

# Why is This Man Exploding?

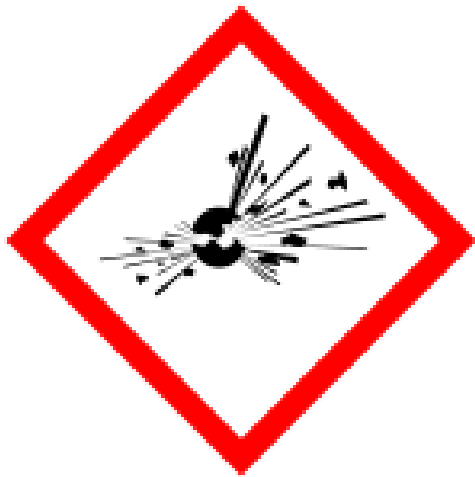


**The Impact of the GHS on Industrial  
Hygiene and Safety**

# The Exploding Man (or Woman)

- Health Hazard Symbol
  - One of the nine pictograms of the GHS
  - Represents some of the more serious health hazards of chemicals
  - The pictograms are a visual representation of the intrinsic hazards of chemicals
  - Transcend language barriers
  - The pictograms are:

# Exploding Bomb Symbol



GHS01

- Unstable Explosives
- Explosives (Divisions 1.1-1.4)
- Self-reactives (Type A and Type B with Flame)
- Organic Peroxides (Type A and Type B with Flame)

# Flame Symbol



GHS02

- Flammable Gases
- Flammable Aerosols
- Flammable Liquids (Categories 1-3)
- Flammable Solids
- Self-Reactives (Type B with bomb, Types C-F)
- Pyrophoric liquids and solids
- Self-heating substances
- Substances which in contact with water emit flammable gases
- Organic Peroxides (Type B with bomb, Types C-F)

# Flame over Circle Symbol



GHS03

- Oxidizing Gases
- Oxidizing Liquids
- Oxidizing Solids

# Gas Cylinder Symbol



GHS04

- Compressed Gas
- Liquefied Gas
- Refrigerated Liquefied Gas
- Dissolved Gas

# Corrosion Symbol



GHS05

- Corrosive to Metals (steel or aluminum  $>6.25$  mm/year at 55C)
- Skin corrosion/ irritation – Category 1 (A, B and C)
- Serious eye damage/ irritation – Category 1

# Skull and Crossbones Symbol



GHS06

- Acute Toxicity –  
Categories 1-3 (oral,  
inhalation or dermal  
routes)



# Exclamation Mark Symbol



GHS07

- Acute Toxicity – Category 4 (oral, inhalation or dermal routes)
- Skin Irritation/ Corrosion – Category 2
- Serious Eye damage/ irritation – Category 2A
- Skin Sensitizer
- STOT (single exposure) – Category 3 (respiratory tract irritation, narcotic effects)
- Hazardous to the Ozone Layer

# Health Hazard Symbol



GHS08

- Respiratory Sensitizer
- Germ Cell Mutagenicity
- Carcinogenicity
- Toxic to Reproduction
- STOT (single exposure) – Categories 1-2
- STOT (repeated exposure) – Categories 1-2
- Aspiration Hazard

# Environment Symbol



GHS09

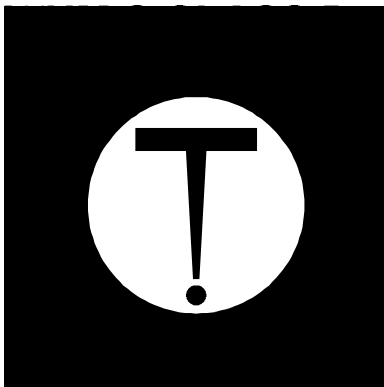
- Acute hazards to the aquatic environment – Category 1 (Categories 2 and 3 no symbol or signal word)
- Chronic hazards to the aquatic environment – Categories 1 and 2 (Categories 3 and 4 no symbol or signal word)

