RUSSIAN MARITIME REGISTER OF SHIPPING

Для работы поиска по словам в документе
необходимо использовать Acrobat Reader 7.0

METHODOLOGICAL RECOMMENDATIONS FOR FUEL, LUBRICATING OIL, OIL PRODUCT CARGO AND OILY WATER ANALYSES

ND No 2-039901-002-E

St. Petersburg
2010

Methodological Recommendations for Fuel, Lubricating Oil, Oil Product Cargo and Oily Water Analyses have been approved in accordance with current provisions and come into force since the date of publication.

The Methodological Recommendations are based on the review of ISO, GOST and industry standards for fuel, lubricating oil and oily water analyses of particular types to ensure the compliance of testing laboratories recognized by the Register with the requirements of Annex VI to the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78 Convention), IMO Resolutions MEPC.96(47), MEPC.107(49) and MEPC.60(33) (whichever is applicable) and other documents relating to environment pollution prevention, as well as with the requirements of the International Association of Classification Societies (IACS), Russian Maritime Register of Shipping and industry standards for assessment of technical condition of items to be surveyed, regarding compliance and submission.

The Methodological Recommendations contain a large database of information on the international and national quality control standards for ship working media which permits testing laboratories rendering services for sea transport to establish a flexible system of normative documents concerning provision of quality control of ship oil products and oily waters. The information database contains standards for products to be tested, as well as for relevant testing methods including alternative ones, thus enabling not only testing and measuring equipment manufactured lately to be used, but also that traditionally applied by the thermotechnical laboratories of shipping companies in the past, with their gradual replacement by more advanced ones.

The Methodological Recommendations are intended for testing laboratories, cargo owners, shipowners and surveyors.

ISBN 978-5-89331-128-0

CONTENTS

1 GENERAL

1.1 Methodological Recommendations for Fuel, Lubricating Oil, Oil Product Cargo and Oily Water Analyses[1] supplement the requirements of Sections 7 and 9, Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships and are used by Russian Maritime Register of Shipping[2] for recognition of the testing laboratories performing the analyses of ship fuels, lubricating oils, oil product cargo and oily waters to assess their technical competence and ability to carry out particular tests in the declared sphere of activity.

1.2 The Methodological Recommendations are intended for the testing laboratories recognized by the Register to provide the analyses of fuel oil and oily water samples in compliance with the requirements of Annexes I and VI to MARPOL 73/78, IMO Resolutions MEPC.107(49), MEPC.60(33), MEPC.96(47) and other documents concerning prevention of environment pollution from ships, as well as the requirements of the Register and industry standards in assessment of the technical condition of ship items to be surveyed with respect to the necessity of submission by ships the results of fuel, lubricating oil and oily water analyses.

To carry out analyses for determination of the bunker fuel oil quality conformance to the requirements of Annex VI to MARPOL 73/78 the shipowner submits samples taken in compliance with the requirements of Guidelines for the Sampling of Fuel Oil adopted by IMO Resolution MEPC.96(47).

1.3 The Methodological Recommendations apply to all testing laboratories, irrespective of their legal form and form of ownership, that carry out analyses of ship oil products and oily waters for the items under the Register technical supervision.

1.4 The Methodological Recommendations are aimed at the operational support of the testing laboratories network recognized by the Register and improving the organizational and methodological basis of ship oil product and oily water analyses.

The Methodological Recommendations may be applied by testing laboratories for quality management system development and preparation of documents to obtain the RS recognition.

[1] Hereafter referred to as "the Methodological Recommendations".
[2] Hereafter referred to as "the Register or RS".

2 TERMS AND DEFINITIONS

2.1 For the purpose of these Methodological Recommendations the following terms and definitions have been adopted.

Official sample is a check sample to be used for arbitrary analysis.

Arbitrary analysis is determining conformity of oil product quality to the requirements of normative documents to be carried out by an independent laboratory in case of difficulties and differences arise between the customer and the supplier in relation to quality assessment. The independent laboratory is selected by agreement between the parties concerned. Arbitrary analysis may be witnessed by the persons concerned.

Bottom sample (according to GOST 2517-85) is a point sample of the oil product taken from the bottom of the reservoir (tank of a transportation facility) with a portable metal sampler which is lowered to the bottom. The bottom sample is not included in the combined sample and is analysed separately.

Accuracy control of oil product test is a combination of organizational arrangements, means and methods of test accuracy control of relevant item under test aimed at uniformity of measurement and the required metrological characteristics of testing procedures.

Check sample is a portion of basic, point or combined sample of oil product, which is used for the analysis.

Laboratory test (analysis) is an oil product check sample quality assessment for compliance with the requirements of the normative document which is performed under laboratory conditions using standard testing methods according to the list of quality characteristics established during accreditation.

Oil product is a finished product obtained by processing oil, gas condensate, hydrocarbons and chemical raw (synthetic gasoline).

Area of recognition is a list of activities performed which is established in the scope determined by the testing laboratory during preparation for the Register survey.

Combined sample (according to GOST 2517-85) is an oil product sample made up of several point samples taken in accordance with the relevant procedure and combined in prescribed proportion.

Basic sample (according to IMO Resolution MEPC.96(47) is the representative sample of the fuel delivered to the ship collected throughout the bunkering period obtained by the sampling equipment positioned at the bunker manifold of the receiving ship.

Quality passport of oil product is the official accompanying document containing values of quality characteristics of the oil product obtained from laboratory tests performed by a competent body.

Oil product quality characteristic is a quantitative characteristic of one or more properties which determine oil product quality.

Commission analysis is the assessment of oil product quality conformance according to the established list of characteristics, grade and data given in supplier quality passport (during acceptance) or analysis log (during shipment), as well as in compliance with the requirements of the normative document on oil products.

Retained sample (according to IMO Resolution MEPC.96(47)) is a portion of basic sample which, on completion of the bunkering operations shall be retained under the ship's control.

Standard testing procedure is a test method for determination of oil products quality characteristic, as referred to in Section "Technical Requirements" of the normative document on a particular oil product grade. Where a test method is standardized, i. e. a standard of the type "Test Methods" is developed for it, the Section "Technical Requirements" includes a reference to the number of the relevant standard. Where the test method is not standardized, the Section "Technical Requirements" of the normative document on oil product contains full description of the test method with indication of its developer.

