskeletal, kelelahan dan beban kerja serta meningkatkat produktivitas pekerja industry gerabah di Kasongan, Bantul, Indonesian journal of biomedical sciences, Vol 1 no.3, Progdil ilmu Kesehatan, Universitas Udayana, Denpasar.
- Mosen Zare, Michel Oroq, 2015, Apakah ergonomic meningkatkan kualitas produk dan mengurangi biaya? Artikel ulasan, ResearchGate, Human factors and ergonomics manufacturing and service industries, University of technology of Belford-Montbelard, Prancis.
- Petrus Wisnubroto, Titin Isna Oesman, Wiwin Kusniawan, 2018, Pengendalian kualitas terhadap produk cacat menggunakan metode seven tool guna meningkatkan produktivitas di CV. Madani plast Solo", Industrial engineering journal of the University of sarjanawiyata Tamansiswa, Vol 2 no.2, E-ISSN 2613-9812, Yogyakarta.
- Puti Dwi Ginanti, 2025, Ergonomi, PT. Prodi occupational helth Indonesia, prodiaohi.co.id
- Tribuana Yogaswara, Zulkifli Djunaidi, 2023, Analisis ergonomic di tempat kerja dan kelelahan pada pekerja dalam Upaya peningkatan kinerja di PT.X, Jurnal Kesehatan Masyarakat inovatif, Volume 6 nomor 4, Fakultas Kesehatan Masyarakat, Universitas Indonesia, Jakarta.
- Tribuana Yogaswara, Zulkifli Djunaini, 2023, Analisis ergonomic di tempat kerja dan kelelahan pada pekerja dalam Upaya peningkatan kinerja di PT.X", Jurnal Kesehatan masyarakat inovatif, Volume 6 no.4, Fakultas Kesehatan masyarakat, Universitas Indonesia, Jakarta.
- Tyastiana Arbianisa, Agus Suwarni, Muryoto, 2016, Analisis ergonomic posisi kerja dan kelelahan kerja pada tenaga kerja di CV. Sinar albasia utama Kalasan, Sleman, Provinsi DI Yogyakarta, Jurnal Kesehatan lingkungan, Vol 7 no.4, Poltekes Kemenkes Yogyakarta.

Wibisono, Olivia, 2020, Integrasi antara ergonomic dan lean sigma dam perbaikan proses untuk mengurangi pemborosan di home industry victor Mojokerto, Repository, Departemen of industrial engineering, Faculty of engineering, University of Surabaya.

Yodi Prasetyo, Budi Aswin, La Ode Reskiaddin, 2024, Kajian bahaya potensial ergonomic pada pengrajin batik (studi kasus craftsmen in ulu Gedung sub-district), Jurnal kesmas Jambi, e-ISSN 2580 5894, Volume 8 no. 1, Progdil ilmu Kesehatan Masyarakat, Universitas Jambi.