STRATEGIC BUSINESS PLAN
ISO/TC 58

EXECUTIVE SUMMARY

ISO/TC 58, *Gas cylinders*, is involved in the development of standards for pressure receptacles, including gas cylinders, their fittings and characteristics relating to their manufacture and use. The scope includes all types of transportable pressure receptacles for gas, provided they are not cryogenic containers (covered by ISO/TC 220, *Cryogenic vessels*) or aerosol containers.

Pressure receptacles are used throughout the world for the transport and supply of gases, and the range of users of the gases is extremely wide, including pharmaceuticals, electronics, food, chemicals and the manufacturing industry. The estimated annual world turnover is *approximately* 180 billion USD. The number of pressure receptacles in circulation is estimated to be *approximately* 2 billion of which about 20% are high pressure, the balance being the familiar low-pressure type used mainly for Liquefied Petroleum Gas (LPG).

Having international standards, which are recognised in regulations enables pressure receptacles to be accepted for use in more than one country. Without such recognized standards, countries impose their own national standards, which are often more than is technically necessary for essentially the same pressure receptacle and restrict their movement across national borders. This represents inefficiency in the use of resources.

The main objective of the committee's work is the production of a comprehensive suite of modern, high-quality standards covering the design and manufacture of pressure receptacles and their fittings, as well as providing a set of standards for the filling, inspection, maintenance, testing and operational aspects of the business. The priorities are to ensure that the standards are available for the most commonly used types of pressure receptacle and valve, while also taking care to use the best available technology to make the standards as state-of-the-art as is achievable.

1. INTRODUCTION

1.1 ISO technical committees and business planning

The extension of formal business planning to ISO Technical Committees (ISO/TCs) is an important measure which forms part of a major review of business. The aim is to align the ISO work programme with defined business environment needs and trends and to allow ISO/TCs to prioritize among different projects, to identify the benefits expected from the availability of International Standards, and to ensure adequate resources for projects throughout their development.

1.2 International standardization and the role of ISO

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

Three bodies are responsible for the planning, development and adoption of International Standards: the International Organization for Standardization (ISO) is responsible for all sectors excluding Electrotechnical, which is the responsibility of International Electrotechnical Committee (IEC), and most of the Telecommunications Technologies, which are largely the responsibility of International Telecommunication Union (ITU).

ISO is a legal association, the members of which are the National Standards Bodies (NSBs) of 169 countries (organizations representing social and economic interests at the international level), supported by a Central Secretariat based in Geneva, Switzerland.

The principal deliverable of ISO is the International Standard.

An International Standard embodies the essential principles of global openness and transparency, consensus and technical coherence. These are safeguarded through its development in an ISO Technical Committee (ISO/TC), representative of all interested parties, supported by a public comment phase (the ISO Technical Enquiry). ISO and its Technical Committees are also able to offer the ISO Technical Specification (ISO/TS), the ISO Public Available Specification (ISO/PAS) and the ISO Technical Report (ISO/TR) as solutions to market needs. These ISO deliverables represent lower levels of consensus and have therefore not the same status as an International Standard.

ISO also offers the International Workshop Agreement (IWA) as a deliverable which aims to bridge the gap between the activities of consortia and the formal process of standardization represented by ISO and its national members. An important distinction is that the IWA is developed by ISO workshops and fora, comprising only participants with direct interest, and so it is not accorded the status of an International Standard.

2. BUSINESS ENVIRONMENT OF ISO/TC 58

2.1 Description of the Business Environment

The political, economic, technical, regulatory, legal and social dynamics set the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this ISO/TC. These factors may significantly influence how the standards development processes is conducted and the content of the resulting standards.

The scope of ISO/TC 58 is:

Standardization of gas cylinders and other pressure receptacles, their fittings and requirements relating to their manufacture and use.

Excluded: Cryogenic vessels (ISO/TC 220) and aerosol containers.

A note appended to the scope statement points out that pressure receptacles, cryogenic receptacles and aerosols are defined in the international regulations for the transport of dangerous goods by sea, air, road and rail and in the *United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations* (also known as "the Orange Book" - ST/SG/AC.10/1 as amended from time to time).

