Industrial Ergonomics

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Abstract - De Looze assume a gap between scientific research on human factors and on design theories on one hand, and the needs of professionals in engineering and design on the other hand. Is the ergonomics community studying the most relevant issues from a practical point of view? Closing the gap between practitioners and researchers remains a challenge. Two steps should be taken: 1) organize access to the best practices developed in the field and 2) organize research programmes with potential societal and market value. There is one important thing scientist are missing: case material. Professional ergonomists have a tremendous amount of case material. After 25 years of working in the field, the author would be able to present over 100 cases. Some are included here. Practitioners, evaluating work and designing or implementing solutions, may develop good or even best practices. Publishing a report on a successful, or perhaps an unsuccessful project, seldom is part of the work contract. It is not a standard line of business if one is not affiliated to scientific research. In addition, getting a project report published may easily fail, because this type of work is not commonly accepted in the international journals. Hence, writing this article has been an opportunity taken to publish about projects.

Keywords - Erogonimics, Industry.

I. INTRODUCTION

Ergonomics (or human factors) is described as fitting tasks, workplaces and interfaces, to the capacities, needs and limitations of human beings. The aim of ergonomics is to optimise safety, health, comfort and efficiency for the human in the work system. The tools which are used and the production systems which are controlled, are numerous and varied. Due to the variety of tools and differences between users in terms of for example body size, muscular strength, and cognitive abilities, favourable human-task matches will not arise as a matter of course. Therefore, designing human-machine systems is a complex task [1], characterized by the need for an interdisciplinary approach. A succinct definition of ergonomics is user-centred design or user-centred engineering [2], expressing a focus on the human being, and at the same time emphasizing prevention by design. (Note: such a definition would also cover other words related to ergonomics and frequently used as well, such as human factors, design for all, or participatory ergonomics.

The word “ergonomics” originates from Greek language from the word “ergon,” meaning work, and “nomos” meaning “laws.” In todays terminology, this word refers to science of “designing the job to fit the worker, rather than forcing the worker to fit the job.” Every aspect of a job, from the physical stresses it places on muscles, joints, tendons, nerves and bones, to environmental factors like noise, lighting, temperature, air moisture and other factors that can affect human health – it is all related to the subject of ergonomics.

In the packaging industry,we focus on packaging solutions. We focus on cartoners, case packers, tray packers and palletizers. We focus on protecting the product, but we shouldn’t overlook the importance of protecting the workers as well.

Ergonomic Injuries in the World of Packaging

When done manually, packaging operations often require employees to stand in a single location, performing repetitive movements. Some packaging operations require heavy lifting or awkward postures. Workers that handle packaging operations manually have the risk of repetitive motion injuries – injuries that are caused by performing the same movement over and over which strains the body part. A research paper published earlier this year, “An Ergonomic Investigation of the Case Packing Line at Company XYZ” gave us these insights on the types of injuries and their impact when it comes to manual case packing operations. According to the paper, the most common injuries were associated with the wrist (caused by cumulative trauma disorders, such as carpal tunnel syndrome and tendonitis) and the back (the result of improper lifting techniques). But these injuries don’t hurt only the worker. Data from the Bureau of Labor Statistics emphasizes the loss of productivity caused by workplace injuries, for example:

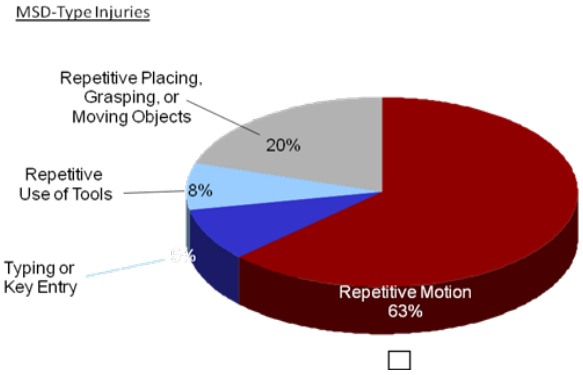
- 3,277,700 total reportable injuries; 965,000 of those injuries resulted in absence from work
- 379,340 injury reports involved sprains, strains, and tears; 11% of those injuries (43,100) happened to workers in the manufacturing industry
- 195,150 back injuries were reported; 10% (20,540) occurred to employees in the manufacturing industry (v)

Though training can help, it doesn’t change the work process, so certain risks remain. These risks can be lowered by automation, so consider these improvements

