

APPROVED



National Iranian Gas Co.

مدیریت پژوهش و فناوری

Research and Technology Management

امور تدوین استانداردها

Standardization Division

IGS

Iranian Gas Standards

مشخصات فنی خرید

روغن توربین

Turbine Lubricating Oil



شرکت ملی گاز ایران



دفتر مدیر عامل

تاریخ: ۱۳۸۷/۴/۲۳

شماره: م.ا.دب.ا. ۰/۲۰۰-۱۴۸۰۷

رسید

ابلاغ مصوبه هیأت مدیره

به: مدیر محترم پژوهش و فناوری

از: دبیر جلسات هیأت مدیره

باسلام،

باستحضار میرساند در جلسه ۱۳۲۲ مورخ ۱۳/۳/۱۳۸۷ هیأت مدیره، نامه شماره گ ۲۳۱۸۱/۰۰۰/۹ مورخ ۲۵/۲/۸۷ مدیر پژوهش و فناوری در مورد تصویب نهایی استانداردهای (IGS-M-IT-001-1(0) و (IGS-C-PL-025(0) و (IGS-M-CH-043(0) ارجاعی از مدیر عامل شرکت مطرح و مورد تصویب قرار گرفت.

۱- اصل باکشی مصوبت حد ۲
۲- مصوبه آتشی در حد
لطفاً جهت اقدام لازم

پاکر
۱۳۸۷/۴/۲۸

۲)

با سلام
به استحضار
رئیس هیأت مدیره
با سلام
به استحضار
رئیس هیأت مدیره

ابراهیم رئیسی

با سلام
به استحضار
رئیس هیأت مدیره
با سلام
به استحضار
رئیس هیأت مدیره

رونوشت: مدیریت محترم عامل و قائم مقام رئیس هیأت مدیره.

اعضای محترم هیأت مدیره / مدیر محترم پالایش گاز / امور حسابرسی داخلی / روابط عمومی / امور بازرسی و پاسخگویی به شکایات.

با سلام
۱۳۸۷/۴/۲۸

پیشگفتار

- ۱- این استاندارد/دستورالعمل بمنظور استفاده اختصاصی در شرکت ملی گاز ایران و شرکتهای فرعی وابسته تهیه شده است.
- ۲- شرکت ملی گاز ایران در مورد نیازهای عمومی از استانداردهای وزارت نفت (IPS) و در مورد نیازهای اختصاصی از استانداردهای اختصاصی خود (IGS) استفاده می نماید.
- ۳- استانداردهای شرکت ملی گاز ایران (IGS) توسط کمیته های تخصصی استاندارد متشکل از کارشناسان بخش های مختلف و یا مشاور تهیه می شود و توسط شورای استاندارد (منتخب هیئت مدیره شرکت ملی گاز ایران) به تصویب میرسند.
- ۴- در تنظیم متن استانداردهای (IGS) از کلیه منابع شناخته شده استاندارد، اطلاعات فنی- تخصصی مربوط به صنایع گاز دنیا، مشخصات فنی تولیدات سازندگان معتبر جهانی و نیز از نتیجه تحقیقات و تجربیات کارشناسان و متخصصان داخلی بر حسب مورد استفاده می شود. همچنین بمنظور استفاده هرچه بیشتر از تولیدات داخلی قابلیت های سازندگان داخلی نیز مورد توجه قرار میگیرد.
- ۵- استانداردها از طریق پایگاه اینترنتی شرکت * و یالوح فشرده (CD) در اختیار واحدها و کاربران قرار می گیرد .
- ۶- استانداردها بطور متوسط هر ۵ سال یکبار و یادر صورت ضرورت زودتر، مورد بازنگری و بروزرسانی قرار میگیرند. بنابراین کاربران باید همیشه آخرین نگارش را مورد استفاده قرار دهند.
- ۷- هرگونه نظر و یا پیشنهاد اصلاح در مورد استانداردها مورد استقبال و بررسی قرار خواهد گرفت و در صورت تأیید، استاندارد مربوطه نیز مورد تجدیدنظر قرار خواهد گرفت .