# What is the GHS?

- Harmonized criteria for the classification of substances and mixtures according to their health, environmental and physical hazards
- Harmonized hazard communication system including requirements for labelling and safety data sheets
- Scope – all hazardous chemicals except at the point of intentional intake
- Target Audience – Everyone (workers, employers, consumers, transport workers, emergency responders)

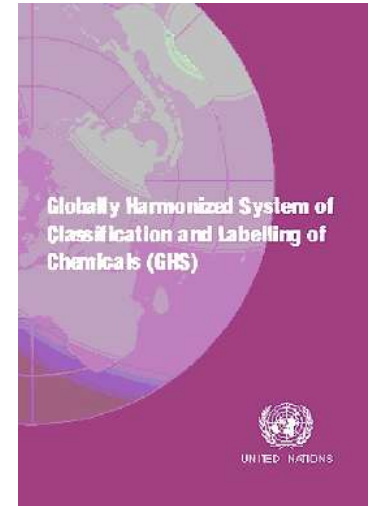
# Why do we need the GHS?

- Existing systems used different symbols, shapes, colors, etc. leading to confusion



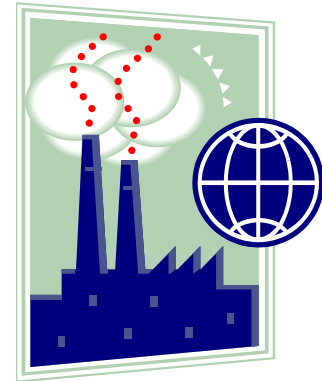
# GHS History

- 1989 - ILO Convention on Safety in the Use of Chemicals at Work
- 1992 Rio “Earth Summit” established 6 program areas on sound management of chemicals - including harmonization of classification and labelling of chemicals
- IOMC (Interorganization Programme for the Sound Management of Chemicals) - Coordinating Group for the Harmonization of Chemical Classification Systems led the effort. Technical Work:
  - Physical Hazards - UN Experts on TDG
  - Health/Environmental Hazards - OECD
  - Hazard Communication - ILO
- Adopted December 2002, Rev 1 2005, Rev 2 2007, Rev 3 2009, Rev 4 2011, Rev 5 2013 (Rev 6 2015) - “Purple Book” available
  - English, French, Spanish, Arabic, Russian and Chinese



# GHS - Based on Existing Major Systems

- US - OSHA, CPSC (consumer), EPA pesticides
- Canada - WHMIS, CCCR (consumer), pesticides
- EU classification and labelling system (DPD/DSD)
- UN Recommendations on Transport of Dangerous Goods



# Goals of the GHS

- Enhances the protection of human health and the environment by providing an internationally comprehensible system for hazard communication
- Provide a recognized framework for those countries without an existing system
- Reduce the need for (duplicative) testing and evaluation of chemicals
- Facilitate international trade in chemicals whose hazards have been properly assessed and identified on an international basis.





# Application of the GHS

- Competent authorities decide how to apply the elements based on needs and target audience
- Transport: labels and training
- Consumer: Labels
- Workplace: labels, SDS, training



# Hazard Classification

- Data on intrinsic hazards is collected
  - Internal studies, published literature, testing
- Data is compared to detailed criteria
- All potential hazards are considered
  - 16 Physical Hazard Classes (+ country specific)
  - 10 Health Hazard Classes (+ country specific)
  - 3 Environmental Hazard Classes



# Hazard Classification

- Hazard Classes = type of hazard
- Hazard Categories = degree of hazard
  - 1 – 7 categories / hazard class
- Hazard Classification Identifies all applicable hazard classes/categories
  - Flammable Liquid Category 2
  - Reproductive Toxicity Category 1B
  - Chronic Aquatic Toxicity Category 3



# Classification Example

- Solvent Amazing
  - FP 14 deg. C
  - BP 100 deg. C
  - LD50 oral rat 400 mg/kg
  - LC50 30 mg/L/4 hr (as vapor)
  - LD50 dermal rat >2000 mg/kg

