



THE **GLOBAL** LANGUAGE OF SAFETY

Fridtjof Schucht and Stephen Harrison, Linde Gases, Germany, discuss the harmonised system of classification and labelling of chemicals.





The convergence of several chemical reclassification and labelling initiatives being implemented in the global business arena to boost health, safety and environmental protection to an unprecedented level is poised to have a monumental impact on the world's industrial sector.

Together with other chemical sectors that use raw materials and introduce new formulae, the petrochemical industry is being required to make rapid and sweeping changes to comply with a whole new level of regulatory requirements. The new legislation impacts on product registration, classification and labelling, packaging and transportation, storage, product information and product disposal.

Launched in 2005, the United Nations' Globally Harmonized

Figure 1. GHS aims to achieve uniform worldwide criteria for classifying chemicals according to their health, environmental and physical hazards.



COVERSTORY

System of Classification and Labelling of Chemicals (GHS) affects more than 60 countries and, since 1st December 2010, directly impacts all chemical substances in EU countries. The GHS aims to achieve uniform worldwide criteria for classifying chemicals according to their health, environmental and physical hazards. This uniformity will also apply to hazard communication requirements for labelling and safety data sheets. The GHS is not a formal treaty, but is rather a non-legally binding international agreement. In addition to improving health and safety in this arena, a key UN objective with this initiative is to make it easier for companies to conduct international trade.

The GHS addresses the classification of chemicals by types of hazard and proposes harmonised hazard communication elements, including labels and safety data sheets. It aims to ensure that information on chemical hazards is made available to enhance the protection of human health and the environment during the handling, transportation and use of these chemicals. The GHS also provides a basis for harmonisation of rules and regulations on chemicals at national, regional and worldwide level, which is an important factor for trade facilitation.

REACH and CLP

The EU has already taken the lead in the harmonisation quest with its REACH regulation on chemicals and their safe use, which applies to substances manufactured or imported into the EU in quantities of 1 tpy or more. Implemented in June 2007, REACH deals with the registration, evaluation, authorisation and restriction of chemical substances. The purpose of this regulation is to ensure a high level of protection for human health and the environment. This includes the promotion of alternative methods for assessment of hazards of chemicals, as well as the free movement of substances on the market of the EU. REACH makes industry responsible for assessing and managing the risks posed by chemicals and providing appropriate safety information to their users. Substances in volumes over 1 tpy that are either manufactured or imported into the EU (even in preparations/mixtures and articles), now have to be registered.

The CLP regulation, a more recent EU initiative implemented in January 2009 has the dual objectives of facilitating international trade in chemicals and improving protection of human health and the



Figure 2. Physical properties of gases do not change, but the understanding of gas physics has, and this impacts on whether or not they represent a safety hazard.

environment. CLP aligns the EU system of classification, labelling and packaging of substances and mixtures to the GHS. It is expected to facilitate the harmonised communication of hazard information of chemicals and to promote regulatory efficiency. It complements REACH and replaces the current system contained in the Dangerous Substances Directive and the Dangerous Preparations Directive. CLP introduces new classification criteria, hazard symbols (pictograms), signal words and labelling phrases (hazard and precautionary statements), while taking account of elements which are part of the current EU legislation.

CLP provides a transitional period to allow a gradual migration from the existing system to the new regime. These arrangements cover a transitional period of up to seven and a half years from implementation.

ISO 10156: 2010

Although less formidable in implication, another critical technical standard coming into play is ISO 10156: 2010, superseding ISO 10156: 1996. This norm impacts on how mixtures of two or more products are classified and where and how they should be labelled, transported, used and stored. Once this revision comes into effect, the impact on affected products could include a new identification label, a new cylinder shoulder colour to indicate the change from either a non-flammable to a flammable mixture, or from a flammable to a non-flammable mixture, updated safety data sheets to include the changes for cylinder safety and transportation, and a different cylinder valve outlet.

In terms of the end user, storage conditions may now need to be reviewed, including permits for storage of dangerous substances. Transport conditions will need to be revisited, as will risk assessment to update operational procedures according to the new risk assessment outcome. Gas control equipment and supply system compatibility may also need to be checked, as changes may be required for both cylinder connections and supply line labelling.

Although the physical properties of gases do not change, the understanding of the physics of these gases has certainly changed and this impacts on whether or not they represent a safety hazard. The implication is that even though a product someone may have purchased in the past may have been labelled as non-flammable, in the future it might be labelled as flammable.

There is a knock on effect associated with this. The implication to customers is how they will train their personnel to handle these gases in future. If the product is now labelled as flammable, they will need to look at factors such as fire safety procedures, transport measures and storage configurations. Previously used regulators may not do the trick anymore, because the outlet valve has changed to comply with a new classification.

REACH, the forerunner of the global harmonisation initiative, is now moving beyond Europe. There are moves to implement it in the USA within the next two years and a similar system has already been implemented in China. Dubbed 'China REACH', it draws on many elements of REACH, particularly those concerning risk assessment, risk management and data submission.

The timelines for the EU are as follows: To comply with REACH, all substances imported or produced in quantities greater than 1000 tpy had to be registered, by 1st December 2010. By the same date, all (pure) substances had to be classified and labelled to comply with CLP. By 1st June 2013 all substances imported or produced in quantities between 100 - 1000 tpy must be registered to comply with REACH and by 1st June 2015, all mixtures must be classified and labelled according to CLP. The final deadline for REACH is 1st June 2018, by which time all substances imported or produced in a range between more than 1 t and less than 100 tpy must be registered. ISO 10156: 2010 came into effect in April 2010.