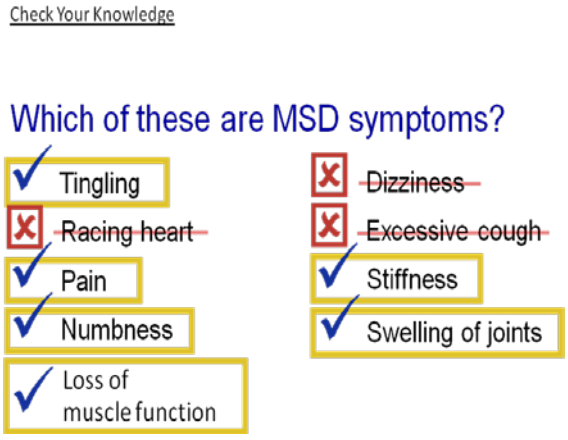
for your packaging line in order to avoid repetitive motion injuries and other hazards:

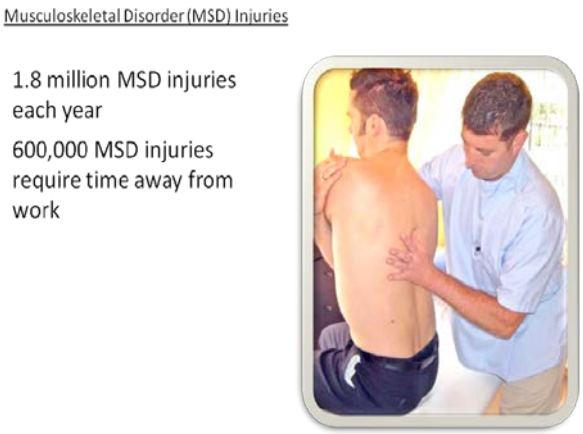
- Instead of making the workers erect cartons by hand, consider acquiring a case erector. Besides an increase in the efficiency, you will also eliminate the chance of repeated-use injuries.

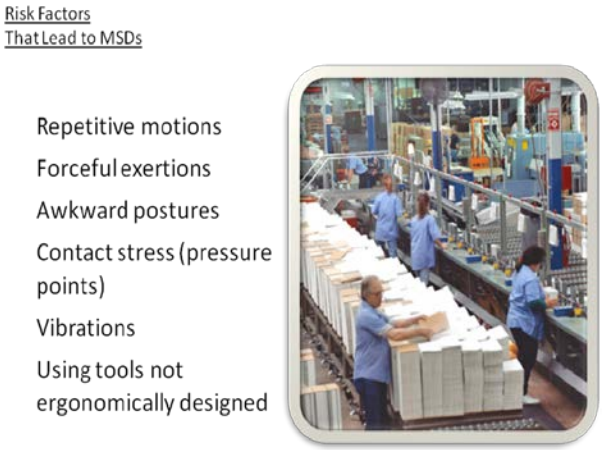
- To prevent repetitive use injury due to hand taping of cases, think about the use of case sealers which automatically apply tamper evident security tape to packages.



- Use a robotic automation solution to reduce the ergonomic risks of both the manual case packing and palletizing processes. A robot cannot be injured, so if you leave all the repetitive work to a robot, human intervention will be required only to run the machine and re-load the case magazine. When it comes to palletizing, let the robot handle the case lifting and stacking motions, and reduce the risk of injury to personnel. Keep in mind that even assembly processes include repetitive motion that can lead to carpal tunnel syndrome or tendonitis. Robots today have what it takes for assembly and material handling processes, so you can reassign your workers to duties that are less likely to cause injury.







Some following Points are:

- Ergonomics (or human factors) is described as fitting tasks, workplaces and interfaces, to the capacities, needs and limitations of human beings. The aim of ergonomics is to optimise safety, health, comfort and efficiency for the human in the work system.

- The tools which are used and the production systems which are controlled, are numerous and varied

- Due to the variety of tools and differences between users in terms of for example body size, muscular strength, and cognitive abilities, favourable human-task matches will not arise as a matter of course.