تعاریف عمومی

در متن استانداردهای (IGS) از تعاریف و اصطلاحات زیر استفاده میشود.

- ۱- "شرکت" (COMPANY): منظور از شرکت "شرکت ملی گاز ایران" و یا شرکتهای فرعی وابسته میباشد.
- ۲- "فروشنده" (SUPPLIER/VENDOR): به فرد یا موسسه ای اطلاق میگردد که تعهدی رانسبت به شرکت تقبل نموده است.
- ۳- "خریدار" (PURCHASER): منظور از خریدار "شرکت ملی گاز ایران" و یا شرکتهای فرعی وابسته میباشد.
- ۴- "SHALL": در مواردی بکاربرده میشود که انجام مورد نظر اجباری است
- ۵- "SHOULD": در مواردی بکاربرده میشود که انجام خواسته مورد نظر ترجیحی و درعین حال اختیاری است
- ۶- "MAY": در مواردی بکاربرده میشود که انجام کار به شکل مورد بحث نیز قابل قبول میباشد

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- "SUPLIER" : 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 .

Website : <http://igs.nigc.ir>

E-mail : nigc_igs@nigc.org

CONTENT

1. SCOPE	1
2. REFERENCES	1
3. REQUIRMENTS	2
4. INSPECTION	3
5. DOCUMENTATION	4
6. PACKING	4
7. MARKING	4
8. STORAGE LIFE	4
TABLE 1- Physical , Chemical and Performance Characteristics	5
ANNEX A - THE SAMPLNIG	6
ANNEX B - OIL DETERIORATION AND ITS DETECTION	7
TABLE B.1 - Requirements for Inspection and Testing of Oil in Service	9

1. SCOPE

This standard specification covers the minimum requirements for lubricating oils used in steam and gas turbine lubrication systems in four grades of differing viscosity ranges . Oils shall be refined petroleum oils , formulated to provide rust protection and oxidation stability and may contain selective additives as needed to control foam , wear , demulsibility , etc. and as required to comply with the requirements of this standard specification .

Note 1 : This standard specification covers the minimums requirement for lubricating oils used in compressors lubricating system when oil tank is common between turbine and compressor .

Note 2 : The choice of oil and its viscosity grade should comply with the turbine/compressor manufacturer's recommendations .

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 (2007) 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 (2002) "Test Method for Flash and Fire Points by Cleveland Open Cup Tester"

ASTM D 97 (2002) "Test Method for Pour Point of Petroleum Products"

ASTM D 130 (2000) "Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test"

ASTM D 445 (2001) "Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)"

ASTM D 665A (2002) "Test Method for Rust - Preventing Characteristics of Inhibited Mineral Oil in the Presence of Water"

ASTM D 892 (2002) "Test Method for Foaming Characteristics of Lubricating Oils"

ASTM D 943 (2002) "Test Method for Oxidation Characteristics of Inhibited Mineral Oils"

ASTM D 974 (2002) "Test Method for Acid and Base Number by Color-Indicator Titration"

ASTM D 1401 (2002) "Test Method for Water Separability of Petroleum Oils and Synthetic Fluids"

ASTM D 1500 (1998) "Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)"

ASTM D 2270 (1998) "Practice for Calculating Viscosity Index from Kinematic Viscosity at 40 and 100 °C"

ASTM D 2272 (2002) "Test Method for Oxidation Stability of Steam Turbine Oils by Rotating Pressure Vessel"

ASTM D 2273 (1997) "Test Method for Trace Sediment in Lubricating Oils"

ASTM D 2422 (2002) "Classification of Industrial Fluid Lubricants by Viscosity System"

ASTM D 3427 (2002) "Test Method for Air Release Properties of Petroleum Oils"

ASTM D 4057 (2000) "Practice for Manual Sampling of Petroleum and Petroleum Products"

ASTM D 5182 (2002) "Test Method for Evaluating the Scuffing Load Capacity of Oils (FZG Visual Method)"

ASTM D 6304 (1998) "Test Method for Determination of Water in Petroleum Products , Lubricating Oils , and Additives by Coulometric Karl Fischer Titration"

ASTM D 6595 (2000) "Test Method for Determination of Wear Metals and Contaminates in Used Lubricating Oils or Used Hydraulic Fluids by Rotating Disc Electrode Atomic Emission Spectrometry "

3. REQUIREMENTS

3.1 Characteristics

Oils shall be in accordance with the limiting requirements given in Table 1 when tested in accordance with the specified test methods .

