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Ergonomics and Manual Material Handling

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Overview

As members of ISTA and the packaging community, we are in a unique position to help improve ergonomics as it relates to handling products, packages, and unit loads.

This presentation will help to highlight high risk manual material handling (MMH) work tasks and choose effective options for reducing their physical demands, increasing general safety and health aspects of work environments, and increasing productivity.
Ergonomics

- Ergonomics is the scientific study of people at work.
- The goal of ergonomics is to reduce stress and eliminate injuries and disorders associated with the overuse of muscles, bad posture, and repeated tasks.
- This is accomplished by designing tasks, workspaces, controls, displays, tools, lighting, and equipment to fit the employee’s physical capabilities and limitations.

Source: National Institute for Occupational Safety and Health (NIOSH)
Ergonomics and Musculoskeletal Disorders
Ergonomics

• Comprised of three main fields of research:
  ▪ Physical Ergonomics
  ▪ Cognitive Ergonomics
  ▪ Organizational Ergonomics

• Types of ergonomic improvements:
  ▪ Engineering Controls
  ▪ Administrative Controls
  ▪ Personal Protective Equipment (PPE)

• Today’s focus is on the Physical Ergonomics and Engineering Controls

Musculoskeletal Disorders (MSDs)

- MSDs are injuries and disorders of the soft tissues (muscles, tendons, ligaments, joints, and cartilage) and nervous system.

- The High Cost of MSDs
  - MSDs account for 34 percent of all lost-workday injuries and illnesses.
  - Employers report nearly 600,000 MSDs requiring time away from work every year.
  - MSDs account for $1 of every $3 spent for workers’ compensation.

Source: Ergonomics: The Study of Work Occupational Safety and Health Administration (OSHA 3125)
Musculoskeletal Disorders (MSDs)

- **Ergonomic risk factors for MSDs**
  - Force
  - Repetition
  - Awkward postures
  - Static postures
  - Quick motions
  - Compression or contact stress
  - Vibration
  - Cold temperatures
  - Recovery time

- **Force, repetition, and awkward postures**, especially when occurring at high levels or in combination, are most often associated with the occurrence of MSDs

Source: Ergonomics: The Study of Work (OSHA 3125)
Musculoskeletal Disorders (MSDs)

- Manual materials handling (MMH) risks
  - Lifting / Lowering
  - Pushing / Pulling
  - Carrying / Holding
  - Bending / Reaching
- MSDs most frequently involve the arms and back.

Source: Ergonomics: The Study of Work (OSHA 3125), google images
Injuries linked to MMH jobs

• Hand/Wrist 9 %

Source: Practical Demonstrations of Ergonomic Principles (NIOSH RI 9684)
Injuries linked to MMH jobs

• Elbows 18%

Source: Practical Demonstrations of Ergonomic Principles (NIOSH RI 9684)
Injuries linked to MMH jobs

• Shoulders 30%

Source: Practical Demonstrations of Ergonomic Principles (NIOSH RI 9684)
Injuries linked to MMH jobs

- Back 43%

Source: Practical Demonstrations of Ergonomic Principles (NIOSH RI 9684)
Best and Preferred Work Zones

• Work is safest when lifting and reaching is performed in these zones. Working outside these work zones results in non-neutral postures that may increase the risk of injury.

“Power Zone”
shake hands with your work

Source: Occupational Safety and Health Administration Guidelines for Retail Grocery Stores (OSHA 3192-05N 2004), OSHA Supplemental Info: Ergonomic Principles Index
Examples of MMH and Ergonomic Solutions

Source: MHI EASE Council
Pallets

Approximately 475 M new pallets produced each year in the USA. 1.4 B (est.) pallets are in use at any given time.

MANUAL LOADING AND UNLOADING OF PALLETS CONTINUES TO BE ONE OF THE MOST COMMON AND MOST INJURY PRONE TASKS IN INDUSTRY TODAY.
Here is a very typical problem
In this retail paint store 65 to 80 lb. pails need to be moved from the pallet to mixer and shaker - then back to the pallet.
The solution not only solves the lower back problem, it substantially enhances productivity.

Positioners allow the worker to stand erect, dramatically reducing the back bending.
Workers carrying heavy loads...

...then picking or placing those loads on pallets which are on the floor.

DOH! My aching back
Positioners hold pallet loads to a proper height
Lifts and positioners can also be fitted with turntables for “near side” loading.