Representative sample (according to IMO Resolution MEPC.96(47)) is a fuel oil sample having its physical and chemical characteristics identical to the average characteristics of the total volume being sampled.

Point sample (according to GOST 2517-85) is a sample got by single taking. It characterizes the oil product quality in a particular area of the container unit (barrel, can/tank, etc.), or on a particular prescribed level in reservoir (transportation facility), or at a particular time during pipe sampling.

Express analysis is oil product quality assessment using express method. Results of express analysis shall not be used for presentation of claim, issuing an oil product quality passport or making an entry in the analysis log. Where it is demonstrated by the express analysis that the oil product quality is sub-standard, such data shall be checked by laboratory testing.

Express method is a test method to enable determination of an oil product quality characteristic with a predetermined probability degree and within a shorter time as compared to the standard method, and deciding on its verification under laboratory conditions.

3 ORGANIZATION OF TESTING LABORATORY ACTIVITIES

3.1 The activity of testing laboratories recognized by the Register shall be based on GOST R ISO/MEC 17025-2006 General Requirements for the Competence of Testing and Calibration Laboratories.

The laboratories shall have the area of recognition established by the Recognition Certificate of Testing Laboratory, containing lists of tested products and testing methods, as well as lists of required measuring and testing equipment.

Testing laboratories independently establish the types of products to be tested and analyses to be made which shall be introduced into the area of recognition depending on the operational conditions and testing equipment.

The activity of recognized testing laboratories shall meet the requirements of the following basic documents approved as a result of the testing laboratory survey:

.1 Regulation on Testing Laboratory;

.2 Area of Recognition;

.3 Testing Laboratory Passport containing data necessary for testing in compliance with area of recognition;

.4 Quality Manual.

Simultaneously, the management of the testing laboratory approves Instructions on the Procedure of Sampling, Testing, Issuing of Testing Results.

The Instructions specify the following:

acceptance and identification procedure for samples received by the testing laboratory as well as their storage;

assignment issuing to personnel for sample testing;

testing procedure and issuing of test results;

order in which regulations and procedures to be found in the Quality Manual of Testing Laboratory are complied with;

forms of documents: reports, requests, sample logs, summary examination results logs;

test report forms;

document filing procedure;

tested samples storage procedure;

procedure for consideration of customer claims and corrective actions carried out by the testing laboratory;

sample recycling procedure after warranty expiration.

The above listed may also be specified in any other documentation complying with Section "Document Control" of GOST 17025-2006.

Recommended area of recognition for fuel oil, lubricating oil and oily water analyses is given in Tables 3.1-1, 3.1-2, 3.1-3.

Testing laboratories determine product types to be tested and analyses to be carried out proceeding from the operational conditions and availability of testing equipment.

Table 3.1-1

Recommended area of recognition of testing laboratories concerning fuel oil

Fuel oil to be tested	Code OKP/ TN VED Code	Tests and/or determined characteristics (parameters)	Normative documents on products with determined characteristics (parameters)	Normative documents on testing methods		
				GOST	ISO	ASTM
1 Distillate fuel						
1.1 Diesel fuel	02 5131		GOST 305-82			
1.2 Low-viscous marine fuel	02 5155		TU 38.101.567			
1.3 ISO-F (DMX, DMA, DMB, DMC)			TU 38.401-58-302-2001			
1.4 ISO-F (DMX, DMA, DMB, DMC)			ISO 8217:2005			
1.5 Fuel oil for gas-turbine plants	02 5195		GOST 10433-75			
1.6 Motor fuel for medium and low speed diesel engines	02 5221		GOST 1667-68			
1.7 Marine burner oil			TU 38.101.656			
2 Residual fuel oils	02 5210					
2.1 Oil fuel. Mazut.	02 5211		GOST 10585-75			
2.2 ISO-F (RMA, RMB, RMD, RME, RMF, RMH, MK)			TU 38.401-58-302-2001			
2.3 ISO-F (RMA, RMB, RMD, RME, RMF, RMH, MK)			ISO 8217:2005			
2.4 Highly viscous marine fuel			TU 38.101-1314			
2.5 Marine fuels IFO-30, IFO-180, IFO-380	02 5213		TU 0252-014-000-443 LUKOIL oil company			
		Cetane index		27768-88	4224:2007	D4737-09a
		Density, in kg/cm^3		3900-85	3675:1998	D1298-99(2005)
				R 51069-97		D5002-99(2005)
		Kinematic viscosity, in cSt		33-2000	3104:1994	D445-09
		Closed cup flash point, in °C		6356-75		D93-09
		Pour point, in °C		20287-91		D97-09
		Cloud point, in °C		5066-91		D2500-09
		Mass fraction of sulphur, in %		R 51947-2002	14596:2007	D4294-08
		Mass fraction of water-soluble acids and alkalies, in %		6307-75		
		Acidity, in mg KON/g		5985-79		D664-09a
		Ash content, in %		1461-75	6245:2001	D482-07
		Coking ability, in %		19932-99		D189-06e2
		Mass fraction of water, in %		R 51946-2002	3733:1999	D95-05
				2477-65		
		Filtering factor		19006-73		
		Mass fraction of mechanical admixtures, in %		6370-83		D4055-04(2009)
		Lowest filtering temperature determined on cold filter, in %		22254-92	IP309	D6371-05
		Straight-run		R 50837.6-95		
		Stability and compatibility		R 50837.7-95		D4740-04(2009)
		Distillation characteristics		2177-99		D86-09e1
		Chromaticity		20284-74		D1500-07
		Bacterial contamination		"EASICULT COMBI" non-standard method		

