LIMITED LIABILITY COMPANY
"Ural Gas and Fire Fighting Equipment Factory"

APPROVED
General Director
of "Ural Gas and Fire
Fighting Equipment Factory" LLC
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CYLINDERS FOR FLAMMABLE AND EXPLOSIVE GASES

OPERATION MANUAL

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1. INTRODUCTION

1.1. The present Operation Manual dwells upon steel seamless cylinders according to GOST 949-73 (hereinafter - Products), manufactured by the limited liability company «Ural Gas and Fire Fighting Equipment Factory», intended for storage and transportation of flammable and explosive gases.

Please direct all issues related to operation of the Products to the limited liability company «Ural Gas and Fire Fighting Equipment Factory»: 55, Nachdiva Onufrieva str., room 1934, Ekaterinburg, Sverdlovsk region, 620146, multichannel phone +7 (343) 383-63-63, or use the feedback from at website UZGPO.COM.

1.2. The Products operate under pressure, and pose a potential hazard, so they shall be designed, manufactured and examined in such a manner that ensures safety in operation within the design life. Use for other purposes is not allowed.

1.3. The Products comply with the Technical Regulation of the Customs Union TR CU 032/2013 « On Safety of Equipment Under Overpressure ».

1.4. The manufacturer's responsibility is specified by Federal law of the Russian Federation No. 237-FZ dd. 18th July 2011 «On Introduction of changes into the Code of the Russian Federation on Administrative Offenses»:

- violation of the requirements of the Technical Regulation of the Customs Union TR CU 032/2013 «On Safety of Equipment Under Overpressure » (article 14.43);
- false declaration of the product compliance (article 14.44);
- violation of the order of distribution and sales of the Products subject to mandatory confirmation of compliance (article 14.45);
- violation of the marking procedure of the Products subject to mandatory confirmation of compliance (article 14.46).

The manufacturer guarantees compliance of the products to the requirements of GOST 949-73, in case of observance of the operation and storage conditions.

Warranty period – 2 years (GOST 949-73) from the date of putting into operation.

The Products are not repairable.

1.5. Among the existing hazards and residual risks (critical failure) that may appear during operation one shall name failure of cylinders due to overpressure because of:

- Unacceptable deviation from the assigned parameters (wall thickness of the body, defects of the outer and inner surface of the body, defects of metal continuity of the body, and of the quality of heck thread surface);
- Use for manufacture of the materials with the improper mechanical properties;
- Absence of marking, ensuring identification;
- Simultaneous action of the load cases.

1.6. Requirements to the qualification, level and validation of the special-purpose training of the attending personnel are determined by the operator depending on the operational parameters.

1.7. The operator personnel shall read carefully the present Operation Manual and strictly observe the safety requirements specified in it.

1.8. The present Manual is developed in accordance with the requirements of Technical Regulation of the Customs Union TR CU 032/2013 «On Safety of Equipment Under Overpressure » and is intended for information of the users on typical hazards and measures on their elimination, which are possible when operating the cylinders made by the limited liability company «Ural Gas and Fire Fighting Equipment Factory», being filled with flammable and explosive gases.

2. DESCRIPTION OF PRODUCTS.

2.1. Technical specifications (properties).

The range of steel seamless cylinders intended for storage and transportation of flammable and explosive gases, manufactured by the limited liability company «Ural Gas and Fire Fighting Equipment Factory», is shown in Table 2.1.:

Table 2.1. – Product range of steel seamless cylinders of small (up to 12 liters) and medium (up to 50 liters) capacity according to GOST 949-73.

