Case of the worn fodder silo

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Aim of the best

- Series of best practices targeting welders
- Thematic according to hazard categories

Structure of the best practice

- Introduction and a warning
- The story
- Analysis
- Hazards
- Theoretical background
- Practical tips and solutions
- Summary
- References and links

A complex story: Case of the worn fodder silo

- At a poultry farm, dry feed was stored in a wall-mounted steel container of 5 m3. The material was fed by chuting (down-spouting) through a pipeline on a weekly basis, and it was opened through an outlet pipe on the side of the container on an hourly basis.
- The old container got worn out around the outlet opening, therefore a decision was made to replace the area affected. In the course of container inspection it was also revealed that this opportunity would be better to be used for the replacement of supporting structures as well; furthermore, it would be high time to check the inside of the container and repair it if required.

Analysis

- Locations
- Stakeholders (those endangered)
- Operations and technologies applied (e.g. Materials handling)
- Tools applied for work (e.g. Speed cutter)
- Materials (e.g. gases used for welding)
- Worksite accessories (e.g. workbench, scaffolding)
- Working environment components (e.g. Traffic routes)
- (Safety tools e.g. Glasses against flying objects)

Hazards

All hazards occurring at work must be explored by analysis in respect of the specific workers, tools, materials and technologies, etc. concerned. The example shows a great number (and variety) of hazards; a detailed description of circumstances provides assistance in their collection. Hazard groups from the example of silo maintenance:

- **Hazards from materials (material of electrodes, welding gases, etc.)**
- **Hazard of work in heigh (fixing the container after reassembly)**

Warning!

- **The list of hazards above does not include welding risks in detail. All stakeholders are supposed to reduce hazards in order to create the conditions for safe work not representing a health hazard. Risk assessment at work is a legal obligation of employers; but as it is a special professional operation, it is recommended to ask for the assistance of health and safety experts.**