Table 3.1-2

Recommended area of recognition concerning marine oils

Products to be tested	Code OKP/ TN VED Code	Tests and/or determined characteristics (parameters)	Normative documents on products with determined characteristics (parameters)	Normative documents on testing methods		
				GOST	ISO	ASTM
1 Lubricating oils						
1.1 Motor oils for diesel engines	02 5335		GOST 12337-84 TU for particular products			
1.2 Universal motor and automobile carburetor engine oils	02 5314		GOST 10541-78			
1.3 Motor oils for motor and tractor diesel engines	02 5313		GOST 8581-78			
1.4 Petroleum turbine oils with dopes	02 5371		GOST 9972-74			
1.5 Turbine oils	02 5371		GOST 32-74			
1.6 Oil for marine gas-turbines	02 5371		GOST 10289-79			
1.7 Compressor oils	02 5351		GOST 1861-73			
1.8 Gear-box oils	02 5360		GOST 23652-79			
1.9 Transformer oils	02 5376		GOST 982-80			
1.10 Industrial oils	02 5341		GOST 20799-88			
1.11 Oils for refrigerating machines	02 5373		GOST 5546-86			
1.12 Oil AMG-10	02 5335		GOST 6794-75			
1.13 Hydraulic oils	02 5372		TU for particular products			
1.14 Motor oils produced on the basis of manufacturer's standards (national and industry), imported oils			TU for particular products Manufacturer' specifications			
1.14.1 Groups SAE-20; 30; 40; 50						
1.14.2 All-season groups SAE 5W/40; 10W/30; 10W/40, etc.						
		Density, in kg/cm^3		3900-85 R 51069-97	3675:1998	D1298-99(2005) D5002-99(2005)
		Kinematic viscosity, in cSt		33-2000	3104:1994	D445-09
		Viscosity index		25371-97		D2270-04
		Base number, in mg KOH/g		11362-76		D4739-08e1
		Mass fraction of mechanical admixtures, in %		6370-83		D4055-04(2009)
		Mass fraction of water, in %		R 51946-2002	3733:1999	D95-05
		Open cup flash point, in °C		4333-87		D92-05a
		Pour point, in °C		20287-91	3016:1994	D97-09
		Mass fraction of insoluble sediments, in %		20684-75		
		Neutralization number		11362-96	6619:1988	D4739-08e1
		Sulfated ash, in %		12417-94		
		Demulsification time, in h		12068-66		D86-09e1
		Chromaticity		20284-74		D1500-07
		Grade of purity		17216-2001	4406:1999	

Table 3.1-2 — continued

Products to be tested	Code OKP/ TN VED Code	Tests and/or determined characteristics (parameters)	Normative documents on products with determined characteristics (parameters)	Normative documents on testing methods		
				GOST	ISO	ASTM
2 Lubricating oils used in engine lubricating systems and other equipment (used oil products)	02 5892		GOST 21046-86			
		Density, in kg/cm^3		3900-85 R 51069-97	3675:1998	D1298-99(2005)
		Kinematic viscosity, in cSt		33-82	3104:1994	D445-09
		Mass fraction of water, in %		2477-65 R 51946-2002	3733:1999	D95-09
		Mass fraction of insoluble sediments, in %		20684-75		
		Aging: oil oxidation, contamination, degradation		ЯКУТ 26-002-2001		
		Grade of purity		17216-2001	4406:1999	
		Chromaticity		20284-74		D1500-07

Table 3.1-3

Recommended area of recognition of testing laboratories concerning oily water analyses (tests)

Products to be tested	Tests	Normative documents on testing methods
Bilge and ballast water	Oil product (hydrocarbon) content, in ppm, in mg/dm^3	RD 31.04.20-97 RD 31.28.52-79 RD 31.27.43-81 GOST R 51797-2001 GOST R 52406-2005 ISO 9377-2:2000 ASTM D3921-96(2003)e1 Additional industry normative documentation: RD 52.24.476-93

4 FUEL OIL QUALITY CONTROL

4.1 The testing laboratories carry out tests (analyses) of bunker fuel oil and cargo fuel oil to determine compliance of the oil product quality characteristics with the current standards.

Oil fuel quality characteristics to be monitored are given in Table 4.1-1, and the list of normative documents on methods for fuel analysis is given in Table 4.1-2.

Bunker fuel oil analysis is carried out during the ship bunkering, when testing and setting the fuel oil preparation system. Cargo fuel oil analysis methods are similar to those of bunker fuel oil analysis.

The aim of bunker fuel oil analysis is to check the bunker fuel oil quality characteristics conformity to quality passport data or to the characteristics of the oil ordered by the shipowner.

The quality passport shall be issued by the fuel supply organization (fueller vessel) proceeding from the analyses of a particular fuel delivery carried out by the laboratory of the oil delivery terminal, shipowner, port, survey company, and not proceeding from the quality passport issued by the fuel oil manufacturer.

During the bunker operations in compliance with the provisions of IMO Resolution MEPC.96(47), the basic sample being actually a representative sample of the fuel delivered shall be drawn at the receiving ship's inlet bunker manifold.

The basic sample shall be divided in three samples. Two samples are sealed and used in compliance with IMO Resolution MEPC.96(47). One of retained samples shall be kept onboard until the delivered fuel oil is consumed, but in any case for a period of not less than 12 months from the time of delivery. This sample is used as an official sample if a claim is laid against the fuel supplier. The second sealed retained sample is stored by the fuel supplier (fueller vessel or oil delivery terminal).

The third sample is used as a check one for verification of fuel quality using express methods. When in doubt concerning the bunker fuel oil quality or where fuel quality non-conformance to the quality passport characteristics is revealed by the express method, the sample shall be sent to the testing laboratory recognized by the Register for analysis within the scope of normative documentation requirements for the particular fuel.

Results of sampling are documented with appropriate Sampling Reports. The Sampling Report is drawn up in two copies, where data for identification of received fuel is stated including the information on fuel name and fuel supplier, location at which the sample was drawn, type of analysis or list of quality characteristics to be determined for the particular sample. The Sampling Report is signed by parties involved in bunker operations.

On customer's request the testing laboratories may conduct analyses of other specific types of samples, i.e. point samples, combined samples and bottom samples taken in compliance with the requirements of GOST 2517-85.

All analyses and tests are carried out in compliance with the area of recognition of the laboratory on the basis of ISO and GOST standards, Technical Specifications or by other methods recommended by the normative documents. Results of sample analyses and tests shall be documented with Test Reports.