3.2 Sampling

The sampling shall be carried out in accordance with ASTM D 4057 .

Note : The general precautions are mentioned in Annex A .

3.3 Appearance

The appearance of the oil shall be clear bright , and free from visible foreign matter like water , suspended matter , dirt and sediment , when the oil is examined with transmitted light through a thickness of approximately 100 mm and at ambient temperature .

3.4 Interchangeability

Interchangeability of type of used oil with another type of oil shall be approved with the turbine manufacturer .

3.5. Compatibility

The feasibility of mixing unused oils of different type , with oil in service shall not be allowable unless when compatibility of these oils approved with the turbine manufacturer or a recognized laboratory .

Note : Compatibility tests may be needed to determine the feasibility of mixing unused oils of different type and origin , with oil in service . The main characteristics of the mixture should not be less favourable than those of the worst individual oil . Reference to the oil supplier is recommended if any doubts concerning compatibility arise .

4. INSPECTION

4.1 The supplier set up and maintain such quality and inspection system to ensure the products comply with all aspects of the requirements of this standard specification .

4.2 The supplier shall be responsible for carrying out all the tests and quality assurances required by this standard specification and shall maintain complete records of all such tests and qualifications. Such records shall be available for review by the purchaser or its nominated inspector. These documents and test results shall be traceable with regard to the batch number of each lot .

4.3 The supplier shall furnish to the purchaser a certificate of quality stating that each lot has been sampled, tested, and qualified in accordance with this standard specification and has been found to meet the requirements specified .

4.4 The purchaser or its nominated inspector reserves the right to inspect a part or whole of the products during manufacturing and prior to packing and could witness any inspections and tests in accordance with this standard specification .

4.5 Purchaser's inspector reserves the right to have access to the products at any time during manufacturing.

4.6 The supplier shall provide all facilities necessary for carrying out all inspections and tests as required by this standard specification .

4.7 Random sampling proportional to the quantity of each lot and frequency of inspections and tests as required by this standard specification shall be at the discretion of the inspector .

4.8 If a sample rejected in any inspection or test, re - sample shall be carried out, in case of any rejection in new samples, all products represented by such sampling shall be rejected .

4.9 Inspection or tests that carried out by the purchaser's inspector , in no way relieves the supplier of his responsibilities and liabilities under the conditions, terms and inspection of this standard specification .

5. DOCUMENTATION

The supplier shall provide Original technical catalogues , Material Safety Data Sheet (MSDS) and application procedure recommendation and guidelines .

6. PACKING

6.1 The oil shall be suitably packed in approved containers in accordance with the requirement of the contractor or order .

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

7. MARKING

7.1 Marking of Containers

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

Name and trade mark of the supplier

Product designation (type and trade name)

IGS No.

Net weight

Handling

Storage condition

Date of manufacture

Date of expiry

Order No.

Batch No.

Supplier 's address

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

7.2 Instruction

The supplier shall provide complete sets of instruction for use and replacement of oil in service and refilling with an unused oil .

8. STORAGE LIFE

The oil shall meet the requirement of clause 3 after storage for 24 months from date of delivery, in a tightly covered container at temperature between -10 to +35 °C .