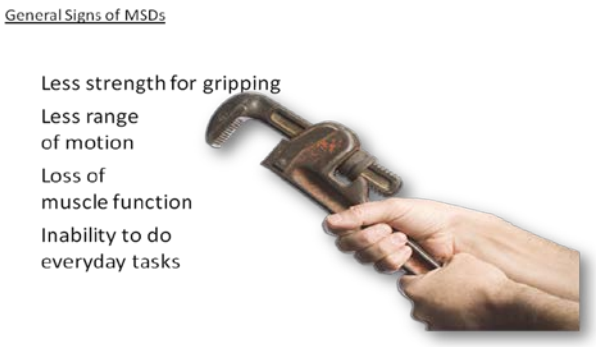
II. SYSTEM MODEL

Projects concern building a new production system, extending an existing system, or automating (or mechanizing) existing systems. It doesn't make any difference whether the system is a large production system, an office building or merely a small facility, such as a bridge masters guard house. A project is characterized by a physical result, something that actually works. A project always requires the input of several disciplines: – management (project owner, project managers) – end users or their representatives – engineering disciplines

(mechanical, instrument, building, software) – (building) contractors – others, such as an architect, ergonomist, and a personnel manager.

III. PREVIOUS WORK

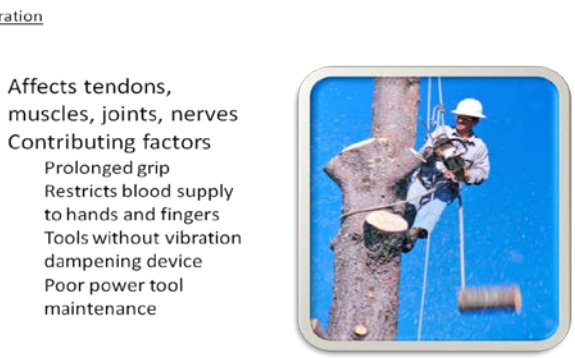
To reduce the chance of injury, work tasks should be designed to limit exposure to ergonomic risk factors. Engineering controls are the most desirable, where possible. Administrative or work practice controls may be appropriate in some cases where engineering controls cannot be implemented or when different procedures are needed after implementation of the new engineering controls. Personal protection solutions have only limited effectiveness when dealing with ergonomic hazards.



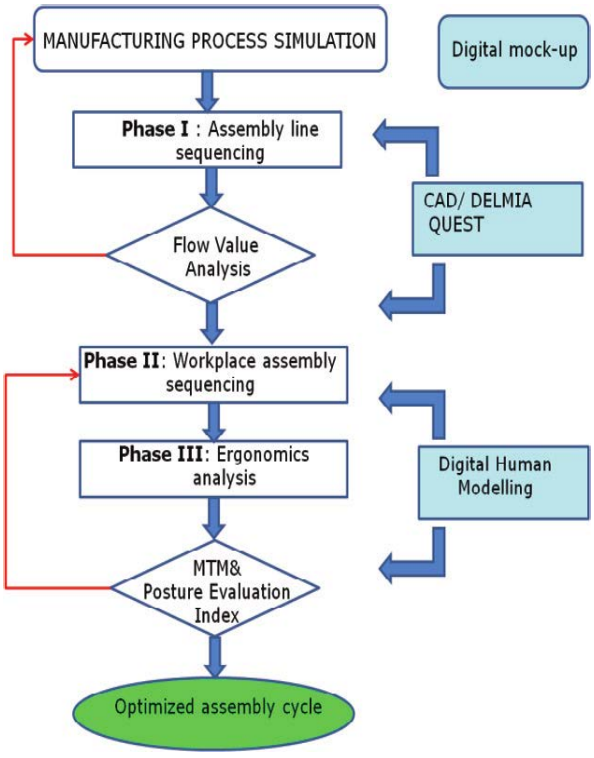
IV. PROPOSED METHODOLOGY

Packed with illustrations and practical examples, Guide to Methodology in Ergonomics: Designing for Human Use, Second Edition provides a concise introduction to ergonomics methods in a straightforward manner that helps you conduct an ergonomics analysis of a product in development. It details the execution of 12 ergonomics methods that can be applied to the design of any type of product or interface.

The authors stress the role of ergonomics in reducing device interaction time and user error while improving user satisfaction and device usability. See What's in the New Edition: * Four case studies * Addition of another co-author * Examples that reflect current technology * Information on Critical Path Analysis (CPA) The authors highlight where ergonomics methods fit in the design process and how to select a method appropriate for your purpose. They describe each method, supplying an overview, instructions on how to carry out an analysis, a mini bibliography, pros and cons, one or more examples, and a flow chart. They then rate each method for reliability/validity, resources, usability, and efficacy. The book then examines data from studies on training, reliability, and validity, and presents an equation that enables you to calculate approximately the financial benefits of using each method. Based on research and expertise, the book gives you the freedom to be adventurous when choosing methods and the foundation to choose the method that fits the task at hand. Written by experts, it also helps you hone your skills and put the craft of ergonomics into practice.