Cylinder capacity, liters	Thread type	Cylinder wall thickness for pressure, MPa (kgs/cm^2), not less					Cylinder weight for pressure, MPa (kgs/cm^2)				
		carbon steel			alloy steel		carbon steel			alloy steel	
		9.8 (100)	14.7 (150)	19.6 (200)	14.7 (150)	19.6 (200)	9.8 (100)	14.7 (150)	19.6 (200)	14.7 (150)	19.6 (200)
0.4	W19.2 acc. to GOST 9909	1.6	2.2	2.9	1.6	1.9	0.6	0.8	1.0	0.6	0.7
0.7							0.9	1.2	1.5	0.9	1.0
1.0		1.9	2.8	3.6	1.9	2.5	1.2	1.8	2.3	1.2	1.6
1.3							1.5	2.2	2.8	1.5	1.9
2.0							2.1	3.1	4.0	2.1	2.7
2.0		2.4	3.4	4.4	2.4	3.0	2.5	3.7	4.7	2.5	3.1
3.0							3.4	5.0	6.4	3.4	4.3
3.0		3.1	4.4	5.7	3.1	3.9	4.1	6.0	7.9	4.1	5.3
4.0							5.0	7.3	9.6	5.0	6.5
5.0							5.8	8.5	11.4	5.8	7.6
6.0							6.7	9.8	13.1	6.7	8.8
7.0							7.6	11.1	14.9	7.6	9.9
8.0							8.5	12.4	16.6	8.5	11.1
10.0							10.2	13.0	20.1	10.2	13.4
12.0							10.9	17.6	23.5	11.9	15.6
20.0	W27.8 acc.to GOST 9909	5.2	6.8	8.9	5.2	6.0	28.5	32.3	42.0	28.5	
25.0							34.0	38.7	50.5	34.0	
32.0							42.0	47.7	62.5	42.0	
40.0							51.5	58.5	76.5	51.5	
500							62.5	71.3	93.0	62.5	

Notes:
1. Weight of cylinders is stated without valves, caps, rings and shoes and is a reference value.
2. Estimated weight of metal cap– 1.3 kg; of ring – 0.3 kg; of shoe – 4.0 kg.
3. Thread in the neck of acetylene cylinders W30,3 GOST 9909.

2.2. Design and Function

2.2.1. The Products are intended for storage and transportation of compressed and liquified gases.

2.2.2. The Products are made from pipes (or cylinder workpiece), ultrasonic testing of continuity of metal.

2.2.3. Thread of the neck is made according to GOST 9909 with outer diameter of the thread in the base plane:

- for cylinders of small capacity -19.2 mm;
- for cylinders of medium capacity – 27.8 mm;
- for acetylene cylinders– 30.3 mm.

2.2.4. Assigned life - 40 years.

2.3. Marking.

2.3.1. In accordance with item 29 TR CU 032/2013 the marking for the Product identification shall contain:

a) description and (or) designation of the Product;

b) parameters and properties which influence safety;

c) description of the materials from which the Product is made;

d) manufacturer trade mark;

e) serial number;

f) date of manufacture.

2.3.2. Outer surface of the cylinder shall be painted in accordance with table 2.2. (Appendix 3 to TR CU 032/2013):

Table 2.2. – Painting and marking of the cylinders

Gas	Color of painting	Text	Text color	Strip color
Acetylene	White	Acetylene	Red	-
Butylene	Red	Butylene	Yellow	Black
Oil gas	Gray	Oil gas	Red	-
Butane	Red	Butane	White	-
Hydrogen	Dark green	Hydrogen	Red	-
Cyclopropane	Orange	Cyclopropane	Black	-
Ethylene	Violet	Ethylene	Red	-
All other flammable gases	Red	Name of gas	White	-

3. PUTTING INTO OPERATION

3.1. Putting of the Products into operation shall be conducted by the personnel who are properly trained and instructed in accordance with the Federal norms and rules in the area of industrial safety "Industrial safety rules at hazardous industrial objects where equipment operating under excess pressure is used".