This includes the following definitions:

Pressure receptacles is a collective term that includes cylinders, tubes, pressure drums, closed cryogenic receptacles, metal hydride storage systems, bundles of cylinders and salvage pressure receptacles;

Cylinders are transportable pressure receptacles of a water capacity not exceeding 150 litres;

Pressure drums are welded transportable pressure receptacles of a water capacity exceeding 150 litres and of not more than 1000 litres, (e.g. cylindrical receptacles equipped with rolling hoops, spheres on skids).

Tubes are transportable pressure receptacles of seamless or composite construction having a water capacity exceeding 150 litres and of not more than 3000 litres;

Notwithstanding the capacity limit for tubes of 3000 litres in the international regulations for the transport of dangerous goods, work is in hand to develop a standard for composite tubes of much larger capacities. ISO/TC 58 notes that requirements for tubes larger than 3000 litres have been published as an ISO Technical Specification. This Technical Specification will be reviewed, and consideration given to its development as a future International Standard. Within ISO/TC 58 tubes larger than 3000 litres water capacity are known as “Large Tubes”. For “Large Tubes” to be accepted into the UN Model Regulations, would require significant work. This subject is being discussed within ISO/TC 58 and its sub-committees and if consensus can be reached and the technology is proven to be safe and effective, then future work will involve discussions with regulatory authorities.

Bundles of cylinders means a pressure receptacle comprising an assembly of cylinders or cylinder shells that are fastened together and which are interconnected by a manifold and transported as a unit. The total water capacity shall not exceed 3000 litres except that bundles intended for the transport of gases of Division 2.3 shall be limited to 1000 litres water capacity;

Multiple-element gas container (MEGC) means a multimodal assembly of cylinders, tubes or bundles of cylinders which are interconnected by a manifold and which are assembled within a

framework. The MEGC includes service equipment and structural equipment necessary for the transport of gases.

ISO/TC 58 has current work or published standards on all the above types of pressure receptacles and assemblies of pressure receptacles.

In a general sense, gas cylinders are small transportable containers for substances stored under pressure. The uses for gas cylinders vary from the transport and storage of relatively low value commodities like compressed air or LPG, to highly refined and very expensive gases (which may have a variety of different properties, e.g. toxic, corrosive, etc.) for specialty use, such as in the semiconductor industry, which are sold and shipped in small quantities. Due to the materials used in their construction, the weight of a cylinder often far outweighs its gaseous content. Industry balances the requirement for efficiency in manufacturing against the need to improve the customer experience, for example, by making cylinders as light as practical (by reducing wall thickness, using high strength materials, etc.). On the other hand, there must be a sufficient safety margin to avoid exposing workers and the general public to unacceptable dangers. Valves and other fittings must be suitable for purpose and meet stringent safety requirements. In most cases, all metal cylinders last for many decades and must be operated and maintained in a proper way to retain their original properties and inherent safety characteristics. Most of the standards in this field address these issues and are thus safety related.

The definition of gas cylinder types is given below:

- Type 1: all metal cylinder;

- Type 2: hoop wrapped cylinder with a load-sharing metal liner and composite reinforcement on the cylindrical portion only;

- Type 3: fully wrapped cylinder with a load-sharing metal liner and composite reinforcement on both cylindrical and dome ends;

- Type 4: fully wrapped cylinder with a non-load sharing liner and composite reinforcement on both the cylindrical portion and the dome ends; and

- Type 5: fully wrapped cylinder without a liner and with composite reinforcement on both the cylindrical portion and dome ends.

Major stakeholders in this field are pressure receptacle and valve manufacturers, fillers and distributors, regulatory authorities and inspection bodies. Whilst manufacturers and pressure receptacle fillers are well represented by trade associations, the end users of gases form a very heterogeneous group. They are not organized in any tangible way and are thus hard to reach as stakeholders. However, the law protects their interests and ISO/TC 58 is grateful for the participation in the standardization process by the stakeholders, including representatives of the regulatory authorities. Above all, the stakeholders want safe pressure receptacles and general market forces require that they are also efficient and cost-effective.