V. SIMULATION/EXPERIMENTAL RESULTS



Under the conditions of integrated joint operations, it is required that a new generation equipment integrated seamlessly into the joint warfare architecture, the span of armored equipment intelligent control technology would produce a new model of human–computer interaction, with virtual reality technology, building a “man in the loop” of the crew cabin ergonomics virtual test system;

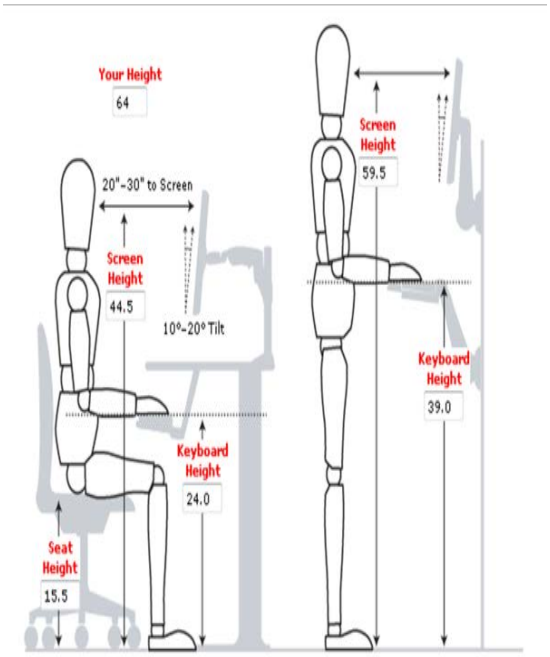


Fig.1. Chiropractic Care Series

it has the characteristics of quick change among the three compartment models such as job scene custom, job task performance evaluation, and ergonomic assessment tools of combination of subjective and objective; the system relies on a new generation of equipment cabin design, it could achieve design optimization, crew workload assessment, the verification of crew job tasks and processes, and ergonomic studies, to provide assessment tools of the overall cabin design.

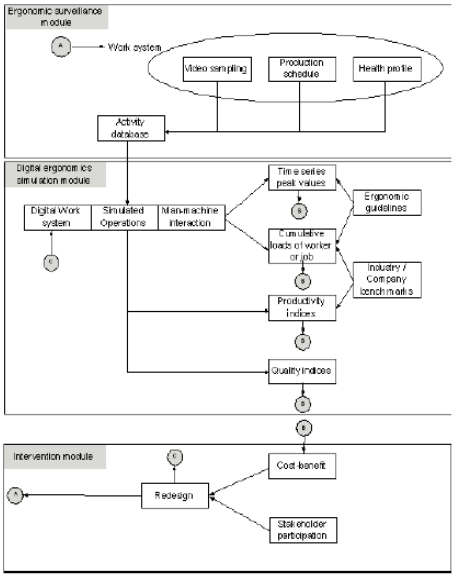


Figure 2: HFE intervention framework, Note: A, B and C are connecting links between three modules in the above flowchart.

VI. CONCLUSION

Forceful Exertions

Inflammation of tendons, nerves, joints
Contributing factors
- Type of grip
- Weight of object
- Body posture
- Type and duration of the task

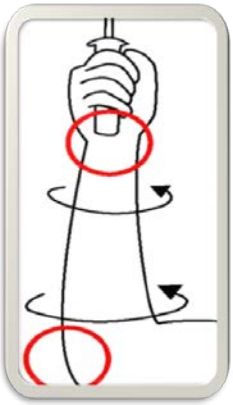


Image Credit: OSHA

Contact Stress

Pressing against or grabbing a hard object puts pressure on nerves, tendons, and blood vessels
Contributing factors
- Repetition
- Duration of contact
- Grip strength required

Risk Factor– Repetitive Motion

Stress on muscles and tendons
Contributing factors
- Duration and speed of repetitious movement
- Number of muscles involved
- Required force

Raising and lowering the arm over and over again

VII. FUTURE SCOPES

The existence of adequate ergonomic conditions is essential to guarantee an optimal performance of work and to preserve the most important asset of an enterprise: the human capital. The best way to achieve this is to implement ergonomic principles from design (of machines, production processes, management systems…), and there the industrial engineer acquires greater prominence.

On the other hand, there is a strong need for research in ergonomics, as the continuous changes in technology and production systems introduce new risk factors with still unknown effects on this type of disorders.

Taking all this into account, ergonomics should be included in the training of all industrial engineers, as ergonomic principles should accompany them along their whole professional life.

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