



شرکت ملی گاز ایران

مدیریت پژوهش و فناوری

امور تدوین استانداردها

IGS

Iranian Gas Standards

مشخصات فنی خرید

تری اتیلن گلیکول برای استفاده در واحد نم زدایی پالایشگاه گاز

Triethylene Glycol (TEG) as a Dehydration Agent in Natural Gas Treating Plant



شرکت ملی گاز ایران

دفتر مدیر عامل

تاریخ: ۱۳۹۰/۹/۲۳

شماره: ک/۰ دب/۰-۳۸۹/۱۵۹۸۷

ابلاغ مصوبه هیأت مدیره

مدیر محترم پژوهش و فناوری و رئیس شورای استاندارد

باسلام،

به استحضار می‌رساند در جلسه ۱۴۷۳ مورخ ۱۳۹۰/۸/۸ هیأت مدیره، نامه شماره

۱۰۴۱۲۵/۰۰۰/۹۵ مورخ ۹۰/۷/۳۰ آن مدیریت در مورد تصویب نهایی استاندارد تحت عناوین ذیل

مطرح و مورد تصویب قرار گرفت:

۱- تری اتیلن گلایکول برای نم زدایی پالایشگاه گاز IGS-M-CH-049(0)

۲- بررسی دوره ای کیفیت روغن کمپرسورهای هوا IGS-C-CH-045-2(0)

این مصوبه در حکم مصوبه مجمع عمومی شرکتهای تابعه محسوب و برای کلیه شرکتهای

تابعه لازم الاجراء می‌باشد.

ناصر آنگون

دبیر هیأت مدیره

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FOREWORD

This standard is intended to be mainly used by NIGC and contractors and has been prepared on interpretation recognized standards, technical documents, knowledge, backgrounds and experiences in gas industries at national and international levels.

Iranian gas standards (IGS) are prepared, reviewed and amended by technical standard committees within NIGC Standardization division and submitted to the NIGC's "STANDARDS COUNCIL" for approval.

IGS Standards are subject to revision, amendment or withdrawal, if required, thus the latest edition of IGS shall be checked/inquired by NIGC users.

This standard must not be modified or altered by the end users within NIGC and her contractors. Any deviation from normative references and / or well known manufacturers specifications must be reported to Standardization division.

Any comments from concerned parties on NIGC distributed IGS are welcome to technical standards committees and will receive serious attention and consideration should a revision to standards is recommended .

GENERAL DEFINITIONS:

Throughout this standard the following definitions, where applicable, should be followed:

- 1- "STANDARDIZATION DIV." has been organized to deal with all aspects of industrial standards in NIGC. Therefore, all queries for clarification or amendments are requested to be directed to mentioned div.
- 2- "COMPANY": refers to national Iranian gas company.
- 3- "SUPPLIER": refers to a firm who will supply the service, equipment or material to IGS specification whether as the prime producer or manufacturer or a trading firm.
- 4- "SHALL ": is used where a provision is mandatory.
- 5- "SHOULD": is used where a provision is advised only.
- 6- "MAY": is used where a provision is completely discretionary.

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1. SCOPE

This standard specification covers the minimum requirements for triethylene glycol (TEG) for dehydration in natural gas treating plant . This standard specification provides purity , properties , safety and test methods .

2. REFERENCES

Throughout this standard specification the following standards are referred to . The editions of these standards that are in effect at the time of issues of this standard specification (2011) shall , to the extent specified herein , form part of this standard specification . The applicability of changes in standards that occur after the date of this standard specification shall be mutually agreed upon by the purchaser and the supplier .

ASTM D 92 (2005) "Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester"

ASTM D 93 (2007) "Standard Test Methods for Flash-Point by Pensky-Martens Closed Cup Tester"

ASTM D 445 (2006) "Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids and Calculation of Dynamic Viscosity"

ASTM D 482 (2003) "Standard Test Method for Ash from Petroleum Products"

ASTM D 1015 (2005) "Standard Test Method for Freezing Points of High-Purity Hydrocarbons"

ASTM D 1078 (2005) "Standard Test Method for Distillation Range of Volatile Organic Liquids"

ASTM D 1209 (2005) "Standard Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)"

ASTM D 1613 (2006) "Standard Test Method for Acidity in Volatile Solvents and Chemical Intermediates Used in Paint , Varnish , Lacquer , and Related Products"

ASTM D 1747 (2004) "Standard Test Method for Refractive Index of Viscous Materials"

ASTM D 2766 (2005) "Standard Test Method for Specific Heat of Liquids and Solids"

ASTM D 4052 (2002) "Standard Test Method for Density and Relative Density of Liquids by Digital Density Meter"

ASTM E 202 (2005) "Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols"