The Conclusion on the fuel quality is issued based on the comparison of values of physical and chemical properties (characteristics) obtained by sample analysis with the values stipulated by standards.

Table 4.1-1

Quality characteristics of oil fuel to be monitored

Type of oil product	Analysis for compliance with normative documents (GOST, TU, manufacturer's specification)	Performance analysis	Notes
1 Distillate fuel (DMA, DMB, DMC, TMC), diesel fuel, burner oil	1. Density at 15 °C, in kg/cm^3	1. Density at 15 °C, in kg/cm^3	For diesel fuel GOST 305-82 at 20 °C
	2. Kinematic viscosity at 50 °C, in cSt	2. Kinematic viscosity at 50 °C, in cSt	For diesel fuel GOST 305-82 at 20 °C
	3. Mass fraction of water and mechanical admixtures, in %	3. Mass fraction of water and mechanical admixtures, in %	
	4 Closed cup flash point, in °C	4. Closed cup flash point, in °C	
	5. Mass fraction of sulphur, in %	5. Mass fraction of sulphur, in %	
	6. Fuel appearance	6. Pour point, in °C	
		7. Cloud point, in °C	
		8. Ash content, in %	
		9. Coking ability of 10 % of carbon residue, in %	For DMA and diesel fuel
		10. Conradson coking ability, in %	For DMB, DMC
		11. Distillation characteristics	
		12. Cetane index	
		13. Acid number, in mg KOH/g	For DMB, DMC and burner oil
		14. Filtering factor	
		15. Lowest filtering temperature	
2 Residual fuel oil (RMA, RMB, RMD, RME, RMF, RMG); Mazut (GOST 10585-99)	1. Density at 15 °C, in kg/cm^3	1. Density at 15 °C, in kg/cm^3	
	2. Kinematic viscosity at 50 °C, in cSt	2. Kinematic viscosity at 50 °C, in cSt	
	3. Mass fraction of water and mechanical admixtures, in %	3. Mass fraction of water and mechanical admixtures, in %	
	4 Closed cup flash point, in °C	4. Closed cup flash point, in °C	
	5. Mass fraction of sulphur, in %	5. Pour point, in °C	
	6. V, Al, Si, Na, content, in %	6. Mass fraction of sulphur, in %	
	7. Mass fraction of water-soluble acids and alkalies, in %	7. Ash content, in %	
		8. Total sediment (hot filtration), in %	
		9. Conradson coking ability, in %	
		10. V content, in %	
		11. Al + Si content (catalyst fines), in %	
		12. Stability and compatibility	
		13. Pollution by used lubricating oil (zinc, phosphorus and calcium content), in %	
		14. Water-soluble acids and alkalies	
		15. Heat value	
		16 Design aromatics index CCAI	Design values

Table 4.1-2

Normative documents on methods for fuel analyses

Nos.	Parameter (Characteristic)	Method	Updating
1	Density measured by hydrometer	GOST 3900-85. Petroleum and petroleum products. Methods for determination of density	
		GOST R 51069-97. Crude petroleum and petroleum products. Determination of density, relative density and API gravity. Hydrometer method	
		ASTM D1298-99. Standard test method for density, relative density (specific gravity), or API gravity of crude petroleum and liquid petroleum products by hydrometer method	
		ISO 3675:1998. Crude petroleum and liquid petroleum products. Laboratory determination of density. Hydrometer method	
2	Density measured by density analyzer	ASTM D5002-99. Standard test method for density and relative density of crude oils by digital density analyzer	
		ISO 12185:1996. Crude petroleum and petroleum products. Determination of density. Oscillating U-tube method	
3	Viscosity	GOST 33-2000. Petroleum products. Transparent and opaque liquids. Determination of kinematic viscosity and calculation of dynamic viscosity	
		ASTM D445-01.Standard test method for kinematic viscosity of transparent and opaque liquids (the calculation of dynamic viscosity)	
		ISO 3104:1994. Petroleum products. Transparent and opaque liquids. Determination of kinematic viscosity and calculation of dynamic viscosity	
		GOST 1929-87. Petroleum products. Methods of test for determination of dynamic viscosity by rotary viscosimeter	
		GOST 6258-85. Petroleum products. Method for determination of assumed viscosity	
4	Closed cup flash point	GOST 6356-75. Petroleum products. Method of test for flash point by closed cup	
		ASTM D93-00. Standard test methods for flash-point by Pensky-Martens closed cup tester	
		ISO 2719:2002. Determination of flash point. Pensky-Martens closed cup method	
5	Open cup flash point	GOST 4333-87. Petroleum products. Methods for determination of flash and ignition points in open crucible	
		ASTM D92-01. Standard test method for flash and fire points by cleveland open cup	
		ISO 2592:2000. Determination of flash and fire points. Cleveland open cup method	
6	Water content	GOST 2477-65. Petroleum and petroleum products. Method for determination of water content	
		GOST R 51946-2002. Petroleum products and bituminous materials. Method for determination of water by distillation	
		ASTM D95-99. Standard test method for water in petroleum products and bituminous materials by distillation	
		ISO 3733:1999. Petroleum products and bituminous materials. Determination of water. Distillation method	
7	Cloud point	GOST 5066-91. Motor fuels. Methods for determination of cloud, chilling and freezing points	
		ASTM D2500-09. Standard test method for cloud point of petroleum products	
		ISO 3015:1992. Petroleum products. Determination of cloud point	
8	Pour point	GOST 20287-91. Petroleum products. Methods of test for flow point and pour point	
		ASTM D97-02. Standard test method for pour point of petroleum products	
		ISO 3016:1994. Petroleum products. Determination of pour point	