Table 1 – Physical , Chemical and Performance Characteristics

Items	Properties	Units	Limits				Test Methods
	1) Physical :						
1	_ ISO_ viscosity grade	---	32	46	68	100	ASTM D 2422
2	_ Kinematic viscosity at 40 °C min max	cSt(mm ² /s) cSt(mm ² /s)	28.8 35.2	41.4 50.6	61.2 74.8	90 110	ASTM D 445
3	_ Viscosity index , min ^a	---	90	90	90	90	ASTM D 2270
4	_ Flash point , min	°C	200	200	200	200	ASTM D 92
5	_ Pour point , max ^b	°C	-6	-6	-6	-6	ASTM D 97
6	_ Density at 15 °C , max	kg/m ³	900	900	900	900	ASTM D 1298
	2) Chemical :						
7	_ Total Acid Number , max	mg KOH/g	0.3	0.3	0.3	0.3	ASTM D 974
	3) Performance :						
8	_ Emulsion characteristics : at 54 °C , to 3 mL emulsion , max at 82 °C , to 3 mL emulsion , max	minutes minutes	30 ---	30 ---	30 ---	--- 60	ASTM D 1401
9	_ Foam characteristics : tendency/stability , Sequence I , max	mL	200/nil	200/nil	200/nil	200/nil	ASTM D 892
10	_ Air release , 50 °C , max	minutes	5	7	10	17	ASTM D 3427
11	_ Rust preventing characteristics	---	Pass	Pass	Pass	Pass	ASTM D 665A
12	_ Copper corrosion , 3 h at 100 °C , max	---	1	1	1	1	ASTM D 130
13	_ Oxidation stability : Neutralization No. 2.0 , min ^a 175 kPa drop , min	hours minutes	2000 350	2000 350	1500 175	1000 150	ASTM D 943 ASTM D 2272
14	_ Water content	ppm	Nil	Nil	Nil	Nil	ASTM D 6304
15	_ Load carrying capacity , FZG : fail stage , min	---	7	7	7	7	ASTM D 5182

Notes :

a) The mentioned limit is defined as minimum requirement and should be increased in accordance with turbine manufacturer's recommendation .

b) Regarding to low ambient temperature design in site condition this limitation should be decreased with 10 °C margin .

ANNEX A " THE SAMPLING "

In the sampling the following general precautions shall be taken :

- Preferably be carried out while the equipment is operating normally .
- Accomplish by an experienced person .
- Take sample before filtration and centrifuge .
- Not to take sample before or after make up .
- Take sample from specified places .
- Take samples preferably in dry weather and avoid any external contamination . If weather is bad , special precautions shall be taken .

Note : every precaution shall be taken when sampling not to contaminate or moisten . Outdoor sampling in rain , fog or high wind shall be permitted only if all precautions have been taken to avoid the pollution . In this special case the use of cover is necessary . Condensation shall be avoided by warming the sampling equipment so as to be above the ambient air temperature

- Ensure that the oil is at least as warm as the ambient temperature (The temperature of the oil at the time of sampling shall be recorded) .
- Use only clean dry container .
- First run off a sufficient quantity of oil to eliminate any contaminants which might have accumulated at the orifice .
- Rinse the containers with the liquid being sampled .
- Fill the containers by allowing liquid being sampled to flow against the sides of the containers , thus avoiding entraining air .
- Ensure that each container is filled at least 95% of its capacity .
- After taking the sample , ensure that the cock is correctly closed .
- Mark containers with legibly label on which is marked all the data necessary to identify the content , i.e. perfect data about the oil , the date of sampling , the place of sampling and etc. .
- Check that the label marking are correct and complete .
- During sampling , every care shall be taken to avoid contamination oil .
- Use regular program .

ANNEX B (Informative)

" OIL DETERIORATION AND ITS DETECTION "

B.1 Deterioration

Oil in service is subject to deterioration due to the conditions of use . Oil is in contact with air water and contamination that may change the characteristics of oil .

Some changes in the characteristics of oil may indicate deterioration of other materials used in the construction of the equipment . These changes may affect oil materials , and may interfere with the proper functioning of the equipment and shorten its working life .

The contaminants mentioned in the following subclauses may be found in oil in service . The presence of these contaminants or any kind of deterioration of an oil is made evident by one or more changes of the properties discussed in the following subclauses. The development of an odor , and a change in color may be a useful guide to the nature of any contamination or deterioration of the oil .

B.1.1 Air

Oil is in contact with air and therefore subject to oxidation reactions accelerated by an increase in temperature and the presence of catalysts (either metals or dissolved metallic compounds or both) , there may be a change in color , and acidic compounds are among the oxidation products formed . The viscosity may increase and the viscosity index may decrease and foam may form and , at an advanced stage of oxidation , separation of sludge may occur .