Gas cylinders can be split into two categories:

- the low-pressure cylinder, usually welded or of seamless composite design, of which a major part is used for the distribution of LPG and similar gases which liquefy at relatively low pressure. LPG cylinders are distributed in a wide variety of ways, many are owned by LPG companies, but LPG customers also own individual cylinders. Distributors vary from small local shops to large multinational companies; and

- the high-pressure cylinder, used for the distribution of compressed, dissolved and

liquified gases. These cylinders and their accessories are produced by a relatively small number of manufacturers but are used by a very large number of customers ranging from households to large industrial enterprises.

Pressure receptacles are typically owned, filled and distributed mostly by a small number of large multinational gas companies. A slow but steady trend is an aggregation of the market in that pressure receptacles are more and more owned by distributors, which in turn merge into larger enterprises, thus giving better control over filling practices and maintenance. The capital investment in a pressure receptacle is high in comparison to the cost of its gas contents and transportation (for all but a few specialty gases). The heavy weight of a pressure receptacle, compared to its content, puts a heavy penalty on long journeys for low-cost gases. On the other hand, some rare and expensive gases travel on intercontinental journeys, notably to supply the microelectronic industry.

Over the lifetime of a pressure receptacle, handling and transportation costs are significantly more than the initial investment.

A malfunctioning pressure receptacle represents an obvious danger and national authorities have long since regulated their production and use. Basically, there is a common approach to safety issues, but in principle every nation requires that pressure receptacles be inspected and approved in the country or region where they are to be used. This severely limits the free circulation of pressure receptacles over national or non-free trade borders. Over the decades the regulations have also established different national requirements, sometimes fiercely defended. It is almost impossible to make a reasonable true estimate of the cost incurred by those restrictions, but a rough estimate points towards 10 to 100 million USD per year.

Pressure receptacles have been around for more than a century and represent a mature market with firmly established, not necessarily coherent, opinions regarding design and operation in various parts of the world. The dynamics in the field are not very obvious.
Technical development, constrained by legislation and considerations of user safety is more evolutionary than revolutionary in character as, for example, the trend towards pressure receptacles made of materials with higher strength. However, recent developments in the use of composite materials (fibre and resin), as well as valve designs incorporating additional functions, such as pressure regulation, flow-metering, content level indication, etc. should be mentioned as examples of emerging products. Business development follows the general trend of acquisitions and mergers. A long-term tendency is that filling and distribution companies acquire the customer owned pressure receptacles.

Major regulatory barriers to international trade with pressure receptacles exist today. The standard procedure is that for a pressure receptacle type to be manufactured, it first has to have the design authorised by the authorities in the country/region where it is going to be used. After production the pressure receptacle has to be inspected and tested by an inspector authorised in the country/region of use. It then cannot normally be used in any other country/region unless it has been inspected and tested again or has been given an exemption based on previous inspection and testing. This means that pressure receptacles are essentially restricted to that country/region for which they are made. Filled pressure receptacles may sometimes be transported to a customer in another country, but then only for use of the received gas. It may not be filled again unless transported back to the country of origin.

The need for fewer restrictions in the circulation of pressure receptacles over national borders has been steadily increasing. In Europe, common agreements for the free transport of dangerous goods by rail and on roads have been in force for decades. Having European standards allowed the creation of suitable regulations. In the late 1990's, the UN Committee of Experts on the Transport of Dangerous Goods decided to incorporate a chapter on pressure receptacles in the *United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations*, in which more than 50 ISO/TC58 standards are currently referenced.

Compliance to the UN Model Regulations is required for pressure receptacles to carry the UN packaging mark. It is expected that over the years these references will be successively incorporated into regional and national regulations. This will mean an important strengthening of the influence of ISO standards. This is particularly evident in Europe where the European pressure receptacle standards published by CEN (The European Committee for Standardization) are being progressively replaced by EN ISO standards which mandatorily replace the national standards of CEN Members.