Table 4.1-2 — continued

Nos.	Parameter (Characteristic)	Method	Updating
9	Lowest filtering temperature	GOST 22254-92. Diesel fuels. Cold filter method for determination of lowest filtering temperature	
		ASTM D6371-99. Standard test method for cold filter plugging point of diesel and heating fuels	
		IP 309/99. Diesel and domestic heating fuels. Determination of cold filter plugging point.	
10	Sulphur content	GOST R 51947-2002. Petroleum and petroleum products. Determination of sulphur by method of energy-dispersive X-ray fluorescence spectrometry	
		GOST R 50442-92. Petroleum and petroleum products. X-ray fluorescence method for determination of sulphur content	
		GOST 3877-88. Petroleum products. Determination of sulfur by calorimetric bomb method	
		GOST 1437-75. Dark petroleum products. Accelerated method for determination of sulphur	
		ASTM D4294-08. Standard test method for sulfur in petroleum and petroleum products by energy-dispersive X-ray fluorescence spectroscopy	
		ISO 8754:2003. Petroleum products. Determination of sulfur content. Energy-dispersive X-ray fluorescence spectrometry	
11	Ash content	GOST 1461-75. Petroleum and petroleum products. Method of ash test	
		ASTM D482-03. Standard test method for ash from petroleum products	
		ISO 6245:2001. Petroleum products. Determination of ash	
12	Coking ability	GOST 19932-99. Petroleum products. Determination of carbon residue. Conradson method	
		ASTM D189-01. Standard test method for Conradson carbon residue of petroleum products	
		ISO 6615:1993. Petroleum products. Determination of carbon residue. Conradson method	
13	Hot filtration sediment	GOST R 50837.6-95. Residual fuel oils. Test for straight-run. Method for determination of total sediment	
		ASTM D4870-09. Standard test method for determination of total sediment in residual fuels	
		ISO 10307:1993. Petroleum products. Total sediment in residual fuel oils — Part 1: Determination by hot filtration. Part 2: Determination using standard procedure for ageing	
14	Stability and compatibility	GOST R 50837.7-95. Residual fuel oils. Test for straight-run. Method for determination of stability and compatibility by spot	
		ASTM D4740-04(2009). Standard test method for stability and compatibility of residual fuels by spot test	
15	Straight-run of residual oils	GOST R 50837.3-95. Residual fuel oils. Test for straight-run. Method for determination of toluene equivalent GOST R 50837.4-95. Residual fuel oils. Test for straight-run. Method for determination of xylene equivalent	
16	Oil products distillation characteristics	GOST 2177-99. Petroleum products. Methods for determination of distillation characteristics	
		ASTM D86-03. Standard test method for distillation of petroleum products at atmospheric pressure	
		ISO 3405:2000. Petroleum products. Determination of distillation characteristics at atmospheric pressure	
17	Mechanical admixtures	GOST 6370-83. Petroleum, petroleum products and additives. Method for determination of mechanical admixtures	
18	Filtering factor	GOST 19006-73. Motor fuel. Method for determination of the filtering factor	

Nos.	Parameter (Characteristic)	Method	Updating
19	Acid number determined by potentiometric titration method	GOST 11362-96. Petroleum products and lubricants. Neutralization number. Potentiometric titration method	
		ASTM D664-01. Standard test method for acid number of petroleum products by potentiometric titration	
		ISO 6619:1988. Petroleum products and lubricants. Neutralization number. Potentiometric titration method	
20	Acidity and acid number with colour indicator titration method	GOST 5985-79. Petroleum products. Method for determination of acidity and acid number	
		GOST 29255-91. Petroleum products and lubricating oils. Neutralization number. Colour indicator titration method	
		ASTM D974-08. Standard test method for acid and base number by colour-indicator titration	
		ISO 6618:1997. Petroleum products and lubricants. Determination of acid or base number. Colour-indicator titration method	
21	Water-soluble acids and alkalies	GOST 6307-75. Petroleum products. Method of test for water-soluble acids and alkalies	
22	Corrosion — copper strip test	GOST 6321-92. Engine fuels. Method for copper strip test	
		ASTM D130-94(2000)e1. Standard test method for detection of copper corrosion from petroleum products by the copper strip tarnish test	
		ISO 2160:1998. Petroleum products. Corrosiveness to copper. Copper strip test	
23	Colour of oil products	GOST 20284-74. Petroleum products. Method for determination of colour on colourimeter ЦНТ	
		ASTM D1500-98. Standard test method for ASTM colour of petroleum products (ASTM colour scale)	
		ISO 2049:1996. Petroleum products. Determination of colour (ASTM scale)	
24	Iodine number and unsaturation	GOST 2070-82. Light petroleum products. Methods for determination of iodine numbers and content of unsaturated hydrocarbons	
25	Bacterial contamination	Easicult Combi. Test for bacteria, yeasts and fungi	
26	Chloride salts content	GOST 21534-76. Petroleum. The determination of chloride salts content	
		ASTM D4929-99. Standard test methods for determination of organic chloride content in crude oil	
		ISO 15597:2001. Petroleum and related products. Determination of chlorine and bromine content. Wavelength-dispersive X-ray fluorescence spectrometry	
27	Cetane index	GOST 27768-88. Diesel fuel. Determination of cetane index by calculation method	
		ASTM D4737-09a. Standard test method for calculated cetane index by four variable equation	
		ISO 4264:1995. Petroleum products. Calculation of cetane index of middle-distillate fuels by the four-variable equation	
28	Calorific value	GOST 21261-91. Oil products. Method for the determination of gross calorific value and calculation of net calorific value	
29	Metals in oil products (RFS[1])	ASTM D4927-05. Standard test methods for elemental analysis of lubricant and additive components — barium, calcium, phosphorus, sulfur, and zinc by wavelength-dispersive X-ray fluorescence spectroscopy	
		ISO 14597:1997. Petroleum products. Determination of vanadium and nickel content. Wavelength-dispersive X-ray fluorescence spectrometry	

Table 4.1-2 — continued

Nos.	Parameter (Characteristic)	Method	Updating
30	Metals in oil products (AAS[2])	ASTM D5863-00a(2005).Standard test methods for determination of nickel, vanadium, iron, and sodium in crude oils and residual fuels by flame atomic absorption spectrometry	
31	Aluminium and silicon in fuel oil (AAS[2])	ISO 10478:1994. Petroleum products. Determination of aluminium and silicon in fuel oils. Inductively coupled plasma emission and atomic absorption spectroscopy methods	
		IP 377-95. Method for determination of aluminium and silicon in mazut by flame atomic absorption spectrometry	
32	Polypropylene in oil products	Saybolt Qualit SAM 1001/98/03. Determination of polypropylene in residual fuels by Fourier transform infrared spectroscopy (FTIR)	
33	Saturated vapors pressure	GOST 1756-2000. Petroleum products. Determination of saturated vapors pressure	
		ASTM D323-08. Standard test method for vapour pressure of petroleum products (Reid method)	
		ISO 3007:1999. Petroleum products and crude petroleum. Determination of vapour pressure. Reid method	

[1] RFS — X-ray fluorescence spectrometry.
[2] AAS — atomic absorption spectrometry.