Flammable Liquid Category 2, Acute Oral Toxicity Category 4

Table 2.6.1: Criteria for flammable liquids


Category	Criteria
1	Flash point < 23 °C and initial boiling point ≤ 35 °C
2	Flash point < 23 °C and initial boiling point > 35 °C
3	Flash point ≥ 23 °C and ≤ 60 °C
4	Flash point > 60 °C and ≤ 93 °C

Table 3.1.1: Acute toxicity hazard categories and acute toxicity estimate (ATE) defining the respective categories

Exposure route	Category 1	Category 2	Category 3	Category 4
Oral (mg/kg bodyweight) <i>See notes (a) and (b)</i>	5	50	300	2000
Dermal (mg/kg bodyweight) <i>See notes (a) and (b)</i>	50	200	1000	2000
Gases (ppmV) <i>See notes (a), (b) and (c)</i>	100	500	2500	20000
Vapours (mg/l) <i>See notes (a), (b), (c), (d) and (e)</i>	0.5	2.0	10	20
Dusts and Mists (mg/l) <i>See notes (a), (b), (c) and (f)</i>	0.05	0.5	1.0	5

# Labels

- Based on classification
- Label
  - Product Identity
  - Signal Word
  - Pictogram
  - Hazard Statements
  - Precautionary Statements
  - Supplier Information

FLAMMABLE LIQUIDS (CHAPTER 2.6)			
Hazard category	Signal word	Hazard statement	Symbol Flame
1	Danger	H224 Extremely flammable liquid and vapour	
2	Danger	H225 Highly flammable liquid and vapour	
3	Warning	H226 Flammable liquid and vapour	
Prevention		Precautionary statements:	
<b>P210</b> Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. <b>P233</b> Keep container tightly closed. – if the liquid is volatile and may generate an explosive atmosphere. <b>P240</b> Ground and bond container and receiving equipment. – if the liquid is volatile and may generate an explosive atmosphere. <b>P241</b> Use explosion-proof [electrical/ventilating/lighting/...] equipment. – if the liquid is volatile and may generate an explosive atmosphere. – text in square brackets may be used to specify specific electrical, ventilating, lighting or other equipment if necessary and as appropriate. – precautionary statement may be omitted where local or national legislation introduces more specific provisions. <b>P242</b> Use non-sparking tools. – if the liquid is volatile and may generate an explosive atmosphere and if the minimum ignition energy is very low. (This applies to substances and mixtures where the minimum ignition energy is <0.1mJ, e.g. carbon disulphide). <b>P243</b> Take action to prevent static discharge. – if the liquid is volatile and may generate an explosive atmosphere. – may be omitted where local or national legislation introduces more specific provisions. <b>P280</b> Wear protective gloves/protective clothing/eye protection/face protection Manufacturer/supplier or the competent authority to specify the appropriate type of equipment.		<b>P303 + P361 + P353</b> IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower]. – text in square brackets to be included where the manufacturer/supplier or the competent authority considers it appropriate for the specific chemical. <b>P370 + P378</b> In case of fire: Use ... to extinguish. – if water increases risk ... Manufacturer/supplier or the competent authority to specify appropriate media.	
		<b>P403 + P235</b> Store in a well-ventilated place. Keep cool. – for flammable liquids Category 1 and other flammable liquids that are volatile and may generate an explosive atmosphere.	<b>P501</b> Dispose of contents/container to... ... in accordance with local/regional/national/international regulations (to be specified). Manufacturer/supplier or the competent authority to specify whether disposal requirements apply to contents, container or both.