B.1.2 Water

Water may originate from the atmosphere or be produced by oxidation of the oil . Its presence is harmful , it may adversely affect the characteristics of the oil .

B.1.3 Solid particles

Insoluble contaminants , including metallic and nonmetallic materials can cause abrasive wear of bearings , pupms , and seal , faulty control functioning , plugged oil lines , and reduce filter life .

Solid particles comprise :

A _ insoluble oxidation or degradation products of oil ,

B _ solid products arising from the conditions of service of the equipment : carbon , metal , metallic oxides .

The presence of these particles may reduce the strength of the oil .

B.1.4 Oil soluble compounds

These result from oxidation of the oil itself , or from the solution in the oil of external contaminants or materials used in the construction of equipment . They can be detected and assessed by measurement of acidity .

B.1.5 The acidity

The acid products formed by the oxidation of the oil actively encourage deterioration . It is , therefore , essential to detect and monitor acidity development .

The determination of organic acidity by the measurement of neutralization value is the most convenient and direct method of assessing the chemical ageing of an oil .

A comparison of the rate of change of the neutralization value with that of any of the other characteristics of the oil gives , to some extent , an indication of the probable cause of the deterioration of the oil .

B.1.6 Volatile hydrocarbon

Small amounts of volatile hydrocarbons may be formed during the degradation of oil under the influence of either heat or other stresses , or both . Larger amounts may be an indication of a fault in the equipment . The presence of volatile hydrocarbon deterioration products may be detectable by a lowering of the flash point of the oil .

B.2 Detection

B.2.1 The detection and action to be taken is detailed in Table B.1 . The Table B.1 gives characteristics , warning limits , test methods and action required .

B.2.2 The frequency of testing and the action to be taken should be in accordance with Table B.1 .

It is advisable to consult with the turbine manufacturer and/or the oil supplier .

Table B.1 – Requirements for Inspection and Testing of Oil in Service

Items	Properties	Units	Warning Limits	Test Methods	Frequency of Test	Action	Note
1	Color ^a	---	increase 2 number over new oil	ASTM D 1500	every one months	Determine source and rectify . Determine total acid number .	If the results of each of these tests are close to warning limits , increase frequency of testing
2	Viscosity at 40 ^o C	cSt(mm ² /s)	±10% from original oil viscosity	ASTM D 445	every one months	Determine cause . If viscosity is low , determine flash point .	
3	Water content	ppm	exceed 0.05 %	ASTM D 6304	every one months	Determine source and rectify . Determine Oxidation stability	
4	Flash point	^o C	drop 25 ^o C or more compared to new oil	ASTM D 92	every one months	Determine total acid number .	
5	Total acid number	mg KOH/g	increase 0.2 over new oil	ASTM D 974	every one months	Check Oxidation stability . If Oxidation stability less than 25% of original , replace oil (consult with oil supplier) .	
6	Foam ,tendency/stability sequence 1	mL/mL	450/10	ASTM D 892	every 1000 hours	Rectify cause . Replace oil (consult with oil supplier) .	
7	Oxidation stability : (RBOT)	hours	less than 25% of original	ASTM D 2272	every 1500-2000 hours	Resample and retest . If same , replace oil (check total acid number) .	
8	Emulsion characteristics , at 54 ^o C , minutes to 3 mL emulsion	minute	30	ASTM D 1401	every 1000 hours	Replace oil (consult with oil supplier) .	
9	Rust	---	light fail	ASTM D 665A	after 20,000 hours during life of oil charge	Consult with oil supplier.	
10	Air release	minute	exceed 5-20	ASTM D 3427	every 3 months	Replace oil (consult with oil supplier) .	
11	Insolubles	vol %	exceed 0.1	ASTM D 2273	every 3 months	Centrifuge or replace oil (consult with oil supplier) .	
12	Wear metal	ppm	Concentration of two standard deviations above the mean of six or more prior results	ASTM D 6595	every 3 months	Determine source and rectify . Filter oil .	
13	Additive elements	ppm	± 25% of new oil	ASTM D 6595	every 3 months	Replace oil after consult with oil supplier .	

Note :

a) If there is a sensible color change in daily routine inspection color test shall be done regardless of the specified period .