Standardization work in this field in general means finding a consensus for a standard that more or less changes already existing national standards or local practices. Where the existing situation does not show any significant safety issues, changes are not always required and then work is sometimes slow and tedious. It is also important to avoid a "common denominator" approach, since that might lead to a very safe, but inefficient standard that nobody wants to use.

An expanding application for pressure receptacles is for the high-pressure storage of fuel gas for automotive applications. Liquefied (LNG) and compressed natural gas (CNG) are popular in many countries as a fuel for cars, trucks and buses. Hydrogen is also rapidly gaining in popularity, for example, hydrogen fuel cell electric vehicles (FCEVs) provide a clean propulsion technology that powers increasing numbers of ultra-low emission vehicles (ULEVs). It is pleasing to report that ISO/TC 58 have a strong and cooperative liaison with ISO/TC 197, *Hydrogen Technologies*. They have an aim to harmonise vocabulary and materials compatibility, where appropriate to do so. Note that several ISO/TC 58 standards are referenced in ISO/TC 197 standards.

ISO/TC 58/Sub-Committee (SC) 3 has developed and published a standard for pressure receptacles specifically tailored for the characteristics required for CNG use in vehicles. It also co-operates with ISO/TC 197 in developing appropriate standards to support the application of hydrogen, for example, supporting an ISO/TC 197 standard for the design and manufacture of cylinders for on-board high-pressure storage of hydrogen in land vehicles.

Although this business plan focuses mainly on transportable pressure receptacles, it should not be forgotten that pressure receptacles are an economical means of storing gases, often at high pressure, and many are used in static applications, such as for storage or as receivers to absorb pressure fluctuations.

For example, when a transportable pressure receptacle is used in a static application then, whilst ISO/TC 58 International Standards may be followed, the owner/user is responsible for ensuring that it is installed and maintained in accordance with the appropriate national or international Regulations. For the use of such pressure receptacles in these applications, it is suggested that the equipment provider and manufacturer is consulted.

2.2 Quantitative Indicators of the Business Environment

This section identifies the quantitative indicators describes the business environment in order to provide adequate information to support actions of the ISO/TC:

There are no official statistics available, and the following figures are approximate estimates based on interviews with persons engaged in the trade.

The pressure receptacle market is somewhat unusual in that the main activity is in the filling and distribution of pressure receptacles. The end user (using the gas in the pressure receptacle) rarely uses more than 100 pressure receptacles per year and is not linked to any type of relevant consumer organization. Consequently, they have a very small voice in the market.

A suggested relevant definition of the trade in this segment is the value added from the moment the gas enters the pressure receptacle to the end user of the gas plus the trade in the pressure receptacle itself (including accessories). With this definition, it is estimated that the total global

annual turnover to be approximately 180 billion USD. For cylinders, the total stock in the world is estimated to be *approximately* 2 billion of which *approximately* 20% are high-pressure cylinders.

The majority of the trade occurs within national boundaries and an estimate is that only *approximately* 2% of the total turnover is international trade. This figure is steadily increasing. The international trade concerns mainly newly produced pressure receptacles and expensive gases like noble gases and specialty gases for laboratories and the semiconductor industry.

It is estimated that there are *approximately* 200 pressure receptacle and valve manufacturers of a reasonable size. Note that there are new market entrants, particularly in composite cylinders/tubes, which often target hydrogen applications. Operators (fillers and distributors) vary considerably in size from one-person LPG distributors to multinational gas companies. There are about 20 very large gas supply companies.

The global gas supply business (pressure receptacle and valve manufacture, gas filling and distribution) is estimated to employ about 150 thousand people. Employment is dependent on market conditions but remains reasonably stable. New applications, for example in medical and vehicle fuel gases, may see changes taking place.