# GHS Implementation

- The GHS has been implemented in the following countries/regions

European Union

New Zealand

China

Korea

Japan

Brazil

Australia

Singapore

Taiwan

UAE

Indonesia

United States

South Africa

Uruguay

Philippines

Russia

Thailand

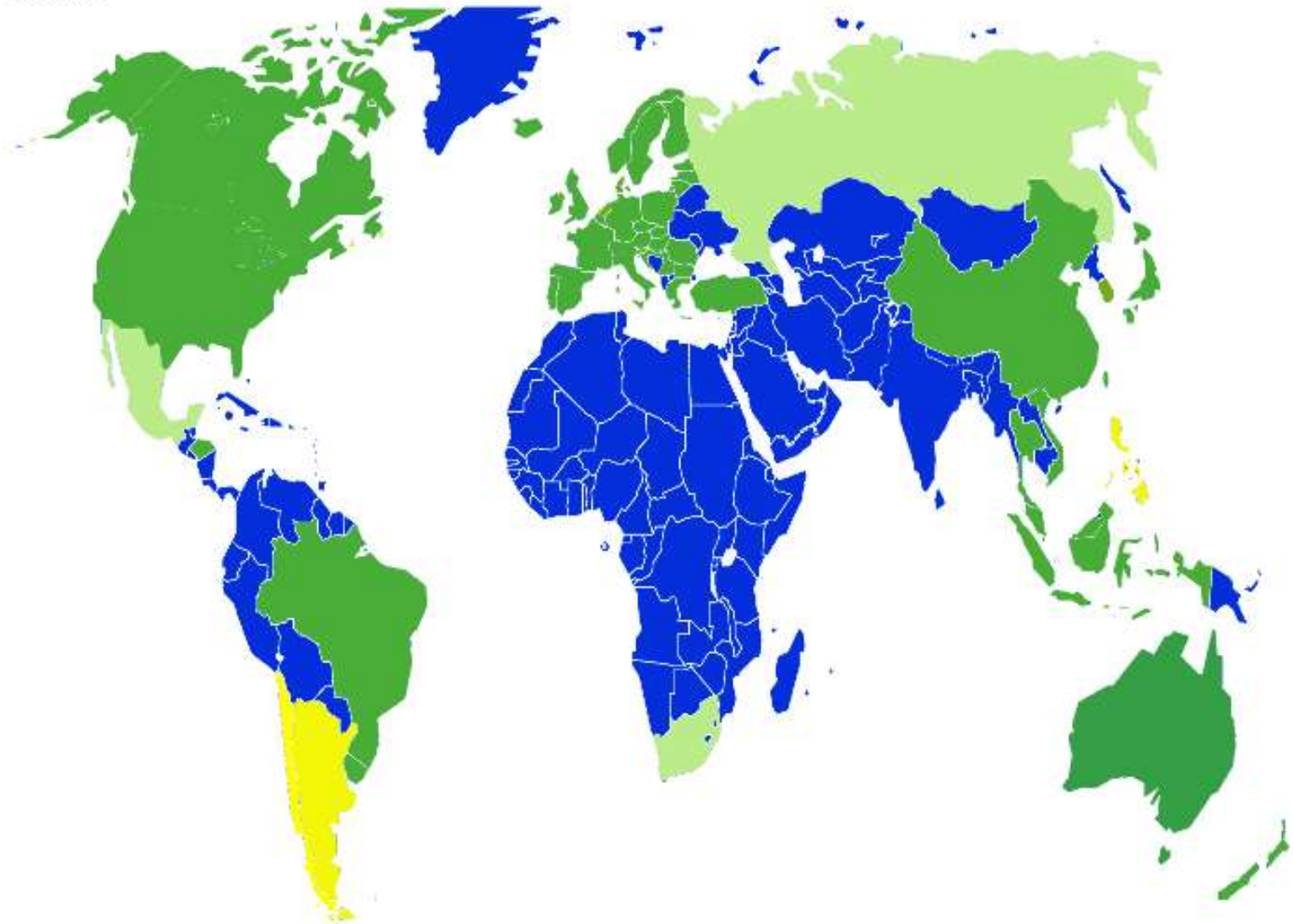
Turkey

Canada

Vietnam

Malaysia

■ : Countries/regions that have already implemented GHS. ■ : Countries/regions where GHS is voluntary.  
■ : Countries/regions that are in the process of implementing GHS. ■ : Countries/regions where GHS is not implemented or not available.