3.2. The cylinders are delivered without valves. Materials for the valve bodies depending on the gas to be filled and the threading direction of the side union are stated in Table 3.1.:

Table 3.1. – Materials of valve body of cylinders and thread direction of side union

Gas	Valve body material	Thread direction of side union
Butane	Brass or steel	Left-hand
Butylene	Brass	Left-hand
Hydrogen	Brass	Left-hand
Methane	Brass	Left-hand
Propane and other flammable gases	Steel or brass	Left-hand
Ethylene	Brass	Left-hand

Side unios of the valves shall be fitted with plugs.

3.3. Prior to screwing in of the cylinder valve one shall remove metal chips and descale the inner surface of the cylinder. Thin solid oxide layer which may appear after normalization and standalone spots caused by the cylinder cleaning mode are allowed.

Prior to screwing in of the cylinder valves the cylinders for hydrogen shall be degreased at the filling stations.

The organization engaged in filling of the cylinders with porous mass shall perform pneumatic test for cylinders for dissolved acetylene.

3.4. Cylinders for dissolved acetylene shall be filled with the required volume of porous mass and solvent.

The organization engaged in filling of the cylinders with porous mass is responsible for the quality of the porous mass and correctness of the filling procedure. The organization engaged in filling of the cylinders with solvent shall be responsible for the quality of solvent and correctness of the filling procedure.

After filling of the cylinders with porous mass and solvent the weight of the tare (weight of the cylinder without cap, however, with porous mass and solvent, shoe, ring and cylinder valve) is stamped on the neck.

3.5. Painting of the cylinders and fitting of the valves shall be made at the filling stations and testing facilities which have the permits of Rostekhnadzor in accordance with the technological instructions.

3.6. For valve installation sealing components shall be employed. There always shall be 2-5 spare threads on the valve screwed into the cylinder neck.

4. OPERATION

4.1. Operational restrictions

4.1.1. The Products are intended for storage and transportation of flammable and explosive gases taking into account the following restrictions (Table 4.1.):

Table 4.1. – Function of steel seamless cylinders

Designation of the normative document	Operational restrictions
GOST 949-73	Storage and transportation of compressed, liquified and dissolved gases with working pressure 19.6 MPa (200 kgs/cm2) at temperatures from minus 50 to plus 60 °C

4.1.2. Because of the diversity of applications of different gases, it is impossible to dwell upon all specific features in the present Manual. That is why one shall develop a separate workplace safety instruction for each process.

4.1.3. Compressed gases are in the gaseous state inside the cylinders at increased pressure and normal temperature, among them nitrogen, argon, oxygen, compressed air, hydrogen, methane, etc.

4.1.4. Liquified gases are inside the cylinders at increased pressure and room temperature in liquified state and in equilibrium with vapor(gas), among them chlorine/ammonia, butane, propane, carbon dioxide, different freons, etc.

4.1.5. Dissolved gases are such gases which are inside the cylinders in the dissolved state; one of such gases is acetylene.

4.1.6. Compressed liquified and dissolved gases are divided into the following main groups:

a) flammable and explosive

b) inert and non-combustible,

c) those which sustain combustion,

dr) poison gases.

Each group of gases demonstrates different degrees of toxicity and hazard. That is why it is important to know their properties and to have skills for handling the cylinders intended for storage, transportation and distribution.

4.1.7. To satisfy the requirements of GOST 949-73 storage of cylinders shall be executed in compliance with conditions specified for group Zh2 GOST 15150.

In the course of storage of cylinders without inhibitor one shall create the conditions which prevent the cylinder surface from dirt, corrosion, other damage, which deteriorate quality and safety of the cylinders.

Period of validity of protective volatile corrosion inhibitor is not more than three months.

4.2. Safety requirements in operation

4.2. 1. The Products shall be operated in accordance with the provisions of the respective instruction, approved according to the stated order.

Failure of the valve, pressure reducer and pressure gauge are considered critical failures, which may lead to dangerous situations.

4.2.2. The personnel working with the cylinders shall be properly trained and instructed as specified by the Federal norms and rules in the area of industrial safety "Industrial safety rules at hazardous industrial objects where equipment operating under excess pressure is used".