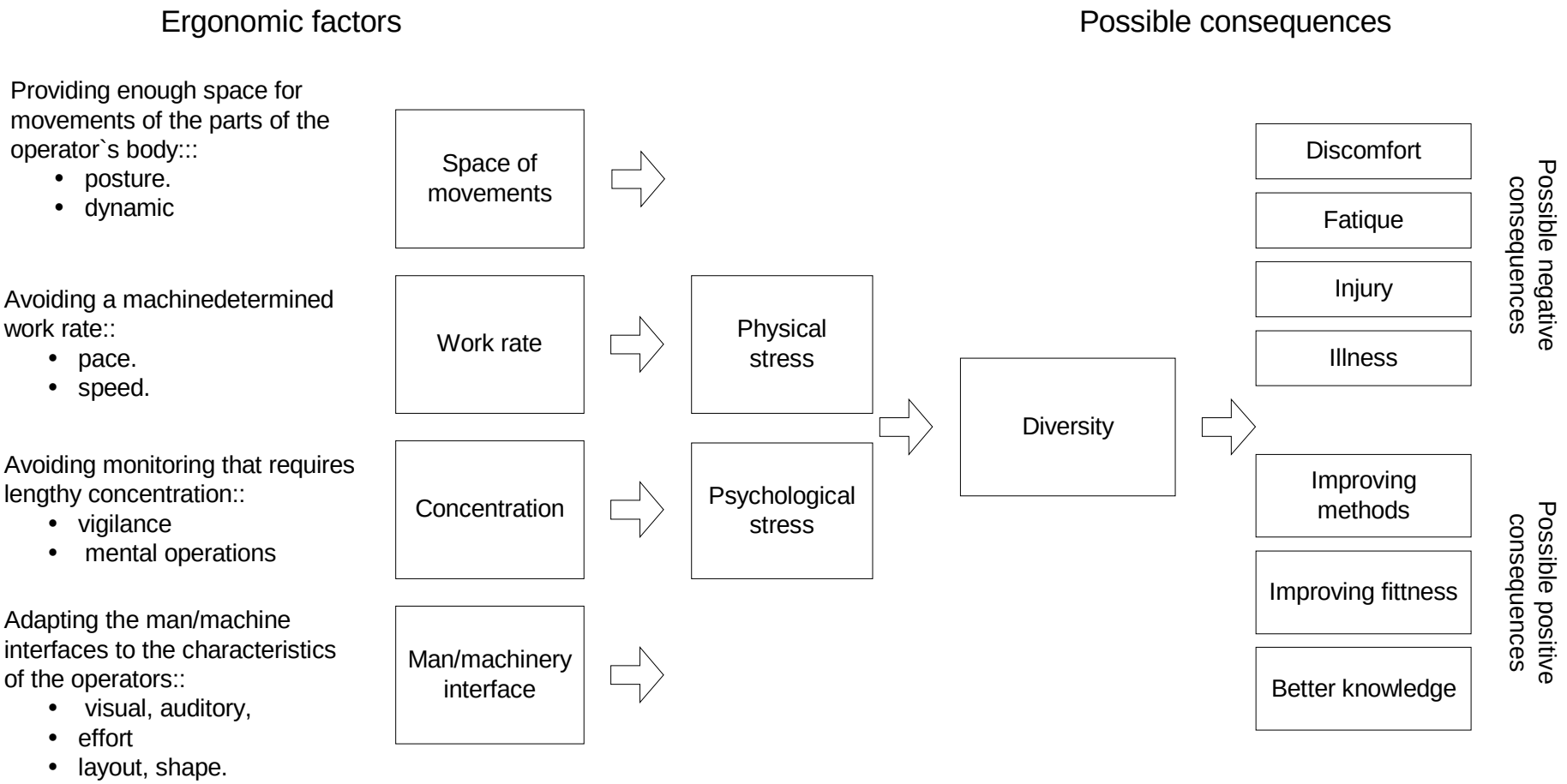
Ergonomics hazard examples

- Hazards of on-site survey: **travel to site and work in a foreign terrain**.
- In case of computer-aided engineering design, hazards include office work (with a monitor).
- Materials procurement hazards involve carrying iron pieces into the workshop, representing **manual materials handling**.
- Use of the cutting machine involves machine tending; hazards may include **bad posture, exertion and manual materials handling** during work.

Theoretical background

- Maintaining posture
- Welding operations
- Manual materials handling
- Safety of machinery
- Ergonomics program elements

Ergonomic factors based on Directive 2006/42/EC and Standard ISO 26800



Typical work-related musculoskeletal disorders

- **Back injuries** primarily include injuries of the spine and adjoining soft parts (strain, rupture, haemorrhage), and the development of diseases causing permanent pathological states ranging from a simple sprain to discopathy.
- **Tendosynovitis:** a disease particularly frequent on the forearms, the hands, the legs and the feet, caused by prolonged overexertion. It can also develop as a consequence of numerous repetitions of identical movements with low exertion; on the legs, it is triggered by excessive standing or walking. In an acute state, the afflicted part of the body is highly sensitive to pressure and very painful to move. Treatment involves total rest (plastered up), and medication, possibly supplemented by hot physical therapy such as bath or mud treatment.
- "**Carpal tunnel syndrome**": In the so-called carpal tunnel along the inside of the wrist, one nerve and nine tendons run from the forearm to the hand. Overexertion of the hand caused by repeated movements, as well as prolonged overstretching of or pressure on the wrist play a dominant role in its development. Symptoms generally include numbness, pain, tingling or a combination of the three in one or both hands, in the thumb, the index finger, the middle finger and more rarely in the ring finger, reduction in the gripping power of the hand and insensibility at fingertips. It is generally cured by relieving the hands and medical treatment, but it may take months for the gripping force to recur and for the original activity of the hands to be restored.
- **Bursitis**: bursae cover osseous protrusions and assist the displacement of muscles and tendons over the bones. Bursitis can develop as a consequence of prolonged elbowing, kneeling or sitting in the course of welding, most frequently in the bursae over the shoulder, the elbow or the knee. It generally starts with sudden and intense pain which will abate later on. Many times, patients recover in a couple of weeks by repose, immobilization and ice packing of the limb and medication, but sometimes a surgical intervention is required.
- **Shoulder pain** – pain in the upper parts of the shoulder caused by the compression of blood vessels and nerves, consequent upon prolonged work performed overhead.
- **Genicular disorders** caused by prolonged kneeling.

Work-related physical risk factors held responsible are linked to disorder groups according to regions of the body

Back disorders

- manual materials handling
- frequent bending and twisting
- heavy physical loads
- static work
- whole body vibration

Upper limb disorders

- repetition
- force
- repetition and force
- repetition and cold
- vibration

Factors to determine ergonomic risks

- **Frequency: how often the impact is exerted, e.g. how many times the given move needs to be performed.**
- **Duration: how long the given task is required to be performed, e.g. length of shift, duration of uninterrupted welding.**
- **Force: how strong the impact is, e.g. what force must be exerted to grip the retainer, what force is required to displace the welding apparatus.**
- **Posture: how natural the bodily position is during work, with particular regard to the position of the back and the upper limbs.**
- **Vibration: vibrations affecting the entire body or the hand, coming from vibrations of the structure or the hand tool.**

Factors affecting ergonomic risks

- **Static posture: the uninterrupted tension of muscles impedes metabolism.**
- **Part of the body used for exertion or exposed to pressure: in respect of welding, the exposure of hands is obviously coupled with the pressure of the mask on the head or the knees being loaded when kneeling.**
- **Temperature of the environment or of the object handled: risks are higher in case of too hot or too cold objects.**

Practical tips and solutions examples

- **Alternate standing and sitting positions if possible. Try to do your work by moving steadily, without sudden motions and static postures.**
- **Open the mask by hand. A nodding move is also a sudden tug for the neck, representing an unnecessary load.**
- **Apply supports verified to be appropriate for holding and supporting the body. Remember to support the legs, the knees, the buttock, the back and the hand (the non-welding but propping one) as well.**

Summary

- In the course of ergonomic development, a complex solution to integrate safety, efficiency and comfort aspects is arrived at after exploring all factors; at the same time, typical solutions can be identified to reduce certain risk types.
- The number of identical movements to be performed by a given employee in a single shift can be reduced to an acceptable level by any of the following, for example:
  - simple tools;
  - enrichment of work operations;
  - longer breaks;
  - job redesign.
- Hazards by physical loads can be reduced by any of the following:
  - reducing the weight of tools, work pieces, and crates;
  - higher adhesion of the hand and the grip;

References and links

- To other cases
- To internet sites
- To standards
- To legislation

Thank you for your attention

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