5 OIL QUALITY CONTROL

5.1 Analyses of incoming oil samples are carried out by the RS recognized testing laboratories which perform tests for the following purposes:

to determine conformance of new oil quality to normative documents;

to determine quality of oils used in the ship systems, machinery and equipment in operation;

for condition monitoring of ship facilities being the items of survey system on the basis of technical condition assessment.

Sampling of lubricating oils is carried out by an authorized representative of the ship or a laboratory specialist in compliance with the rules specified by the relevant instruction. Documentation accompanying the sample shall be sufficient to determine the aim of analysis and interpretation of the analysis results.

All the analyses and tests are carried out in compliance with the area of recognition of the testing laboratory according to ISO, GOST, ASTM standards or other methods recommended by normative documents. Results of sample analyses and tests are documented with Test Reports.

Conclusion on the lubricating oil quality is issued based on the comparison of physical and chemical characteristics obtained by sample analysis with the specified GOST standards, TU (technical specifications), manufacturers' specifications or defect criteria.

Lubricating oil quality characteristics to be monitored are given in Table 5.1-1; list of normative documents is given in Table 5.1-2.

Methods of analyses and normative documents given in Tables 5.1-1 and 5.1-2 are recommendatory. In selecting methods of analyses the standards (requirements) on the products to be tested and the laboratory possibilities are recommended to follow.

Table 5.1-1

Lubricating oil quality characteristics to be monitored

Type of lubricating oil	Analysis for compliance with normative documents (GOST, TU, manufacturers' specification)	Performance analysis	Notes
1 Motor oils	1. Density at 20 °C, in kg/cm^3 2. Kinematic viscosity at 40 °C and 100 °C, in cSt 3. Viscosity index (design) 4. Base number, in mg KOH/g 5. Sulphated ash, in % 6. Flash point, in °C	1. Density at 20 °C, in kg/cm^3 2. Kinematic viscosity at 40 °C and 100 °C, in cSt 3. Alkali neutralization number, in mg KOH/g 4. Sulphated ash, in % 5. Flash point, in °C 6. Mass fraction of water, in % 7. Mass fraction of mechanical admixtures, in % 8. Ageing: oxidation, contamination and degradation of additives 9. Content of wear metals	For imported oils at 15 °C In special cases + acid number Fourier transform infrared spectroscopy (FTIR) Methods: RFS[1], AAS[2], ferrography
2 Industrial oils: turbine oil, compressor oil, hydraulic oil, reduction gear oil, gear-box oil, etc.	1. Density at 20 °C (15 °C), in kg/cm^3 2. Kinematic viscosity at 40 °C and (50 °C), in cSt 3. Open cup flash point, in °C 4. Mass fraction of water, in % 5. Mass fraction of mechanical admixtures, in % 6. Ash content, in % by mass 7. Pour point, in °C 8. Demulsification time, in h 9. Acid number, in mg KOH/g 10. Infrared spectrum for determination of oil type (mineral, synthetic), etc.	1. Density at при 20 °C, in kg/cm^3 2. Kinematic viscosity at 40 °C and (50 °C), in cSt 3. Viscosity index (design) 4. Open cup flash point, in °C 5. Mass fraction of water, in % 6. Mass fraction of mechanical admixtures, in % 7. Ash content, in % by mass 8. Pour point, in °C 9. Demulsification time, in h 10. Acid number, in mg KOH/g 11. Grade of purity 12. Colour 13. Ageing: oxidation and degradation of additives 14. Content of elements: chlorine, phosphorus, sulphur, zinc 15. Chloride content 16. Content of wear metals	For high-viscosity oils at 40 °C and 100 °C For turbine oils FTIR method Methods: RFS[1], AAS[2], ferrography

[1] RFS — refer to footnote 1 in Table 4.1-2.
[2] AAS — refer to footnote 2 in Table 4.1-2.

Table 5.1-2

Normative documents on methods for oil analyses

Nos.	Parameter (Characteristic)	Method	Updating
1	Density measured by hydrometer	GOST 3900-85. Petroleum and petroleum products. Methods for determination of density	
		GOST R 51069-97. Crude petroleum and petroleum products. Determination of density, relative density and API gravity. Hydrometer method	
		ASTM D1298-99. . Standard test method for density, relative density (specific gravity), or API gravity of crude petroleum and liquid petroleum products by hydrometer method	
		ISO 3675:1998. Crude petroleum and liquid petroleum products. Laboratory determination of density. Hydrometer method	
2	Density measured by density analyzer	ASTM D5002-99. Standard test method for density and relative density of crude oils by digital density analyzer	
		ISO 12185:1996. Crude petroleum and petroleum products. Determination of density. Oscillating U-tube method	
3	Viscosity	GOST 33-2000. Petroleum products. Transparent and opaque liquids. Determination of kinematic viscosity and calculation of dynamic viscosity	
		ASTM D445-01. Standard test method for kinematic viscosity of transparent and opaque liquids (the calculation of dynamic viscosity)	
		ISO 3104:1994. Petroleum products. Transparent and opaque liquids. Determination of kinematic viscosity and calculation of dynamic viscosity	
		GOST 1929-87. Petroleum products. Methods of test for determination of dynamic viscosity by rotary viscosimeter	
		GOST 6258-85. Petroleum products. Method for determination of assumed viscosity	
4	Viscosity index	GOST 25371-97. Petroleum products. Calculation of viscosity index from kinematic viscosity	
		ASTM D2270-04. Standard practice for calculating viscosity index from kinematic viscosity at 40 and 100 °C	
		ISO 2909:2002. Petroleum products. Calculation of viscosity index from kinematic viscosity	
5	Closed cup flash point	GOST 6356-75. Petroleum products. Method of test for flash point by closed cup	
		ASTM D93-00. Standard test methods for flash-point by Pensky-Martens closed cup tester	
		ISO 2719:2002. Determination of flash point. Pensky-Martens closed cup method	
6	Open cup flash point	GOST 4333-87. Petroleum products. Methods for determination of flash and ignition points in open crucible	
		ASTM D92-01. Standard test method for flash and fire points by cleveland open cup	
		ISO 2592:2000. Determination of flash and fire points. Cleveland open cup method	
7	Water content	GOST 2477-65. Petroleum and petroleum products. Method for determination of water content	
		GOST R 51946-2002. Petroleum products and bituminous materials. Method for determination of water by distillation	
		ASTM D1533-00(2005). Standard test method for water in insulating liquids by coulometric Karl Fischer titration	
		ASTM D95-99. Standard test method for water in petroleum products and bituminous materials by distillation	
		ISO 3733:1999. Petroleum products and bituminous materials. Determination of water. Distillation method	
8	Pour point	GOST 20287-91. Petroleum products. Methods of test for flow point and pour point	
		ASTM D97-02. Standard test method for pour point of petroleum products	
		ISO 3016:1994. Petroleum products. Determination of pour point	