4.2.3. Storage and transportation of gas cylinders shall be conducted by the assigned organizations in accordance with the provisions of the respective instructions, approved according to the stated order.

According to GOST19433-88 cylinders with gas are considered hazardous cargo of class 2, subclass 2.3 -flammable (combustible) gases.

4.2.4. Cylinders without valves delivered by the limited liability company «Ural Gas and Fire Fighting Equipment Factory» are not considered hazardous cargo.

4.2.5. The cylinders shall be stored in the premises of the category not lower than the category 2 according to GOST 15150.

4.2.6. Filled and empty cylinders shall be stored in separate premises, the place of this respective storage shall be marked with special warning signs.

4.2.7. In the course of storage, it is strictly prohibited to:

- store combustible and easily flammable substances in the place of the cylinder storage;
- permit contact of cylinders with electric cables;
- store cylinders in the basement or attic.

4.2.8. When loading and unloading gas cylinders it is prohibited to:

- work alone (at least 2 persons shall take part in the operations);
- work in the oiled clothes, gauntlets with traces of oil and fat;
- carry cylinders in the hands or on the shoulders;
- roll cylinders along the ground;
- throw cylinders and handle in the manner that they clash against each other;
- hand in or hold cylinders with the valve upside down;
- load and unload cylinders without protective caps or plugs.

4.2.9. When transporting cylinders without valves the neck shall be tightly closed with plastic plugs.

4.2.10. When transporting cylinders with gas one shall use protective caps.

4.2.11. Transportation of cylinders by truck, railway or by air shall be conducted in accordance with the regulations of the respective transportation company.

4.2.12. Cylinders with gas placed inside the premises shall be located at the distance of at least 1 meter form the heating radiator and not less than 5 meters from the open fire source.

4.2.13. It is prohibited to use fully all gas in a cylinder. Residual pressure of gas in a cylinder shall be not less than 0.05 MPa(0,5 kgs/cm^2).

4.2.14. For escape of gas from the Products into the reservoirs with less working pressure one shall use pressure reducer intended for the said gas and painted in the respective color.

Low -pressure chamber of the reducer shall have pressure gauge and spring safety valve, set for the respective permissible pressure in the reservoir into which gas is carried over.

4.2.15. If it is impossible to release gas from the Products directly at the site due to the cylinder valve failure, the Products shall be returned to the filling station. Release of gas from such cylinders at the filling stations shall be made in accordance with the respective instruction approved according to the stated order.

4.2.16. It is not allowed to place the Products in operation if the pressure reducer has got the following defects:

- gas is not delivered to the work chamber when the adjusting screw is fully unscrewed;
- thread of the captive nut is damaged;
- failure of one or two pressure gauges;
- after gas delivery pressure in the work chamber has increased;
- failure of the safety valve.

4.2.17. It is not allowed to place the Products in operation if the pressure gauge has got the following defects:

- if there is no verification mark on calibration;
- validity of verification has expired;
- gauge pointer does not return to zero by value exceeding half of the allowable error, when the pressure gauge is switched off;
- the glass is broken or there are other defects which may influence correctness of the readings.

4.2.18. It is not allowed to place the Products in operation if the valve has got the following defects:

- there is no plug on the union;
- there are traces of oil, fat, dust;
- the handwheel does not rotate;
- gas leakage is noted.

4.2.19. IT IS PROHIBITED TO:

- remove the protective cap from the Product or open the valve using chisel, hammer or other spark-forming tool;
- disassemble the valve or pressure reducer by its own with the purpose of repair;
- leave the cylinder valve in the open state after completion of works.

4.2.20. **THE FOLLOWING IS PROHIBITED:** any unauthorized alterations of design of the Products not approved by the manufacture, which may result in safety problems for the personnel.

4.2.21. In case of leakage of combustible gases from cylinders an explosive mixture of gas and air may be created, and only a small amount of energy is needed for this mixture to explode. The explosion may result in causing severe injuries, death of people and building destruction. Leakage of poison gases from the cylinders in poorly ventilated premises may result in intoxication of the occupants.