The impact of the ISO pressure receptacle standards on the market has hitherto in general been modest. To this it should be said that in Europe the corresponding CEN standards have to be published and used in place of previous national standards. CEN and ISO standards are often very similar and increasingly are identical standards developed according to the Vienna Agreement. It is estimated that roughly 20 world-wide organizations request compliance with at least one ISO pressure receptacle standard. The number of governments, adopting at least one free-standing important ISO pressure receptacle standard in full, is probably not more than ten. Taking CEN/ISO standards into account that number increases by *approximately* 34. It is not fully known how many ISO/TC 58 standards have become normative standards in other ISO standards. Since pressure receptacles constitute a rather specialized field and one which is heavily regulated by national laws, an estimate is that only a few of the TC 58 standards have become normative references in other ISO standards. The impact of ISO pressure receptacle standards has increased with many important design standards published and adopted as ISO pressure receptacle standards in the *United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations*.

There are no good indicators available on the adoption or actual use of ISO/TC 58 standards. However, the European sister committee CEN/TC 23, *Transportable gas cylinders*, is committed to replacing its standards with EN/ISO standards wherever possible. Therefore, an increasing penetration of ISO standards in Europe is expected, followed by the rest of the world. Indeed, the gases industry has stated a preference for using ISO pressure receptacle standards wherever possible, in order to harmonise global activities. Furthermore, industry wants to concentrate its technical standardization effort in the ISO forum and not spend time doing similar work nationally or in CEN thereby improving the efficiency of their technical resources.

3. BENEFITS EXPECTED FROM THE WORK OF ISO/TC 58

The most important benefits from a generally accepted international standardization in the pressure receptacle field would be increased safety levels, particularly in developing countries, and the reduction of technical barriers to trade. Generally accepted international standards should lead to more uniform designs of pressure receptacles and their fittings for various purposes. This would lessen the burden on national authorities, facilitate first inspection procedures and allow the free circulation of pressure receptacles over national borders. Certain gases are only available at limited locations in the world and due to their special nature, they are transported internationally in pressure receptacles. International operators may also want to operate a part of their pressure receptacle stock in different country from where originally put

into use. Thus, there is a need to establish schemes for unrestricted circulation of pressure receptacles. On a regional scale, in the European Union such schemes are materialising (e.g. new approach directives, CEN Standards). The same process is now repeating on a global scale with, for example, the World Trade Organisation (WTO), Technical Barriers to Trade (TBT) agreement and the *United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations*, etc. International standards are a key element to improving the efficiency of international trade.

Note that the RID/ADR (Transport of dangerous goods by rail/road), scheme originally developed for Europe has now expanded to over 50 signatories with many non-European states and so it is now referred to as an "International" rather than a "European" agreement (ADR, 1st January 2021: International carriage of dangerous goods by road).

A generally accepted international design standard should allow for innovation by setting out the principles of good design, therefore allowing the opportunity for increasing efficiencies and longer manufacturing runs. The use of higher strength materials in pressure receptacles increases the importance of fracture mechanics considerations, such as surface defect detection and propagation. This necessitates more sophisticated type approval procedures and tighter production control which reflects the reduced operating window of these materials.

International standards for accessories strengthen an often weak point in a pressure receptacles performance by setting functional requirements on valves, valve guards, etc. With the advent of more complex valves such as those incorporating residual pressure devices and integrated pressure regulators, the benefits of international standards are becoming more and more apparent.

International standards on operational requirements set minimum rules, for example, for filling and the inspection and testing of pressure receptacles. They raise safety awareness, increase safety standards in the workplace and assist in counteracting bad habits.

The major factor relating to suppliers is the ongoing mergers of companies. Multinational companies will have an increased interest in international standardization. For fillers and distributors there is a similar activity of concentration. Another tendency particularly in the low-pressure gas cylinder field is the move from customer owned cylinders to cylinders owned by distributors. Generally, competition is increasing, and international standards could be a means to fight unfair competition based on sub-standard practices.

Regulatory and legal measures play an important role in today's pressure receptacle business. Pressure receptacles are firmly established in national regulations and considerable effort is needed to harmonise regulations in different countries. Some steps have been taken to give regional legislation a supremacy over national regulations, for example, European Directives and Regulations, and the North American Free Trade Agreement (NAFTA), etc.