Tsunami of new regulations

This veritable tsunami of new regulations will have a monumental impact on industry; it is the biggest shake up the business has experienced in the last 100 years. It can be compared to the introduction of regulations in the pharmaceutical industry in the 1960s following the Thalidomide issue, which was called one of the biggest medical tragedies of modern times. Fortunately, the new regulations are not following in the wake of a large scale tragedy; on the contrary, these are proactive initiatives being driven to prevent major incidents like this.

While the argument in favour of harmonisation is sound, the practical implementation is costly and complex. The implementation of REACH and CLP will have a profound affect on all chemical companies, including those operating within the petrochemical industry, and will change all applications within that industry tremendously. All products, pure substances as well as mixtures, have to comply with the requirements of these regulations. Within the legally required



Figure 3. All products, pure substances as well as mixtures, will have to comply with the new GHS and CLP regulations.

Hydrogen sulphide H_2S

CAS: 7783-06-4 EC: 231-977-3 UN: 1053



Chemical hydrogen sulphide 1.8

Impurities [ppm] - Purity >98%
 H_2O
 $\leq 4,000$

Hydrogen sulphide 5.0

Impurities [ppm] - Purity >99.999%
 O_2 H_2 CH_4 H_2O
 ≤ 2 ≤ 5 $\leq 0,5$ ≤ 1

Typical filling pressure
 15 °C: 16 bar(a) 70 °F: 252 psig

Characteristics

Flammable. Extremely offensive odour, liquefied gas.

Hazard classifications

EC C6L



R-phrases:

R12 - Extremely flammable, R26 - Very toxic by inhalation, R50 - Very toxic to aquatic organisms.

Physical data

Molecular weight:	34.082	
Boiling point:	at 1.013 bar [°C]	-60.35
Density:	at 1.013 bar, 15 °C, [kg/m ³]	1.454
Vapour pressure:	at 0 °C, [bar]	10.64
	at 20 °C, [bar]	18.40
Flammability range in air, [% volume]:	4.0 - 44.0	
Specific volume:	at 1.013 bar, 15 °C, [m ³ /kg]	0.689
	at 1 atm., 70 °F, [ft ³ /lb]	11.2

Material compatibility

Aluminium	Brass	Carbon steel	Copper	Iron	Monel	Niobium	Nylon	Polyethylene	PVC	Stainless steel	Teflon	Viton
Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good



Figure 4. New GHS and CLP hazard pictograms for H_2S , a product of desulfurisation in producing environmentally friendly fuels.

implementation phases, labelling must be adapted to the new standards, all products must be reclassified and safety data sheets accordingly amended.

For the companies concerned, this therefore calls for adjustments to the IT systems that generate the labels and requires a considerable additional amount of work and expense. For example, Linde Gas Germany had to submit 600 000 new safety data sheets to its customers and relabel approximately 1.5 million gas cylinders before 1st December 2010.

There are tight deadlines attached to the new regulations. For example, the so called revision of REACH Annex II came into force on 20th May 2010 and applied from 1st December 2010. This gave industry only six months to completely update its safety data sheets and involved intensive work.

Tremendous success and admirable progress

While most countries have systems for the classification of hazardous chemicals to ensure safe transportation, storage, use and disposal, up until now various national or regional systems have not always been compatible. This incompatibility has often meant relabelling or use of multiple labels on a product, increasing the handling risks involved. For organisations operating at an international level, the need to comply with multiple regulations on hazard classification and labelling has created the risk of end users misinterpreting label warnings.

Despite the rapid convergence of these regulations, there has been tremendous success and admirable progress. Using different icons and words to describe hazards and risks is okay if the products remain in that particular country, but once a company starts to export, confusion can enter into the equation and compromise safety. At some point in the not too distant future, there will be harmonisation of all chemical labels. So there will only be one label for a particular product. New Zealand and Japan implemented GHS three years ago. Now all eyes are on Europe, before the focus shifts onto other major economic blocks such as the US.

Industrial regulations will converge around the middle of this decade and it is expected that harmonisation of chemical labelling will be achieved to a level of approximately 80%. It is doubtful that the process will be perfected, because there are many local regulations that cannot simply be completely removed and the manufacturers and authorities will have to work around these.

As an international industrial gases company, Linde is being confronted by the same legislation, processes and timelines as the petrochemical sector and it is well placed to transfer its experience and knowledge to this industry. The company is being proactive in helping gas customers understand and adopt the multiple changes that will impact the way gases are transported, stored and handled across their supply chains. Customers are invited to engage with EU classification experts to understand how these changes can actually benefit them.

With producers of chemicals hard at work to meet the harmonisation compliance deadline, the onus of responsibility now extends to suppliers who are required to cascade this updated information not only down their complex supply chains, but ultimately to an immense world market.

One must not forget product use at the most elementary end of the supply chain: the home user. Take the use of butane and propane for patio barbecues, for instance. Ultimately, this is a common product coming out of the petrochemical sector. But it is a product the man in the street would buy at his local garden centre or petrol station. The label on that cylinder will change to become much more detailed. It is now the responsibility of the company selling this cylinder of gas to the local outlets to label it in the new format. This is a big change implication for such companies and is going to require a huge amount of effort to push the safety data sheet right down the distribution line to the end user. **IE**