4.2.22. Compliance to safety requirements of GOST R 51673-2000 shall be ensured when dealing with gaseous pure hydrogen and of GOST 3022-80 when dealing with technical hydrogen.

4.2.22.1. Hydrogen is colorless combustible gas without odor. Density of hydrogen in normal conditions is 0.0899 kg/m^3, density relative to air – 0.0695.

Hydrogen is physiologically inert gas, at high concentrations it causes suffocation, is not corrosion active, diffuses via heated metals, and dissolves in them, at normal conditions shows low chemical activity, thermal stability. Chemical activity of hydrogen increases with the temperature rise, in case of exposure to UV and radioactive radiation.

4.2.22.2. Hydrogen is explosive and flammable when combined with air and oxygen which is explained by the low value of the minimum ignition energy of the oxygen-air mixture (0.017 mJ), high value of minimum combustion heat (121000 kJ/kg) and wide range of burning and detonation.

Concentration limits of flame propagation for hydrogen-air mixture- 4.12 % - 75 % vol., for hydrogen-oxygen mixture – 4.1 % - 96 % vol.

Self-ignition temperature of hydrogen-air mixture – 510°C.

Mixtures of hydrogen with air belong to the explosive hazard category IIC, group T1 according to GOST R 51330.11-99; GOST R 51330.19-99.

4.2.22.3. Fire and explosion hazard indicators of hydrogen are specified in GOST12.1.044-89.

4.2.22.4. Explosion safety of the production processes including transportation and storage shall comply to GOST 12.1.010-76.

4.2.22.5. Fire safety of production, processing, storage and transportation shall comply to GOST 12.1.004-91.

4.2.22.6. Electric safety of production processes shall comply to GOST R 12.1.019-2009.

4.2.22.7. Fire and explosion safety of static electricity shall comply to GOST ГОСТ 12.1.018-93.

4.2.22.8. Means of protection from static electricity shall comply to GOST 12.4.124-83.

4.2.23. Safety requirements when handling dissolved and gaseous acetylene shall comply to GOST 5457-75:

4.2.23.1. Acetylene is an explosive gas. It creates explosive mixture in combination with air with low concentration ignition limit at atmospheric pressure, corrected to 25°C, - 2.5 % (by volume) according to GOST 12.1.004-91.

Self-ignition temperature of acetylene is 335°C.

4.2.23.2. In terms of explosive hazard classification acetylene relates to category and group IIC-T2 according to GOST R 51330.11-99; GOST R 51330.19-99.

4.2.23.3. Content of acetylene in the work area air shall be monitored by the continuous automatic devices, which provide indication on exceedance occurred with respect to permissible explosion safe acetylene concentration in the air and use of the indicator pipes on a regular basis – according to GOST 12.1.014-84.

4.2.23.4. In terms of fire safety production of acetylene belongs to category A, in terms of explosive hazardous zones – to classes B1; B1a; B1б; B1г.

4.2.23.5. Acetylene production premises shall be equipped with the incoming and exhaust ventilation.

4.2.23.6. All works connected with production and use of acetylene shall be performed in accordance with safety regulations approved by Rostekhnadzor.

4.2.23.7. One shall use compressed nitrogen, carbon dioxide fire extinguishers, asbestos cloth, sand as extinguishing media in case of fire.

4.2.24. Safety requirements when handling liquified hydrocarbon gases as specified in GOST R 51104-97, liquified hydrocarbon gases as specified in GOST 21443-75, liquified hydrocarbon fuel gases as specified in GOST R 52087-2003:

4.2.24.1. Liquified gases are flammable and explosive, demonstrate low toxicity and have specific odor. In terms of the health effects the gases belong to IV hazard class according to GOST 12.1.007.