4. REPRESENTATION AND PARTICIPATION IN ISO/TC 58

4.1 Membership

Countries / ISO member bodies that are P and O members of ISO/TC 58

4.2 Analysis of the participation

There is a noticeable imbalance in the representation with regards to degree of development of the participating countries; the less developed countries being under-represented. The reason is very likely related to lack of pressure receptacle production and because the use of gases is in some respect related to technological advancement.

There is a fair geographical balance on a global scale. Looking at regions, however, there are a large number of European countries. One explanation is the considerable interest in standardization promoted by CEN activities in Europe. Another explanation is that in Europe, contrary to other locations, many ISO standards are included within European Regulations,

whilst other ISO standards (voluntary standards) may not be included.

There is good participation and contribution from other international organizations having knowledge about pressure receptacles and related items. Particularly, the relationship with the corresponding CEN committees, CEN/TC 23 and CEN/TC 286, *Liquefied petroleum gas equipment and accessories*, has improved over the years. The strategy of CEN/TC 23 noted above to adopt ISO/TC 58 standards wherever possible means that co-operation is maintained. The LPG industry also recognises the increasing importance of ISO standards and CEN/TC 286 members participate actively in ISO/TC 58 projects.

The main representatives in the committees and working groups are experts from gas supply companies, notified bodies (indirectly representing regulatory authorities) and manufacturers of pressure receptacles and associated accessories. Unfortunately, member representatives often enter the process late, such as during the DIS or FDIS stage, causing delays, which could have been avoided with earlier participation.

5. OBJECTIVES OF ISO/TC 58 AND STRATEGIES FOR THEIR ACHIEVEMENT

5.1 Defined objectives of ISO/TC 58

The objectives of ISO/TC 58 are to develop standards on:

1. design, manufacture and testing of pressure receptacles;

2. design and testing of valves and fittings and dimensions;

3. operational requirements, including filling conditions, inspections at time of fill, periodic inspections, identification and specific applications.

These standards should be of such a quality that they are accepted and adopted by the authorities, the pressure receptacle and valve manufacturers and the gas industry.

At the time of publication of this revision of the Business Plan, ISO/TC 58 has published 115 documents, which include International Standards, Technical Reports and Technical Specifications.

More specifically under objective 1, ISO/TC 58/SC 3 has produced a complete set of design standards for refillable seamless and welded cylinders manufactured from steel and aluminium alloy, as well as for large seamless steel tubes, pressure drums and bundles. Non-refillable cylinders have also been addressed.

A four-part series of International Standards addresses the modern technology of the different types of composite cylinders. An International Standard on tubes of composite construction having water capacities up to 3000 litres has been published and adopted into *United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations*. A Technical Specification for composite tubes with a scope exceeding 3000 litres specifically for transport purposes permanently mounted on vehicles has also been published. The development of composite technologies is supported by the ongoing creation of a suite of Technical Reports.

An International Standard for steel pressure drums was published in 2015 to fill a gap in the portfolio.

ISO/TC 58/SC 2 has produced a number of International Standards regarding pressure receptacle valves, threads, outlet connections, valve guards, flexible hoses, etc. ISO/TC 58/SC 2 aims to develop standards dealing with safety, compatibility between equipment, interchangeability between parts, as well as qualification test procedures of accessories. International Standards have been published for valves applicable to the healthcare, homecare, the microelectronic industry and for non-refillable cylinders. To complete the valve

standards, there are International Standards for manually operated, actuated and self-closing valves, that can be installed on gas cylinders, bundles (or similar) and pressure drums. International Standards for valves with additional functions have also been developed, notably valves which incorporate residual pressure devices and integrated pressure regulators. Further, there is ongoing development of electronic valves, some of which have external connectivity.

The set of International Standards for threads for the valve-to-cylinder connection was completed with a standard for parallel threads published. The trend toward performance-based standards is illustrated by ISO 10297 covering the design and the testing method to qualify cylinder valves. Methods for determining toxicity, corrosiveness and fire potential or oxidizing ability of gases have been developed with test methods where appropriate.

International Standards for new types of valves have also been developed, notably valves with residual pressure devices, valves with integrated regulators, and ball valves.