ASTM E 203 (2001) "Standard Test Method for Water Using Volumetric Karl Fischer Titration"

ASTM E 300 (2003) "Standard Practice for Sampling Industrial Chemicals"

ASTM E 394 (2004) "Standard Test Method for Iron in Trace Quantities Using the 1,10-Phenanthroline Method"

BS 6829 Sec. 1.6 (1991) "Analysis of Surface Active Agents (Raw Materials) Part 1: General Methods Section 1.6 : Method for Determination of Solubility in Water"

ISO 9001 (2008) "Quality System – Model for Quality Assurance in Design , Development , Production , Installation and Servicing"

3. DEFINITION

Triethylene Glycol (TEG)

Triethylene glycol (TEG) is an organic compound described by the structural formula $\text{HOCH}_2\text{CH}_2(\text{OCH}_2\text{CH}_2)_2\text{OH}$. It is a clear , colorless , viscous , hygroscopic , stable and odorless liquid . It is miscible with water in any proportion and polar organic solvents such as alcohols and ethers . Because it is an efficient hygroscopic agent it serves as a liquid desiccant for removing water from natural gas .

4. REQUIREMENTS

4.1 Purity

The composition of triethylene glycol shall be in accordance with Table 1 when tested in accordance with specified test methods .

4.2 Sampling

The sampling shall be carried out in accordance with ASTM E 300 .

4.3 Properties

The physical properties of triethylene glycol (TEG) shall be in accordance with Table 2 when tested in accordance with specified test methods .

Table 1 – Purity

Item	Content	Unit	Requirement	Test Method
1	TEG , min	wt %	99.0	ASTM E 202
2	MEG* , max	wt %	0.5	ASTM E 202
3	DEG** , max	wt %	0.5	ASTM E 202
4	Heavy end*** , max	wt %	0.5	ASTM E 202
5	Water , max	wt %	0.1	ASTM E 203
6	Acidity as acetic acid , max	wt %	0.01	ASTM D 1613
7	Ash , max	wt %	0.01	ASTM D 482
8	Iron , max	ppm	1.0	ASTM E 394

*MEG: Monoethylene glycol

**DEG: Diethylene glycol

***like Polyethylene glycol

Table 2 – Physical Properties

Item	Characteristic	Unit	Requirement	Test Method	Type of Test *
1	Apparent specific gravity at 20°C , min	---	1.123	ASTM D 4052	Routine
2	Color , max	PT-CO	25	ASTM D 1209	Routine
3	Boiling point range , (5-95 Volume %) , 760 mmHg	°C	280-295	ASTM D 1078	Routine
4	Viscosity at 20 °C , min	cp	47.8	ASTM D 445	Routine
5	Flash point (COC)/(CC) ** , min	°C	166/176	ASTM D 92 or ASTM D 93	Type
6	Solubility in water at 20 °C	% by wt	100	BS 6829 sec. 1.6	Type
7	Refractive index at 20 °C , min	---	1.455	ASTM D 1747	Routine
8	Freezing point , max	°C	-4.3	ASTM D 1015	Routine
9	Specific heat at 20 °C , max	cal/gr °C	0.53	ASTM D 2766	Type

***Note 1** : For type test, a certificate shall be submitted from an independent laboratory .

****Note 2** : Flash point test result must be confirmed by minimum one of the test methods (Cleveland Open Cup (COC) / Closed Cup (CC)) .

5. DOCUMENTATION

The manufacturer/supplier shall provide sufficient information and shall supply the technical information as a minimum requirement as follows :

- ISO 9001 (2008) for management quality control of offered TEG for dehydration of natural gas issued by an internationally recognized body .
- Approval test report , original technical catalogues , manufacturing product data sheet and application procedure recommendation and guidelines .
- Material Safety Data Sheet (MSDS) .

Note : Disposal procedure shall be include :

- Disposal procedures for used or wasted material include recycling , incineration or disposal in landfills under local regulations permit .
- Disposal procedures for containers e.g. drums , pails and IBCs (intermediate bulk containers) include recycling , incineration or disposal in landfills under local regulations permit .
- Filled , signed and stamped data sheets stating in Annex A .

6. INSPECTION

The supplier shall be responsible for carrying out all the tests required by this standard specification , using his own or other reliable facilities , and he shall maintain complete records of all such tests and qualifications . Such records shall be available for review by the purchaser . The supplier shall furnish to the purchaser a certificate of quality stating that each batch has been sampled , tested , and qualified in accordance with this standard specification and has been found to meet the requirements specified .

The supplier shall afford the purchaser's inspector all reasonable facilities required for inspection of each batch of production in accordance with this standard specification . Such inspection in no way relieves the supplier of his responsibilities under the term of this standard specification .

