

**SAFETY Waves OPPORTUNITY**  
 Cardinal Safety Conference  
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# Ergonomics Analysis: In-depth



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## Course Logistics

- ▶ Manual/handouts
- ▶ Course Schedule
  - Starting/ending times
  - Rest breaks
- ▶ Rest rooms
- ▶ Fire exits
- ▶ Telephones
- ▶ Messages
- ▶ Group Introductions



## Course Content and Objectives

### Ergonomics Analysis Process

- ▶ Frame work to perform ergonomics analysis
- ▶ Generate reasonable and feasible recommendations
- ▶ Fundamental knowledge of ergonomics



## Ergonomics Analysis Case Studies (Before)



## What Is Ergonomics?

- ▶ Work Smarter – Not Harder
- ▶ Fit the Job to the Person – Not Force the Person to Fit the Job



## Ergonomics and Gravity

- ▶ Ergonomics is like throwing a ball into air
- ▶ What happens?
  - Correct! The ball comes back down
- ▶ Why?
  - Because GRAVITY works!
- ▶ What if we don't want the ball to come down?
  - Tell it ... TO STAY!



## Applied to work



What is the best option?

So, in our workspace, given a certain set of circumstances we will respond in a fairly predictable way!



If we want to change the response ... We need to change the circumstances!



### All about design

- ▶ **Poor design**
  - Poor response
- ▶ **Better design**
  - Better response



### Ergonomics . . .

Optimizing all aspects of job performance – safety, quality and productivity – through the appropriate design and use of workstations, work processes and the overall organization of work.

### Optimal Relationship



Low Workstation Height      Correct Workstation Height

### Ergonomics Principles

- Promote effective work processes
- Promote neutral positions with support for body/limbs
- Promote physical movement
- Control material handling
- Promote work in reach zone
- Provide correct workstations, tools and equipment
- Provide competency based training
- Control exposure to work environment
- Promote health and wellness
- Provide on-going feedback



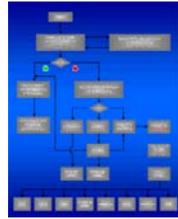
### Promote effective work processes

- ▶ Lean
- ▶ Continuous Process Improvement
- ▶ Value Stream Mapping
- ▶ Kaizen Events
- ▶ Six Sigma
- ▶ 5S +1



### Promote effective work processes

- ▶ Take step back and really examine why something is done as it is
- ▶ If answer is . . . 'Because it has always been done that way!'
- ▶ Take fresh look
- ▶ Is there better way to get it done?



### Look at whole picture

- ▶ Goal is to:
  - Design work to take into account basic predictable human behavior
  - Provide an adequate level of job complexity and challenge
  - Involve worker in design process
  - Implement engineering, work practice and administrative control as appropriate



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### Position in Neutral

- ▶ Spine neutral position
  - S-shape
- ▶ Spring like
- ▶ Arm/hand neutral position



### Spine

#### The Neutral Position

- ▶ Each body segment lined up over the one below
- ▶ Like a well constructed stone fence
- ▶ Gravity helps hold it together not pull it apart
- ▶ S-shaped curve



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### Position

- ▶ Mid-range of joint position



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### Position

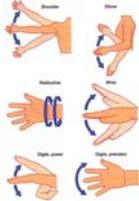
- ▶ Mid-range of joint position
  - More efficient
  - Less wear and tear
  - Less tendency for injury



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### Position

- ▶ Repeated or sustained out-of-neutral positions
- ▶ Identify and improve



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### Out-of-Neutral Position

- ▶ Wrists bent up, down or to side



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### Out-of-Neutral Position

- ▶ Elbow flared out to sides



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### Out-of-Neutral Position

- ▶ Hands and arms overhead



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### Out-of-Neutral Position

- ▶ Neck bent down or up or rotated



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### Out-of-Neutral Position

- ▶ Back bent forward or backward or rotated



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### Provide support for body/limbs

- ▶ **Seated**
  - Compression of soft tissues
  - Decrease in blood flow and circulation
  - Proper seated support is critical
- ▶ **Limbs**
  - Proper support for limbs
  - Removes strain of weight bearing
  - Unloads neck, shoulders and back
- ▶ **Standing**
  - Unsupported standing for extended periods is not desired
  - Joint compression occurs decreasing joint space
  - Inadequate joint lubrication
  - Fluid tends to pool in lower extremities



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### Dynamic Physical Movement

Stand at attention with 30 pounds of equipment VS. Two mile march with 30 pounds of equipment



### Physiology Principles

- ▶ **Movement/activity**
  - Promote dynamic not static muscle contractions
  - Build-in adequate physical recovery times
  - Incorporate movement into the work process
- ▶ **Position and support**
  - Design for neutral positions
  - Design for body/limb support at work stations

### Promote Physical Movement

- ▶ **Build in purposeful movement into the work process**
- ▶ **Dynamic vs. static muscle contraction**
- ▶ **Promote circulation**
- ▶ **30/30 Rule**



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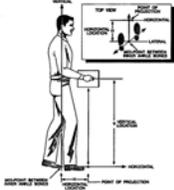
### Control Manual Material Handling

