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ANALYSIS OF COMPOSITE POLYMER MATERIALS USED IN HIGH PRESSURE GAS CYLINDERS

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Abstract:

The development trends of the modern gas cylinders market are considered juice pressure. The design range of high pressure cylinders is described for industrial gases, acetylene, compressed natural gas, mixtures of x-ray apparatus. Technical characteristics are analyzed, especially and the operational benefits of solid-drawn metal cylinders for high pressure gases. Convincing evidence is provided high quality cylinders from Worthington Cylinders GmbH.

Keywords: High pressure cylinders. Composite cylinders. Steel cylinders. Solid metal cylinders. Industrial gases. Natural gas. Acetylene. Parameters of cylinders. Operational safety.

Cylinders - metal vessels designed for storage and transportation of compressed, liquefied and dissolved gases under pressure above atmospheric fernogo. Distinguish between low and high pressure cylinders laziness. The former, for example, are used for propane butane mixtures (liquefied petroleum gases) and refrigerants. Their test pressure was is 30 and 48 bar, respectively. For liquefied gases, and in some cases for acetylene, it is allowed the use of welded cylinders. Cylinders high pressures are designed for industrial gases and methane. Depending on the specification they are tested the actual pressure can be from 300 to 450 bar.

In world practice, the classification is now accepted high pressure cylinders, including fourre main types of structures: all-metal without welding, made of alloyed noah or carbon steel; metal sheets kovye with steel or aluminum liner (type 2); metal-plastic with cocoon-type winding and composite cylinders.

Gas cylinders of a new design are manufactured from innovative composite (composite) materials (fiberglass, ultrahigh fiber, epoxy resin and vinyl ether) using a unique technology at Composite Scandinavia AB (Sweden) and Ragasco AS (Norway). At all stages of manufacturing, products undergo strict quality control with testing for strength under pressure. Household gas cylinders show the highest degree of safety when tested for overpressure, impact resistance and fire resistance.

Due to their physical characteristics and high consumer properties, polymer-composite gas cylinders have earned a reputation for being reliable, durable and easy-to-use products. The products of these two enterprises are leading all over the world and are supplied to many countries of Europe, the USA and Canada, are approved for use in more than 20 countries of the world and comply with European safety standards.

Composite Gas Cylinders Safe: Key Benefits

1. Explosion safety. Undoubtedly, this is one of the most important qualities that equipment for storage, transportation and consumption of gas should have. This quality is achieved both by the physical properties of the materials used and the unique production technology, and by the design features of both the cylinder itself and the valve installed directly at the factory. Each cylinder is tested at 1.5 times the working pressure. The composite gas cylinder has an impact-resistant body made of a very tough material. Factory burst tests are carried out at pressures above 67 bar. With a forced rupture, the balloon is destroyed without the formation of fragments.
2. Resistant to corrosion. This property is especially important due to the fact that in metal cylinders corrosion occurs not only outside, but also inside, due to the content of natural moisture in the gas. Plastic gas cylinders cannot corrode by definition, since both the bulb and the body are made without the use of metal.
3. Protection against excessive gas pressure inside the cylinder and high ambient temperature. The first property is also relevant because of our climate. Gas increases in volume with increasing temperature, which can happen, for example, if a filled cylinder is brought from the cold into a warm room.
4. Light weight, easy to move and transport. Polymer gas cylinders are about 70% lighter than their all-metal counterparts. The range includes cylinders with a volume of 12.5 liters (due to its low weight and dimensions,

this is an explosion-proof gas cylinder for stretch ceilings); 14.8 liters (gas cylinders for burners); 18.2 liters; 20.6 liters; 24.7 liters and 33.5 liters.

5. Impact resistance. Provided by the physical properties of composite materials and design features.
6. Dielectric properties, completely excluding the possibility of sparking. Such composite gas cylinders do not accumulate static electricity, which can happen with all-metal cylinders during transportation.
7. The transparency of the bulb. The visibility of the gas level allows you to monitor the gas reserves in the cylinder. The manufacturer guarantees the preservation of the transparency (transparency) of the flask for the entire life of the cylinder.
8. Long service life: 30 years.
9. Increased interval between re-certification: 10 years.

The technology for the production of modern composite cylinders is a rather complicated and high-tech process, which, in fact, determines the cost of the finished composite cylinder, which is higher than the cost of a conventional metal one. A pressure vessel is made from the so-called preform by the blowing method.

Further, the resulting pressure vessel enters the reinforcement section, where, with the help of special threads impregnated with a composite "resin", the pressure vessel is wrapped and takes the form of a flask. Next comes the process of drying the flask in an infrared camera, after which the process of assembling the finished product goes. A valve (valve) is installed and the casing is assembled.

Next, there is testing - a test pressure is supplied to the finished cylinder, the tightness is checked and the necessary tests are carried out.

Composite cylinders are absolutely explosion-proof, firstly, the manufacturing technology itself provides for protection against high pressure.

So, in particular, the cylinders of the Czech plant HPC Research are tested for destruction at a pressure of 130 Atm., And if we take into account the fact that the gas in the cylinder is under a pressure of 14-16 Atm., The destruction of the cylinder is almost impossible. Moreover, considering the same Czech composite balloon, it is worth noting the fact that the preform used in the manufacture of the balloon (Fig. 1) is made of PET material.

This material has the lowest gas permeability - less than 3 grams of gas per year (for a 24.5 liter cylinder).

Considering the advantages of composite cylinders over old, metal cylinders, the following should be noted:

1. Explosion safety
2. Low weight
3. No cleaning and painting required
4. Gas level visible
5. Aesthetic appearance
6. High reliability

More expensive than old metal cylinders

In fact, composite cylinders are objectively better than metal cylinders, in particular, low weight and complete explosion safety, absence of additional costs (cleaning and painting) and the ability to control gas residues make these products very popular with a growing number of gas consumers in cylinders.

The balloon, today, is presented in the only, most popular volume - 24.5 liters. Cylinders of this volume are optimal both for home (private) use and for work. It should be noted that HPC Research cylinders are the lightest in their category - the weight of such a cylinder is only 5.1 kg!

The cylinder has a high quality and shockproof plastic casing and, indeed, a very attractive design. The top and bottom of the cylinder are made in gray, and this is not only a designer's whim - the cylinder does not get dirty from hands and from the ground during transportation.

The cost of this cylinder, given its high quality indicators, is slightly lower than a cylinder of a similar volume of Norwegian production, and, as explained to us in the Russian representative office of the plant, is due to the fact that in addition to quality indicators, there are also marketing plans, which we will discuss in our upcoming articles.

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