Compatibility of gases with pressure receptacles and valve materials, both metallic and non-metallic is covered in International Standards developed under ISO/TC 58. As an example, hydrogen compatibility for steels is an important safety concern and the optimum test methods are described in ISO 11114-4. It should also be noted that within the ISO 11114 suite of standards work, new parts were published recently on the test methods required for the selection of plastic liners used in Type 4 composite cylinders and on the oxygen pressure surge testing.

ISO/TC 58/SC 4 has the responsibility for the development of operational requirements for pressure receptacles. There are complete sets of standards for periodic inspection and testing and for inspection at time of filling for all common kinds of pressure receptacles. These include welded aluminium-alloy and steel cylinders, seamless aluminium-alloy and steel cylinders and tubes, composite cylinders and tubes, and bundles of cylinders. An International Standard on acoustic emission tests on gas cylinders has been published and is referenced in the *United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations*.

ISO/TC 58/SC 4 develops and maintains International Standards for marking and labelling of pressure receptacles, including colour coding of contents in medical cylinders, precautionary labels and stamp marking. ISO/TC 58/SC 4 is responsible for International Standards for identification and marking using radio frequency identification (RFID) technology and for assigning RFID codes. ISO/TC 58/SC 4 also maintains the listing of cylinder manufacturers' identification marks. Finally, ISO/TC 58/SC 4 develops and maintains standards on acoustic emissions examination (AT) and ultrasonic examination (UT).

Several ISO/TC 58/SC 4 International Standards are referenced in the *United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations*.

The current work programme for ISO/TC 58/SC 4 includes development of standards on methods for inspection and requalification of NGV fuel gas containers, modal acoustic emission testing for composite cylinders and tubes, seamless tubes, composite tubes and large tubes permanently mounted in a frame, acoustic emission testing for composite cylinders and composite tubes permanently mounted in a frame.

There is substantial work in revising these documents to respond to changes in technology and changes made apparent from experience in using them. For example, the markets and requirements for high-pressure gas cylinders continue to develop at a fast pace e.g. higher pressures, larger volumes, lighter systems, easier-to-use etc. It is the plan of TC 58 to keep adapting to this fast-changing world and to provide high quality international standards to meet such demands.

5.2 Identified strategies to achieve defined objectives of ISO/TC 58

A close cooperation with the corresponding CEN committees has proven to be very beneficial and efforts to further increase the alignment of standards developed by ISO and CEN will be undertaken notably during 5-year reviews. The committees are partly manned by the same experts and all efforts to reduce duplicating meetings are appreciated.

An important inroad for the adoption of ISO pressure receptacle standards is the use of the *United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations* and the *Globally Harmonized System of Classification and Labelling of Chemicals* (GHS). The Model Regulations are issued every two years by the UN Committee of Experts on the Transport of Dangerous Goods and many ISO/TC 58 standards are referenced. The text of the *United Nations Recommendations on the Transport of Dangerous Goods – Model Regulations,* is incorporated into the international regulations for road, rail, air and maritime transport of dangerous goods and also influences the adoption of ISO standards into national regulations in Asia, Australasia, Europe and North America.

An important consideration is to be responsive to the needs of legislators who are increasingly relying on references to standards to provide the definitive detail to the regulations. Therefore, the policy is to develop and maintain a close working relationship with the UN Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals.

Generally, the TC, its sub-committees and working groups have responded positively to the ISO time scales and do try to meet the target times. However, with a large programme involving relatively few experts, some delays can occur. In many instances, these delays are due to genuine difficulty in reaching consensus and finding suitable meeting times and venues. Experts are facing increasing difficulty in finding the time to attend standards working groups, but it is pleasing that remote meeting access is now more widely available and encouraged.

Occasionally, errors and omissions cause problems. The committees have studied this issue and opportunities for a significant improvement in delivery times have not been identified. It can be expected that the industries will wish to respond to technological, safety and market developments across the whole spectrum of ISO/TC 58's scope. This will result in a large programme in all three sub-committees, so progress on individual standards may not meet targets.

6. FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE ISO/TC 58 WORK PROGRAMME

An important barrier to the adoption of harmonised standards is firmly established national regulations. Regulatory authorities rarely take part in standards meetings. Their views are often presented first at the DIS or FDIS stage, which means delays and repetition of work.

Making changes can be burdensome for equipment manufacturers, gas companies and users, when there is no known related incident, accident or safety requirement for improvements. As an example, a global harmonisation of pressure receptacle valve outlets would require a considerable effort to changeover to new valves and the associated user-owned regulators which are to be connected to them. This process would also create considerable inconvenience and increase safety risks during the changeover period. Similar obstacles exist in most cases where hardware is involved.

International standardization in the pressure receptacle field in the recent past has been performed at essentially two levels: On an international level (ISO/TC 58) and on a European level (CEN/TC 23 and CEN/TC 286). European standards have replaced national standards and are referenced in European legislation as EN ISO standards. It is pleasing to report that more countries are now moving towards using ISO standards which is helping to achieve an improvement in global standardization.

The trend for harmonizing regulations and globalization of industrial operations means that

incentives for using ISO/TC 58 standards are becoming ever greater.

Some social changes are foreseen to impact on our work. Welfare issues appear to be gaining importance in developed countries and, in particular, there are challenging questions being asked related to gases used in the health and food industries. Since pressure receptacles have hazardous properties, it is expected that in the future there will be an increasing demand on levels of safety. More stringent methods in production control, as well as checks for maintenance and filling may be needed. It is anticipated that ISO standards will form an important reference source for safety and best practice.

The growing emphasis on sustainability and the reuse of materials is high in the waste hierarchy for achieving a sustainable environment. The reusable pressure receptacle, with a typical 50-year life, is a highly efficient use of resources. The International Standards covering use (in many countries made mandatory by law) ensure that the full lifetime of pressure receptacles is realised by a very high proportion whilst ensuring the safety of the user. Composite cylinders are only disposed after failing safety inspections or passing their "use by date".

As published by the UN, the "Sustainable Development Goals (SDGs) are a call for action by all countries – poor, rich and middle-income – to promote prosperity while protecting the planet. They recognize that ending poverty must go hand-in-hand with strategies that build economic growth and address a range of social needs including education, health, social protection, and job opportunities, while tackling climate change and environmental protection."

ISO/TC 58 and its sub-committees have focused on the SDGs and in general has targeted SDG No. 9: "Inclusive and sustainable industrialization - innovation and infrastructure, can unleash dynamic and competitive economic forces that generate employment and income. They play a key role in introducing and promoting new technologies, facilitating international trade and enabling the efficient use of resources." It is also pleasing to report that SDGs 7, 8, 10 and 11 are also covered in some documents.

As with the vast majority of businesses and other Committees, ISO/TC 58 has been impacted by Covid-19 during the past couple of years, however it is very pleasing to report that the impact has been minimal, due to the commitment and dedication of the experts. This has been achieved by the introduction of virtual meetings for both WGs and Plenaries. It is unlikely that face-to-face meetings will disappear altogether, and indeed are to be encouraged from time-to-time, to help to maintain and grow relationships as well as resolving difficult issues. However, virtual meetings are becoming more accepted, as they have several benefits: they allow more people to attend meetings, there is no travel time, travel and hotel accommodation costs are saved and most importantly environmental impact is reduced.

Foreseeable political changes are not expected to have any major impact on the pressure receptacle business.

7. STRUCTURE, CURRENT PROJECTS AND PUBLICATIONS OF ISO/TC 58

Information on ISO online

The link below is to the ISO/TC 58 page on ISO's website:

ISO/TC 58 on ISO Online

Click on the tabs and links on this page to find the following information:

- About (Secretariat, Secretary, Chair, Date of creation, Scope, etc.)
- Contact details
- Structure (Subcommittees and working groups)
- Liaisons
- Meetings
- Tools
- Work programme (published standards and standards under development)

Reference information

Glossary of terms and abbreviations used in ISO/TC Business Plans

General information on the principles of ISO's technical work