Source: dhigroup.com



# Chemical Information

## Explosion

- **Simultaneously Chemical Control Laws rapidly expanded**
  - REACH 2006
  - China REACH
  - Korea REACH
  - Canadian Challenge
  - US EPA HPVIS
- **Greatly increasing our understanding of chemical properties and hazards**



# ECHA Databases

## Registered Substances



The screenshot shows the ECHA website header with the logo and navigation menu. The breadcrumb trail is 'ECHA > Information on Chemicals > Registered substances'. The main heading is 'Registered substances'. The text explains that the data is compiled from registration dossiers and that published information does not necessarily reflect the registered tonnage band(s). A note at the bottom states that chemical properties are accessible via eChemPortal.

**ECHA**  
EUROPEAN CHEMICALS AGENCY

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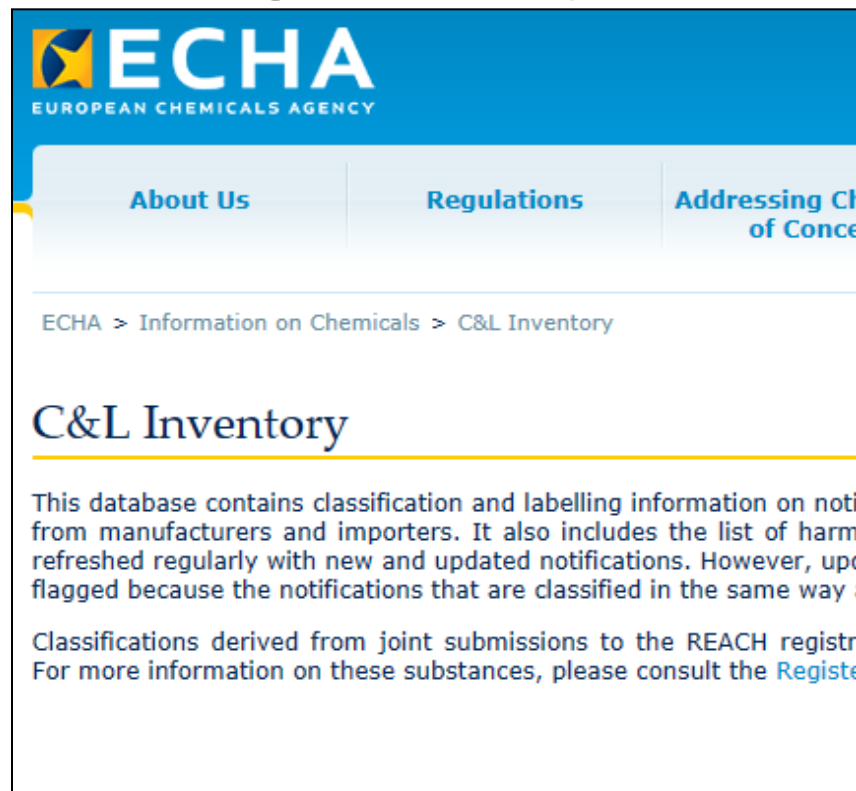
[ECHA > Information on Chemicals > Registered substances](#)

### Registered substances

The data comes from registration dossiers submitted to ECHA by the Total Tonnage Band is compiled from all the dossiers with two exceptions and any quantity used as an intermediate to produce a different chemical published does not necessarily reflect the registered tonnage band(s).

Please note that information on chemical properties of registered substances is directly accessible via [eChemPortal](#).

## Classification and Labeling Inventory



The screenshot shows the ECHA website header with the logo and navigation menu. The breadcrumb trail is 'ECHA > Information on Chemicals > C&L Inventory'. The main heading is 'C&L Inventory'. The text describes the database as containing classification and labelling information on notifications from manufacturers and importers, which is updated regularly. It also mentions that classifications are derived from joint submissions to the REACH registration process and that more information can be found in the Registered Substances Inventory.