4.2.24.2. Liquified gases create explosive mixtures with air at concentration of propane 2.1 – 9.5 %, of normal butane from 1.5 to 8.5 % (by volume) at pressure 98066 Pa (1 atm) and temperature 15-20°C.

To control formation of explosive concentrations in the production premises one shall use the indicators conforming to general technical requirements as per GOST 27540-87 and operating level 20% from the lower explosion limit.

4.2.24.3. Self-ignition temperature of propane in air at pressure 0.1MPa (760 mm Hg) is 466°C, normal butane – 405°C, isobutane - 462°C.

4.2.24.4. Maximum permissible concentration in the working zone area (in terms of carbon) of saturated hydrocarbons (propane, normal butane) 300 mg/m^3.

4.2.24.5. Liquified gases may demonstrate the properties which are dangerous for humans, particularly:

- products of poor combustion are toxic;
- if oxygen content is lower than the permissible value - asphyxiating effect on humans;
- severe frostbite injury caused by the liquid phase.

4.2.24.6. First aid measures:

- in case of intoxication - fresh air (oxygen), warming, smelling ammonia swab, hot drink, if required – artificial respiration;

- if found on the clothes it should be brushed off;
- in case of frostbite injury first aid measures are similar to those taken in case of burns i.e. flushing with plenty of water and putting nourishing cream or paste on the affected areas of skin.

In the course of work with liquified gases one shall put on goggles with the side shielding since contact of drops with eyes may result in vision loss.

4.2.24.7. Personal protection means shall be used in accordance with the safety regulations employed in the gas-handling facility and approved according to the stated order.

4.2.24.8. At high concentrations of the liquified gases one shall use airline insulating pressure demand respirator. At small concentrations one shall use filtering protective respirator, model A (brown box), model BKF (Khaki box).

4.2.24.9. In the industrial premises one shall observe the requirements of health and safety standards according to GOST 12.1.005. All premises with explosive environment shall be equipped with the incoming and exhaust ventilation providing for the tenfold air exchange per one hour and cleanness of air of the working zone in the industrial premises.

4.2.24.10. To control content of hydrocarbons in the industrial premises (in the air of the working zone area) one shall use IVP, STT-2U, STT- 4M analyzers or automatic protection systems and signaling systems of the «AZIZ» or «Logika» types.

4.2.24.11. In the premises where liquified gases are produced, stored or conveyed it is prohibited to use open fire sources, artificial lighting shall be of the explosion-proof design, all works shall be performed with the tools which does not form sparks on impact.

Protection of equipment from secondary effects of lightning and static electricity shall comply with the rules of protection from static electricity, which are employed in the chemical, petrochemical, oil processing industries.

4.2.24.12. In case of fire on shall use the following extinguishing media: carbon dioxide fire extinguishers, powder extinguishers, water spray extinguishers, foam extinguishers; water vapors, nitrogen and other inert gases, carbon dioxide fire extinguishers, diffused and compact water jets, asbestos cloth, dry sand.

4.2.25. Safety requirements when handling natural flammable gases for industrial and domestic use are specified in GOST 5542-87:

4.2.25.1. In terms of toxicological characterization natural flammable gases belong to hazard class IV according to GOST 12.1.007-76.

4.2.25.2. Natural flammable gases belong to the group of substances which are able to form explosive mixtures with air.

Concentration ignition limit (by methane) in the mixture with air (volume percent): lower limit – 5, upper limit – 15, for the specified composition of the natural gas the concentration limits shall be determined according to GOST 12.1.044- 89.

Category of explosive mixture 11A-T1.

4.2.25.3. Maximum permissible concentration of hydrocarbons in natural gas in the air of working zone is 300 mg/m^3 in carbon equivalent (GOST 12.1.005-88).

Maximum permissible concentration of hydrogen sulfide in the working zone 10 mg/m^3, of hydrogen sulfide in the mixture with hydrocarbons C1-C5-3 mg/m^3.