The purchaser reserves the right to perform any inspections set forth in this standard specification where such inspections are deemed necessary to assure that supplies and services conform to the prescribed requirements .

The purchaser's inspector reserve the right to have access to the materials subject to inspection for the purpose of witnessing selection of the samples , preparation of the test samples and performance of the test(s) . For such tests , the inspector reserves the right to indicate the sample(s) from which the quantities will be taken in accordance with the provisions of this standard specification .

7. MARKING

7.1 Marking of Containers

Each container shall be legibly marked with at least following information :

Composition

MESC No.

Handling Guidelines

Safety Precautions

Storage Conditions

Date of Manufacture

Date of expiry

Batch No.

Order No.

Net weight

Gross weight

Name and Address of Manufacturer

HMIS (including Health , Fire , Reactivity , Personal Protection , Specified Hazard , etc.)

7.2 Precautionary Marking

All individual containers shall be marked with precautionary symbols and/or phrases .

8. PACKAGING

8.1 The triethylene glycol (TEG) shall be suitably packed in approved containers in accordance with the requirement of the contractor or order . The containers shall be clean and dry and nitrogen purging to ensure that it remains chloride , iron and ash-free. The containers shall be made of lined carbon steel or stainless steel (type 304 or 316) or polyethylene .

8.2 The containers shall be protected against all damages or defects which may occur during handling .

9. STORAGE LIFE

The Triethylene Glycol (TEG) shall meet all requirements of this standard specification at least 24 months from date of delivery at the ambient temperature below +60 °C .

ANNEX A
"Data Sheets for TEG"

Product designation	
Manufacturer's name	
Manufacturer's address	

Table A – 1. Purity

Item	Content	Unit	Value	Test Method	Remark
1	TEG				
2	MEG				
3	DEG				
4	Heavy End				
5	Water				
6	Acidity as acetic acid				
7	Ash				
8	Iron				

TABLE A – 2. Physical Properties

Item	Characteristic	Unit	Value	Test Method	Remark
1	Apparent specific gravity at 20°C				
2	Color				
3	Boiling point range , (5-95 Volume %) , 760 mmHg				
4	Viscosity at 20 °C				
5	Flash point				
6	Solubility in water at 20 °C				
7	Refractive index at 20 °C				
8	Freezing point				
9	Specific heat at 20 °C				

Notes:

1. This data sheet shall be filled , signed , and stamped by manufacturer/supplier .
2. Any deviation from this standard specification shall clearly be specified by manufacturer/supplier at following table .

DEVIATION(S)

AUTHORIZED SIGNATURE**COMPANY'S STAMP**

ANNEX B
(Informative)
"Hazardous , Safety and Potential Health Effect"

B.1 Hazardous and Safety

TEG is not considered to be a health hazard when handled normal industry condition . It has few irritating effects and has a much lower acute and chronic oral toxicity than the lighter glycols . TEG is also safer at high temperature as it is less flammable . Flash point and ignition temperatures of TEG are 176 and 371 °C respectively .

B.2 Potential Health Effect

Eye contact with TEG may cause slight temporary irritation and after contact eye shall be flushed with water for thoroughly several minutes . Skin contact for prolonged contact may cause skin irritation with local redness . After contact immediately skin shall be flushed with water while removing contaminated clothing and shoes . At room temperature , expose to vapor is minimal due to low volatility , but mist may cause irritation of nose and throat . After inhalation , person shall be moved to fresh air area and if effects occur , consult with a physician . Small amounts swallowed TEG incidentally as a result of handling operations are not likely to cause injury , however , swallowing larger amounts may cause injury . After ingestion do not induce vomiting and seek medical attention immediately and if person is fully conscious give 1 cup or 8 ounces (240 ml) of water .

B.3 Environmental Information

Triethylene glycol is practically nontoxic to aquatic organisms on an acute basis . It is likely the atmospheric triethylene glycol concentrations are low since triethylene glycol is expected to undergo photo degradation with a short half-life . Concentrations in water and soil are also likely to be low since triethylene glycol has high soil mobility and biodegrades readily .

B.3.1 Environmental releases

Triethylene glycol production or the variety of uses for triethylene glycol and triethylene glycol-containing products could result in the release of triethylene glycol to the environment through various waste streams . In the event of a spill , the focus is on containing the spill to prevent contamination of soil and surface or ground water . For small spills , absorb triethylene glycol with materials such as dirt , sand , sawdust , vermiculite , or equivalent filler .

B.3.2 Large release

For large spills , dike the area . Pump recovered material into suitable and properly labeled containers and dispose of containers in compliance with all governmental requirements . Keep unnecessary personnel and all wildlife from entering area . Use appropriate safety equipment . Follow emergency procedures carefully .