**ECHA**  
EUROPEAN CHEMICALS AGENCY

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[ECHA > Information on Chemicals > C&L Inventory](#)

### C&L Inventory

This database contains classification and labelling information on notifications from manufacturers and importers. It also includes the list of harmful substances, which is refreshed regularly with new and updated notifications. However, updates are not flagged because the notifications that are classified in the same way as the substances in the list.

Classifications derived from joint submissions to the REACH registration process. For more information on these substances, please consult the [Registered Substances Inventory](#).

# eChemportal



English ▾

The Global Portal to Information on Chemical Substances



eChemPortal

eChemPortal ▾

> Home

> Substance Search

> Property Search

> What's new?

> General Information

> Participating Databases

> Roles & Responsibilities

> Extension of the Portal

> Linking to eChemPortal

> Schedules of Assessments

> Structure Search

> GHS Classifications

> Other useful information

> FAQ

> Help

> Contact us

> Disclaimer

### Chemical Substance Search

Twenty-nine data sources participate under Chemical Substance Search.

Four databases participate under Chemical Property Data Search.

The [list of data sources participating](#) in eChemPortal is continuously expanding.

### Chemical Property Data Search

*Help us to help you.  
Answer the [User Survey](#)*

eChemPortal provides free public access to information on properties of chemicals:

- Physical Chemical Properties
- Environmental Fate and Behaviour
- Ecotoxicity
- Toxicity

eChemPortal allows simultaneous searching of reports and datasets by chemical name and number and by chemical property. Direct links to collections of chemical hazard and risk information prepared for government chemical review programmes at national, regional and international levels are obtained. Classification results according to national/regional hazard classification schemes or to the Globally Harmonized System of Classification

### Latest news

Closure of ESIS and OECD SIDS temporarily down

*17 November 2014*

The Joint Substance Data Pool of the German Federal Government and the German Federal States is now linked to eChemPortal

*18 August 2014*

A filter by type of information has been

IOHA London 2015, 27-30 April  
2015, Hilton London Metropole

# ChemID

ChemIDplus  
A TOXNET DATABASE

DIMETHYLACETAMIDE

Search

Clear

**NAME: N,N-Dimethylacetamide**  
**RN: 127-19-5**

Basic  
Information

Full  
Record

Names and  
Synonyms

Formulas

Classification  
Codes

Registry  
Numbers

Toxicity

Physical  
Properties

For more information about this substance,  
you may select from the links below.

## File Locator

<a href="#">CCRIS</a>	<a href="#">i</a> NCI Chem Carcino Res Info Sys
<a href="#">DART</a>	<a href="#">i</a> Developmental and Reprod.Tox.
<a href="#">DrugPortal</a>	<a href="#">i</a> NLM Drug Information Portal
<a href="#">EMIC</a>	<a href="#">i</a> Env. Mutagen Info. Center
<a href="#">HSDB</a>	<a href="#">i</a> Hazardous Substances Data Bank
<a href="#">Haz-Map</a>	<a href="#">i</a> Occ. Exposure to Haz. Agents
<a href="#">MeSH</a>	<a href="#">i</a> Medical Subject Headings File
<a href="#">PubChem</a>	<a href="#">i</a> PubChem
<a href="#">PubMed</a>	<a href="#">i</a> Biomedical Citations From PubMed
<a href="#">PubMed Cancer</a>	<a href="#">i</a> Cancer Citations from PubMed
<a href="#">PubMed Toxicology</a>	<a href="#">i</a> Toxicology Citations From PubMed
<a href="#">RTECS</a>	<a href="#">i</a> Reg. of Toxic Eff. of Chem. Sub.
<a href="#">TOXLINE</a>	<a href="#">i</a> NLM TOXLINE on TOXNET

Search  
Navigation

Main Query  
Page

# The Result

- Valuable New (newly available) Information
  - Toxicology
  - Ecotoxicology
  - Environmental Effects and Fate
  - Safety
- All this information has come together to provide a robust approach to chemical hazard classification based on the GHS



