

Human Versus Computer Based Training

Which format is better for teaching
the new GHS symbols?

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What is GHS?

- A New “Global” System
- New Labels
- New Hazard Descriptions
- New Safety Data Sheets
- A New System for Workers to Learn and Use
- Many hazards will now correspond to the transport hazard class/packing group




Why Now?

- Some countries (Japan, New Zealand, Taiwan) have already implemented
- Proposed rule for the US coming out this fall ???
- Europe implementing starting in 2010



GHS will be upon us before we know it – and we can't wait until workers are confused to train them



What Do Workers Need to Know?

- What the signal words mean
- What the new symbols mean
- How to use the symbols to identify hazards
- What the new hazard statements mean
- How to use the hazard statements to understand protection needs

Example

2-Methyl Flammaline



Danger

Highly Flammable Liquid
and Vapor

May cause cancer

Keep away from heat, sparks and flame - No Smoking
Keep container closed. Use only in well ventilated
areas.

Wash thoroughly after handling. Avoid all contact.

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The Purpose of the Experiment

- New GHS symbols means new training needed for workers
- Which system works best?
- How can companies best spend their time and money?

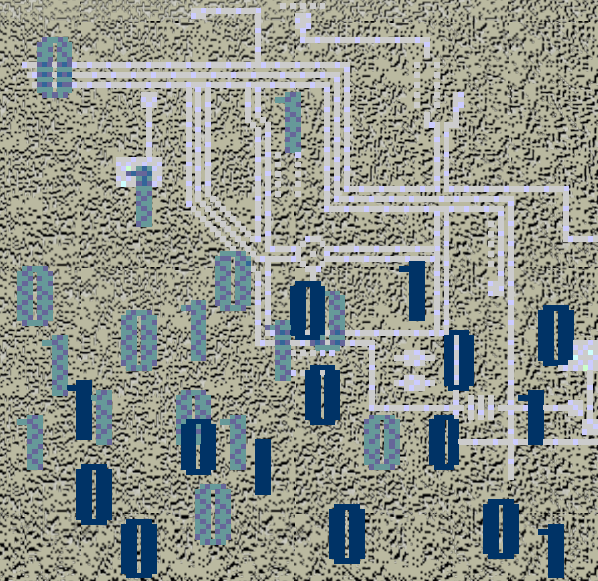





Why GHS?

- A topic I'm well-versed in
- Very simple to train and test – show key topics, answer questions, no hands-on experience
- Very few people have any experience with the GHS yet, so no difference in knowledge coming in

The Training



- Identical Presentations
- Used PowerPoint
- Had a test to check information retention
- Computer-based trainees were instructed to close the training before taking the test



A Sample of the Training

- Following are some slides taken from the training.