Nos.	Parameter (Characteristic)	Method	Updating
9	Ash content	GOST 1461-75. Petroleum and petroleum products. Method of ash test	
		ASTM D 482-03. Standard Test Method for Ash from Petroleum Products	
		ISO 6245:2001. Petroleum products. Determination of ash	
10	Sulphated ash	GOST 12417-94. Petroleum products. Method for determination of sulphated ash	
		ASTM D874-07. Standard test method for sulfated ash from lubricating oils and additives	
		ISO 3987:1994. Petroleum products. Lubricating oils and additives. Determination of sulphated ash	
11	Mechanical admixtures	GOST 6370-83. Petroleum, petroleum products and additives. Method for determination of mechanical admixtures	
12	Mechanical admixtures detected by membrane filtration	ASTM D4055-04(2009). Standard test method for pentane insolubles by membrane filtration	
		MOBIL 1068-79. Determination of pentane insolubles in used marine lubricating oils	
13	Insoluble sediment determined by centrifugation	GOST 20684-75. Used motor oils. Method for determination of insoluble sediments	
		ASTM D893-97(2002)e1. Standard test method for insolubles in used lubricating oils	
14	Acid number determined by determined by potentiometry	GOST 11362-96. Petroleum products and lubricants. Neutralization number. Potentiometric titration method	
		ASTM D664-01. Standard test method for acid number of petroleum products by potentiometric titration	
		ISO 6619:1988. Petroleum products and lubricants. Neutralization number. Potentiometric titration method	
15	Base number determined by potentiometry	GOST 11362-96. Petroleum products and lubricants. Neutralization number. Potentiometric titration method	
		ASTM D2896-98. Standard test method for base number of petroleum products by potentiometric perchloric acid titration	
		ASTM D4739-08e1. Standard test method for base number determined by potentiometric hydrochlofic acid titration	
		ISO 6619:1988. Petroleum products and lubricants. Neutralization number. Potentiometric titration method	
16	Acid and base number with colour indicator	GOST 5985-79. Petroleum products. Method for determination of acidity and acid number	
		GOST 29255-91. Petroleum products and lubricating oils. Neutralization number. Colour indicator titration method	
		ASTM D974-08. Standard test method for acid and base number by colour-indicator titration	
		ISO 6618:1997. Petroleum products and lubricants. Determination of acid or base number. Colour-indicator titration method	
17	Corrosion on metals	GOST 20502-75. Oils and additives to them. Methods for determination of corrodibility	
		GOST 2917-76. Oils and additives. Method of test for corrosion influence on metals	
18	Colour of oil products	GOST 20284-74. Petroleum products. Method for determination of colour on colorimeter ЦНТ	
		ASTM D1500-98. Standard test method for ASTM colour of petroleum products (ASTM colour scale)	
		ISO 2049:1996. Petroleum products. Determination of colour (ASTM scale)	

Table 5.1-2 — continued

Nos.	Parameter (Characteristic)	Method	Updating
19	Iodine number and unsaturation	GOST 2070-82. Light petroleum products. Methods for determination of iodine numbers and content of unsaturated hydrocarbons	
20	Saponification number	GOST 17362-71. Mineral oils. Method of determination of saponification number	
		ASTM D94-07. Standard test methods for saponification number of petroleum products	
		ISO 6293-1:1996. Petroleum products. Determination of saponification number. Part 1: Colour indicator titration method	
21	Demulsification time	GOST 12068-66. Mineral oils. Method for determination of demulsification time	
		ASTM D1401-09. Standard test method for water separability of petroleum oils and synthetic fluids	
22	Grades of liquids purity	GOST 17216-2001. Industrial cleanliness. Grades of liquids purity	
		ISO 4406:1999. Hydraulic fluid power. Fluids. Method for coding the level of contamination by solid particles	
23	Infrared Fourier spectroscopy (FTIR)	ASTM E2412-04. Practice for condition monitoring of used lubricants by trend analysis using Fourier transform infrared (FT-IR) spectrometry	
		DIN 51451:2004-09. Testing of petroleum products and related products. Analysis by infrared spectrometry. General working principles	
		DIN 51452:1994-01. Testing of lubricants. Determination of the soot content in used diesel engine oils. Infrared spectrometry	
		DIN 51453:2004-10. Testing of lubricants. Determination of oxidation and nitration of used motor oils. Infrared spectrometric method	
		GOST 28640-90. Mineral electrical insulating oils. Method for determination of aromatic hydrocarbons	
24	Metals and non-metals in oil products (RFS)	ASTM D4927-05. Standard test methods for elemental analysis of lubricant and additive components — barium, calcium, phosphorus, sulfur, and zinc by wavelength-dispersive X-ray fluorescence spectroscopy	
		ISO 14597:1997. Petroleum products. Determination of vanadium and nickel content. Wavelength-dispersive X-ray fluorescence spectrometry	
25	Metals in oil products (AAS)	ASTM D5863-00a(2005). Standard methods for determination of nickel, vanadium, iron and sodium in crude oils and residual fuels by atomic absorption spectrometry	
26	Drop point	GOST 6793-74. Petroleum products. Method of drop point determination	
		ASTM D566-02(2009). Standard test method for dropping point of lubricating grease	
		ISO 2176:1995. Petroleum products. Lubricating grease. Determination of dropping point	
27	Penetration	GOST 5346-78. Plastic lubricants. Methods for determination of penetration with the conical penetrometer	
		ASTM D217-02(2007). Standard test methods for cone penetration of lubricating grease	
		ISO 2137:1985. Petroleum products. Lubricating grease and petrolatum. Determination of cone penetration	