- ▶ **How much can a person lift?**



### Manual Material Handling

- ▶ **Variables:**
  - Load constant
  - Frequency
  - Horizontal distance
  - Vertical distance
  - Spine rotation
  - Grip/coupling



### Manual Material Handling

- ▶ **Variables:**
  - Load constant
  - Frequency
  - Horizontal distance
  - Vertical distance
  - Spine rotation
  - Grip/coupling
- ▶ **Oregon OSHA**  
[http://www.osha.org/interactive/liftinquiry\\_safetv.html](http://www.osha.org/interactive/liftinquiry_safetv.html)



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### Work in Reach Zone

- How much do you use your hands?
- Where do you use them?
- Comfort Reach Zone
- Functional Reach Zone



### Work in Reach Zone

- Stature and arm's length determine reach zones
  - Comfort Reach
  - Functional Reach
- Determine individual reach zone and set up workstation to promote reach in that zone



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### Provide Correct Workstation, Tools and Equipment



### Provide Correct Workstation, Tools and Equipment

- How to assess if correct?
  - Neutral position: Yes or No?
  - Reach zone: Yes or No?
  - Control force exerted/imposed: Yes or No?
  - Control repetition: Yes or No?

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### Competency based training

- Results not achieved?
  - Spend thousands of \$ on ergonomically designed tools, equipment and facility
  - Workforce doesn't know how to make most of tool or equipment or furniture
- Acquire new skills
  - Need to correctly practice new technique to acquire skill level to advance



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### Control exposure to environment

- › Light
- › Noise
- › Temperature
- › Ventilation



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### Health and Wellness!

- › Health and wellness
  - Diet and nutrition
  - Body weight control
  - Stress management
  - Smoking cessation
  - Blood pressure control
  - Fluid intake - don't get dehydrated
  - Adequate rest/sleep
- › For example movement helps to control fatigue



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### Provide on-going feedback

- › **100% Correct the First Time?**
  - Does any new process work 100% correctly out of gate?
    - Unintended consequences
  - Schedule formal follow-up sessions
    - Document outcome of follow-up
    - Alleviate issues identified in timely manner
- › **Continuous Process Improvement and Ergonomics**
  - Continuous process improvement strategies have tremendous benefit
    - Waste is reduced
    - Productivity is enhanced
- › **Applying ergonomics principles to overall continuous process improvement effort is integral to success of process!**



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### Problem Solving Principles



### If you like to solve problems . . . ergonomics is for you!



### Design dictates performance

- › Gravity works!
- › Throw a ball up . . .
- › What happens?
- › What goes up must come down
- › The situation dictates a predictable response



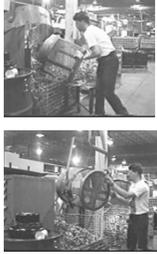
### Understand and make productive use of human behavior

- ▶ The study of human behavior is one of the most fascinating fields of study that exists
- ▶ The study of human behavior is one of the most frustrating fields of study that exists



There are reasons why we do what we do; sometimes we just can't figure out what they are!

However it is possible to understand human behavior at some level and use this knowledge in a productive way.



### Do not fix without adequate analysis!

- ▶ Many novice analysts (and sometimes some experienced ones) cause themselves and others problems
- ▶ They try to "fix stuff" without knowing why or what or when or who



### Always ask why!

- ▶ Sometimes when we look at work, all we see is what is in front of us
- ▶ It is imperative that we look both up and down stream to see what truly is going on



### Don't generalize from a sample of one

- ▶ Common assumption:
  - Works for me . . .
  - Must then work for everyone!
- ▶ Be wary of population stereotypes
  - Recognize individual uniqueness



### Scope of Influence

- ▶ Have to know scope of influence and not violate boundaries
- ▶ If offer solution that is not within scope of influence of individual . . . solution will not work!



### Resistance to change



- ▶ Most people do not like change
- ▶ Introduce change in a very careful manner
- ▶ Other wise the solution will not work



### Why do people resist change?

- ▶ Wasn't their idea!
- ▶ Fear!
- ▶ Habit!
- ▶ No one else is changing!



### What can you do to facilitate change?

- Wasn't their idea!
  - Involve them!
- Fear!
  - Knowledge/Training!
- Habit!
  - Practice the right way!
- No one else is changing!
  - Group as a whole involved!



### Ergonomics Analysis Tool Box

- ▶ Personal Protective Equipment
- ▶ Measurement devices
- ▶ Background materials
- ▶ Objectives



### Videotaping for Ergonomics Analysis

- ▶ Moving pictures
- ▶ Don't make home videotapes
- ▶ Videotaping sequence



### ErgoSystems Ergonomics Risk Screen





### Ergonomics Analysis Case Studies (Before)



### Ergonomics Analysis Case Studies (After)



### Ergonomics – A Potent Tool!

- ▶ Great number of factors enter into ergonomics workplace equation
  - Goal is to recognize what factors are impacting the job or task
  - Determine true cause and work to offer solutions that are practical and effective




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