# The Result – Part 2

- Better and more consistent hazard information (hopefully)
- Depending on
  - Data quality/availability
  - Hazard Communicator's skill and knowledge
  - SDS Authors need to have training and be qualified (Registered)



AIHA Registry Programs®



SDS & Label Authoring Registry

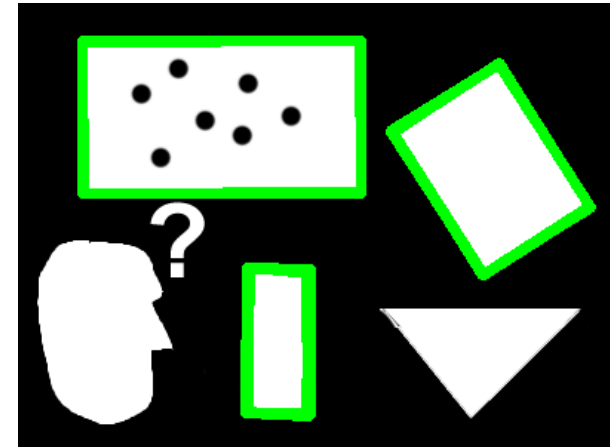


# What Does This Mean for IH/OH

“Industrial Hygiene is a science and art devoted to the anticipation, recognition, evaluation, prevention, and control of those environmental factors or stresses arising in or from the workplace which may cause sickness, impaired health and well being, or significant discomfort among workers or among citizens of the community.”

# What Does This Mean for IH/OH

- A main concern is keeping workers safe from chemical hazards through:
  - Recognition/Anticipation
  - Evaluation
  - Development of controls
- The first step is recognition





# Benefits for IH

- Greater availability of hazard information
- Increased recognition through SDS layout
  - Hazard classification clearly identified through
    - Hazard Class / Category
  - Supported by data in other SDS Sections
- Prioritize evaluations and controls
- Control through substitution
  - Compare hazards of different chemicals



# Benefits for IH

- Independent verification of hazard information through
  - On-Line Databases
  - Review of data on SDS
  - Other manufacturer information
  - Official Classification Sources
- Leading to greater confidence



# Benefits for Safety Professionals

- More effective hazard recognition
  - Pictograms / standardized labeling information
- Easier hazard communication training
- Increased use of Control/Hazard Banding
  - Hazard phrase codes support CB systems
  - H340/H341/H350/H351/H360/H361 = CMR
- Other safety systems: storage, disposal



# Benefits for Business

- More accurate and comprehensive hazard communication systems
- Consistent product stewardship
- Level playing field between competitors
- Drives innovation to safer chemicals
- Decreased cost



# Benefits for Workers

- More accessible information on hazards
  - Right to Know vs Right to Understand
- Greater accuracy and consistency
  - Overwarning vs Underwarning
- Workers can take action to protect themselves



# Benefits for Employers

- Better able to select safer alternatives
- Allocate resources to the highest hazards
- Develop more effective controls
- Healthier and Safer workers



# Benefits for the Public

- Governments can use GHS to develop tools for safer management of chemicals
  - Fewer chemical accidents
  - Limit use of most hazardous chemicals
  - Safer chemicals for use at home
  - Cleaner and healthier environment



# GHS: Are We There Yet?

- Same data = same warnings - but what data?
- Assigned classifications
  - Countries must harmonize based on data
  - UN develop international classifications
- **H** (in harmonized) is too small
  - Stakeholders need to work to reduce differences
- **G** (in global) is too small
  - Support developing countries in adopting GHS





# Benefits for All

- Chemicals are critical to our lives
  - Drugs for healthier lives
  - Food to eliminate hunger
  - Goods for comfort / communication
- Using them safely means a brighter future for all





# 10th IOHA International Scientific Conference

LONDON 2015



April 25th-30th 2015  
London Metropole Hotel



**IOHA & BOHS 2015**  
London: Building on Occupational Hygiene Together

25-30 April 2015  
London Metropole Hotel  
[www.iohalondon2015.org](http://www.iohalondon2015.org)