The Signal Words

- Danger

- High level of hazard
- Check with your supervisor before using this chemical

- Warning

- Lower level of danger
- Be sure you know how to handle this chemical properly

Physical Hazards

- Flammable - Flame



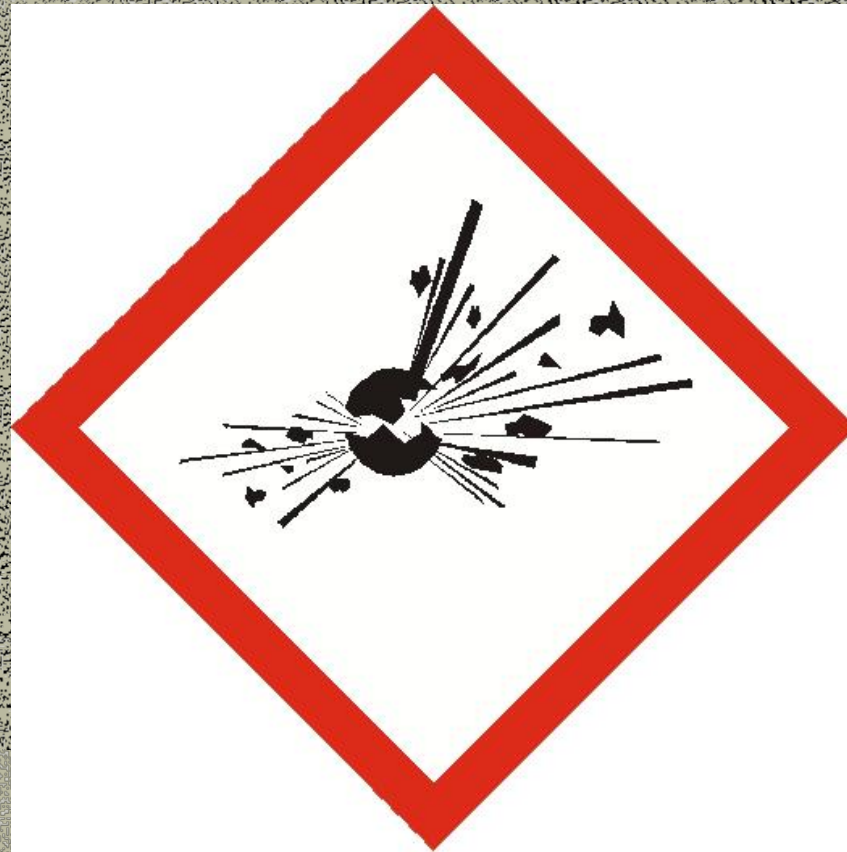
Physical Hazards

- Oxidizer – Flame over circle



Physical Hazards

- Explosive – Exploding Bomb



Physical Hazards

- Corrosive



Physical Hazards

- Compressed gas – Gas cylinder



Health Hazards

- Toxic – Skull and Crossbones



Health Hazards

- Acute hazards – Exclamation Point



Health Hazards

- Chronic hazard – Exploding Man/Star Man







Environmental Hazards

- Environmental Hazard – Dead tree/Dead fish



Self-Reactive Substances

- Type A, B, C, D, E, F – All may cause fire with heating
- Types A and B may cause an explosion with heating



Type A uses this symbol	
Type B uses these symbols	 
Types C-F use this symbol	




Sensitization

- Respiratory sensitization is most dangerous since allergic reactions can cause anaphylactic shock and death, as well as long-term asthma
- Skin sensitization will cause an allergic skin reaction when in contact with hives and itching
- Formaldehyde and isocyanates are skin sensitizers and respiratory sensitizers
- Avoid prolonged contact with these materials, use appropriate PPE, if any reaction is noticed, cease work immediately
- After sensitization occurs, you will always be allergic to this material

Sensitization




Hazard Category	Signal word	Hazard statement	Symbol
Respiratory Sensitizer Category 1	Danger	May cause allergy or asthma symptoms or difficulties breathing if inhaled	
Skin Sensitizer Category 1	Warning	May cause an allergic skin reaction	



Specific Target Organ Systemic Toxicity (Single Exposure)

- Acute exposure
- Will cause damage to one or more organ or organ systems with only 1 exposure
- Also includes materials that will cause respiratory irritation or drowsiness or dizziness (like acetone or paint thinner)
- Check the Safety Data Sheet or talk to your supervisor for proper handling
- Use proper PPE
- Perchloroethylene (used in dry-cleaning) causes liver poisoning with one dose

Specific Target Organ Systemic Toxicity (Single Exposure)

Hazard Category	Signal Word	Hazard Statement	Symbol
Category 1	Danger	Causes damage to organs < > << >>	
Category 2	Warning	May cause damage to organs < > << >>	
Category 3	Warning	May cause respiratory irritation or May cause drowsiness and dizziness	

< > (the organs affected, for example: lungs, kidneys, eyes, lungs)


<< >> (route of exposure if it is proven that no other routes of exposure cause the hazard. For example: "by skin contact", or "if inhaled")



Acute Hazards to the Aquatic Environment

- Will cause damage to aquatic life, either through affecting animals or plants
- Avoid accidental releases to the aquatic environment, either through spills or cleaning of spills (contaminated water)
- Most biocides (anti-fungal agents, anti-mold agents) are toxic to the aquatic environment

Acute Hazards to the Aquatic Environment

Hazard Category	Signal word	Hazard statement	Symbol
Category 1	Warning	Very toxic to aquatic life	
Category 2	None	Toxic to aquatic life	No symbol
Category 3	None	Harmful to aquatic life	No symbol

What was in the test

- Identifying the pictograms (matching)
- Multiple Choice
- Identifying types of hazard (physical, health, acute vs chronic)
- Major concepts (Danger vs Warning)





Examples of Questions

10. Which signal word is used for the most hazardous substance? _____

- a. Danger
- b. Warning
- c. Caution
- e. No signal word



Examples of Questions

13. Labels under the new GHS will have:

-
- a. More information
 - b. New symbols
 - c. Standardized hazard statements
 - d. All of the above



Results

- Computer-based scored higher with a lower standard deviation
- Statistically Significant ($p=0.0345$)
- Average score for computer-based = 0.93
- Average score for human-based = 0.88





Differences in Samples

- It was a cross-section of workers
- All had English as a first language
- The sample size was too small to evaluate other differences (age, gender, work experience)
- If SCHC members want to continue the study, we can obtain more data

What questions did the most people get wrong?

- Meaning of the exclamation point and the star-man
- Definition of a physical hazard
- Definition of an acute hazard



So, what does that mean for companies?

- Computer-based training performed better
- It can be easier to schedule, and cheaper





What does this mean for Industrial Hygienists?

- Computer-based training won't replace human-based for some programs
- All training, but especially hazcom, must be specific to the workplace
- GHS is something all workers and IHs will have to deal with
- We need to start planning



Thanks to those who helped!

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- Howard Cohen
- SCHC