4.2.26. Execution by the personnel of the requirements stated in the present clause provide for reduction of the residual risks to a minimum as it was proved by the similar products, sufficient safety has been validated by the operation experience, however, this does not fully eliminate the existing dangers.

4.3. Actions in emergencies

4.3.1. The list of possible accidents and emergencies, actions of the employees in case of such emergencies, first aid measures shall be specified in the regulations and rules on labor safety approved according to the stated order.

4.3.2. Emergency response plan in case of leakage:

- find the leaking cylinder;

- take off safety valve from the cylinder using the wrench and give the cylinder valve a screw if gas continues to escape, bring the cylinder to a safety place and bleed gas off into atmosphere.

- it is prohibited to use open fire to determine the leak.

4.3.3. Actions in case of spontaneous heating of the cylinder with acetylene:

- take out the cylinder into the fresh air, disconnect the hose from the pressure reducer;
- fully open the cylinder valve and the reducer valve;
- put water onto the cylinder till its complete cooling;
- send the defective cylinder to the manufacturer.

4.3.4. If there appears external or inner heating (ignition) source, which may cause explosion of the cylinder one shall immediately remove the cylinders to the other place. If it is impossible to remove the cylinders from the dangerous zone one shall cool the cylinders with water till their complete cooling.

4.3.5. In case of any accident the injured or eyewitness shall notify the shift supervisor or foreman, who shall be in charge of organization of the first and immediate assistance to the injured person, particularly, provide for fresh air, comfort, warming, clean clothes. In case of contact with eyes or skin -wash with warm water, in case of burn- place an aseptic bandage. If required call an ambulance.

5. CYLINDER DAMAGE EVALUATION

5.1. Technical evaluation of the cylinders shall be performed by the filling stations or testing stations which have respective permits issued by Rostekhnadzor.

Regularity of the technical evaluation of the cylinders filled with gases causing degradation and physical-chemical changes of the materials:

- at the rate of not more than 0.1mm per year - 5 years;
- at the rate of more than 0.1 mm per year - 2 years.

The year of the cylinder damage evaluation shall be indicated in the cylinder marking.

5.2. Technical evaluation shall be conducted in accordance with the instruction on cylinder damage evaluation.

Cylinder damage evaluation, as a rule, includes the following (excepting cylinders for acetylene):

- examination of inner and outer surface of the cylinders;
- control of the mass and capacity of the cylinders;
- hydraulic test.

The instruction shall specify the safety measures, which shall be observed in the course of testing of the cylinders.

The attending personnel may be affected by the following industrial hazardous factors:

- non-fenced moving or rotating parts of equipment;
- damage of the hydro-system or of the cylinder being tested.

5.3. Damage evaluation of the cylinders for acetylene shall be conducted at the filling stations at least once in five years and comprise:

- examination of outer surface;
- examination of porous mass;
- pneumatic test.

5.4. State of the porous mass in the cylinders for acetylene shall be checked ta the filling stations at least once in 24 months.

If the state of the porous mass is evaluated as satisfactory each cylinder shall have the following marking:

- year and month of examination of porous mass;
- seal of the filling station;
- seal of diameter 12 mm bearing letters « PM» («ПМ»), certifying examination of the porous mass.

5.5. Cylinders shall be considered defective if in the process of evaluation at least one of the limiting state criterions is found out.

5.5.1. Cracks, slivers, dents, bulges, blowholes and scratch marks with depth over 10% of minimum wall thickness, tears and chipping on the inner and outer surface of the cylinder;

5.5.2. Wear of the thread of the neck exceeds the normative values set by the calibers for tolerance monitoring;

5.5.3. Leakage and seepage during hydraulic testing;

5.5.4. Some data in the marking are missing.

5.6. Defected cylinders irrespective of their purpose shall be rendered useless in the manner which rules out their further use (by making notches and cuts on the thread of the neck or drilling holes in the body).

5.7. It is not allowed to repair or rearrange the cylinder body, excepting the use of special threading tap of the thread of the cylinder neck.