As much as 40% of the time required loading a pallet, can be spent walking around it!
Lifts fitted with turntables eliminate wasted motion which enhances productivity.

...and put the load at the right elevation to reduce the possibility of back inquiry.
Balancers can also be used to load and unload pallets and make positioning goods at various locations within a machine or work center.

Notice the bi-directional workstation crane. These trays of parts become virtually “weightless.”
This balancer has a vacuum end-effector to quickly grab the heavy cheese wheels. The balancer speeds the lifting and maneuvering of this palletizing operation.
Vacuum lifters are efficient and very useful in handling unusual shapes and sizes in pick and place tasks.
Manipulators making easy work of handling heavy cylinder heads in a machining center
Articulated booms require substantially less force to move them, reducing the stress on the operator.
Another solution to manually handling loads is using powered stackers.

They are highly maneuverable in tight quarters.
These lightweight aluminum stackers are highly maneuverable...

...they provide easy access to loads

...and increase productivity!
Inexpensive stackers to transport pallet loads in and around work stations.

Even load/unload directly from the stacker.
Pallet inverters make quick work exchanging pallets...

...and they eliminate the human interface
Lift tables and gravity conveyor provide efficiency gains as well as ergonomic improvements.
Lumber to be processed that is on the floor or a pallet is slow, back breaking work
With a lift table to level the stack, the lumber can be fed in as fast as the machine can process it – no wasted motion here.
Containers

Manual loading and unloading of wire baskets, containers and Gaylord's leads to a high incidence of lower back injuries.
Production Bottleneck: 
Back bending, back extension, over reaching and fatigue
Portable tilters also provide for getting to all the material in the container.
Proper positioning maximizes production & minimizes ergonomic issues
They can work like this....

....or like this.
Picking 1,000’s of small parts made easy by using tilters

Notice the high hinge causing the container to elevate as it tilts.
This spring loaded positioner elevates the goods in the container to speed picking the parts and eliminates the bending and extension issues.
Good examples of how industrial tilters foster good ergonomics and help get the job done efficiently.
Lift & Tilt to position electrical panels in this work cell
Positioning large assemblies

Turntable

Lift Table
Casters and Wheels

A caster is a complete wheel and horn assembly which, when attached to a piece of equipment, allows that item to move. There are two basic types of casters:

- **Cushion Load**
- **Protect Floor**
- **High Capacity**
- **Roll Easy**

MMH wheel examples

Source: MHI EASE, Hamilton Caster & Mfg. Co., MHI Institute of Caster and Wheel Manufacturers (ICWM)
Caster and Wheel Ergonomics

Pushing is preferable to pulling

Source: MHI EASE, Hamilton Caster & Mfg. Co., MHI Inst. of Caster and Wheel Mfrs (ICWM)
Ergonomic Do’s and Don’t’s

Doing it Right!
- Platform elevated
- Correct push bar height
- Larger wheels

Harder
- Platform too low
- No push bar
- Wheels too small

Source: MHI EASE, Hamilton Caster & Mfg. Co.
IAD - Intelligent Assist Devices

Amplifies operator’s power
Unit has an intuitive, human-like feel

Intuitive
The operator has a sense of control & feel over the load using normal arm, wrist and hand movements.

Intelligent
Resolver feedback from the servomotor allows for future implementation of programmable human limits.
IAD’s for handling heavy castings
Hydraulic tilt table for large window assembly
Two wheel hand truck with powered lift

Source: www.liftnibuddy.com
In this retail paint store 40 to 50 lb. cartons (4 gals.) need to be moved to shelving.
This lifting device permits a greater number of employees to get the same job done ....a job previously assigned to people which had the upper body strength.

Battery powered scissors lift
High density vertical storage systems speed order picking and put each item at the correct height.
This expandable conveyor is driven right into the truck

The individual boxes and cartons are conveyed right to the worker

Notice how the odd sizes and shapes are handled easily by a single piece of equipment
Special Acknowledgements

14 Member Companies
40 Industries Covered
Ergonomic Resources and Tools
Safety and Ergo News
Case Studies
Technical Support
White Papers
Ergo Checklists
Speakers and Presentation Materials

www.MHI.org/EASE
Mission

To broadly promote the benefits of ergonomic assist systems and equipment together with the advantages derived from the use of this equipment in the workplace and to promote the safety and health of the work environments.

free resource
www.MHI.org/EASE

Source: National Institute for Occupational Safety and Health (NIOSH)
What is wrong with this picture?
Thank You

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