Loosening of the ring on the neck of the cylinder may not serve the reason for rejection of the latter. In this case the cylinder may be allowed to pass evaluation after fixation of the ring or replacement by a new one.

If the cylinders with the shoe put on loosely or in the slanting position are found out, such cylinders are not allowed to pass evaluation until the shoe is refitted.

5.8. Technical maintenance of the cylinder valve, pressure reducer, pressure gauges shall be conducted in accordance with the Operation Manual.

6. DISPOSAL

6.1. Prior to utilization the cylinders shall be rendered useless according to item 5.6 of the present Manual.

6.2. The disposed scrap is assigned to a legal entity or businessman engaged in respective activity. The procedure of handling and disposal of ferrous metal scrap is specified in the «Regulations of handling scrap and waste of ferrous metals and their disposal», approved by resolution of the Government of RF No.369 dd.11.05.2001.

6.3. Companies, organizations and businesses engaged in storing up, processing, melting down, otherwise dealing with secondary ferrous metals, and shipping out, transshipping them in the ports and other places shall check all secondary ferrous metals for explosive safety and remove all components containing any explosive or flammable substances.

6.4. The products disposed as scrap shall be free from remaining fuels and lubricants (in winter time from ice and snow), and available for inspection of inner surface.

7. NORMATIVE DOCUMENTATION

GOST R 12.1.019-2009 Occupational safety standards system. Electrical safety. General requirements and nomenclature of types of protection.

GOST R 51104-97 Exported liquified hydrocarbon gases from Russian region. Specifications

GOST R 51673-2000 Gaseous pure hydrogen. Specifications.

GOST R 51330.11-99 Explosion -protected electrical apparatus. Part 12. Classification of mixtures of gases or vapours with air according to their maximum experimental safe gaps and minimum igniting currents

GOST R 51330.19-99 Explosion- protected electrical apparatus. Part 20. Data for flammable gases and vapours, relating to use of electrical apparatus.

GOST R 52087-2003 Liquified hydrocarbon fuel gases. Specifications.

GOST 12.1.004-91 Occupational safety standards system. Fire safety. General requirements.

GOST 12.1.005-88 Occupational safety standards system. General sanitary requirements for working zone air.

GOST 12.1.007-76 Occupational safety standards system. Noxious substances.

Classification and general safety requirements.

GOST 12.1.010-76 Occupational safety standards system. Explosion safety.
General requirements РЭ 00186619-038-2014.

GOST 12.1.014-84 Occupational safety standards system. Working zone air
Methods of measuring unhealthy matter concentrations using indicator tubes.

GOST 12.1.018-93 Occupational safety standards system. Fire and explosion safety of static electricity. General requirements.

GOST 12.1.044-89 Occupational safety standards system.

Fire and explosion hazard of substances and materials. Nomenclature of indices and methods of their determination

GOST 12.4.124-83 Occupational safety standards system. Static electricity protection means. General specifications.

GOST 949-73 Small and medium volume steel cylinders for gases for <19,6 MPa (200 kgs/cm2). Specifications

GOST 3022-80 Hydrogen for industrial use. Specifications.

GOST 5542-87 Natural flammable gases for industrial and domestic use. Specifications.

GOST 5457-75 Dissolved and gaseous acetylene for technical purposes. Specifications.

GOST 9909-81 Basic norms on interchangeability Taper screw thread of valves and gas cylinders.

GOST 21443-75 Liquified hydrocarbon gases for export. Specifications.

GOST 27540-87 Thermochemical signaling devices of combustible gases and vapours. General specifications.

GOST 15150-69 Machines, instruments and other industrial products. Modifications for different climatic regions. Categories, operating, storage and transportation conditions as to environment climatic aspects influence.

Federal norms and regulations in the area of industrial safety
«Regulations on industrial safety of hazardous industrial objects, at which equipment operating under excessive pressure is used».