6 OILY WATER ANALYSIS

6.1 Oily water analyses are carried out by testing laboratories recognized by the Register.

Oily water quality characteristics to be monitored are given in Table 6.1-1; List of normative documents on oily water methods of analysis is given in Table 6.1-2.

On ships oily water sampling is made by the ship crew in compliance with the Register rules and requirements of RD 31.04.20-97 "Programme for on-board testing of oily-water filtering equipment and 15 ppm bilge alarm". Samples are delivered to the laboratory together with the shipboard Sampling Report with identification of filtering equipment type and signature of the authorized persons (chief engineer officers).

During the acceptance tests of filtering equipment and arrangement for prevention of pollution from ships, the sampling is witnessed by representatives of the Register and, where necessary, of the testing laboratory, and in consequence of which a Report is drawn up.

The sampling analysis is performed in compliance with the requirements of MEPC.107(49) or MEPC.60(33), whichever is applicable.

The results of analysis are recorded in Test Report by the testing laboratory.

Table 6.1-1

Oily water quality characteristics to be monitored and testing equipment

Product to be tested	Test	Quality standards, in mg/dm^3, not more than	Method	Testing equipment
Bilge and ballast water	Content of oily products (hydrocarbons), in ppm, in mg/dm^3	15	RD 31.28.52-79 RD 31.27.43-81 RD 31.04.20-97 ASTM D3921-96(2003)e1 GOST R 51797-2001 ISO 9377-2:2000 RD 52.24.476-93	FTIR spectrometer Gas chromatograph IR-photometric analyzer

Table 6.1-2

Normative documents on methods for oily wateranalyses

Nos.	Parameter (Characteristic)	Method	Updating
1	Oil products content in water determined by IR-spectroscopy	GOST R 51797-2001. Drinking water. Method for determination of oil products content	
		ASTM D3921-96(2003)e1. Standard test method for oil and grease and petroleum hydrocarbons in water	
		RD 31.28.52-79. Methods for physical and chemical control of ship equipment working media.	
		RD 31.27.43-84. Instructions on determination of oil and oil products content in different ship water using IR-spectrophotometry	
		RD 31.04.20-97. Programme for onboard testing of oily-water filtering equipment and 15ppm bilge alarm	
2	Oil products content in water determined by gas chromato-graphy	GOST R 52406-2005. Water. Determination of oil products using gas chromatography	
		ISO 9377-2:2000. Determination of oil hydrocarbon index. Part 2. Method using solvent extraction and gas chromatography	

7 LABORATORY TESTING AND MEASURING EQUIPMENT AND STATE STANDARD SAMPLES

7.1 A basic list of testing equipment (TE), measuring equipment (ME) and state standard samples (SSS) necessary to perform tests of oil products (fuel oil and lubricating oils) and oily waters is given in Tables 7.1-1, 7.1-2 and 7.1-3. The testing laboratory shall be provided with TE, ME and SSS to perform tests within the area of recognition.

The list is based on the well-tested and widely applied facilities for testing laboratories rendering services to sea transport on oil product and oily water analyses. Provision of testing laboratories with the above types of equipment is recommendatory.

To be recognized by the Register the testing laboratories may be provided with other similar equipment, unless it is technically inferior to that listed in Tables 7.1-1, 7.1-2, 7.1-3.

8 EXPRESS ANALYSIS OF OIL PRODUCTS

8.1 Bunker fuel oil express analysis.

Bunker fuel oil express analysis is performed onboard the ship or fueller vessel, or in the oil oil delivery terminal laboratory.

Domestic portable testing laboratories (PLAM express laborator ies), as well as similar devices kits for express analyses of foreign firms, e.g. PSK MARTEC, GmbH, Germany are used for the analysis.

The following parameters (characteristics) are determined:

density: density from 0,8 to 1,05 kg/cm^3;

viscosity: kinematic viscosity at the temperatures of 40 and 50 °C;

water content: water presence within 2%;

stability/compatibility: compatibility and stability according to ASTM D 4740-04(2009).

8.2 Express analysis of lubricating oils.

The express analysis of oil from the lubrication systems of marine diesel engines, turbines, air compressors, controllable pitch propellers (CPP) and other machinery is performed onboard the ship for determination of lubricating oil condition and assessment of technical conditions of ship facilities.

Basic parameters (characteristics) determined during the lubricating oil express analysis:

watering of lubricating oil;

carbon concentration and oxidation lubricating oil oxidation;

change in viscosity (e.g. by fuel dilution);

change in motor oil's total base number (TBN);

change in base acid number (BAN) of turbine, hydraulic and other industrial oils.

For lubricating oil express analysis use is made of domestic PLAM-1, PLAM-3 and SKLAMT express laboratories, imported express laboratories, as well as special devices kits for express analyses.

8.3 Express monitoring of ship equipment wear.

The express monitoring is performed using FCHM-P Ferro-indicator, which makes it possible to determine onboard high ferrum concentration in the lubricating machine oil that predicts the increase in wear rate of friction components (pistons, piston rings or diesel engine cylinder liners), or by means of any other apparatus having similar characteristics.

8.4 Equipment for express analyses.

Portable laboratories used shall be provided with a required reagents kit to perform oil analysis.

For calibration of equipment express analyses the SSS may be used.

The express analysis data shall not be used for presentation of claims or issuing oil product quality passport. Where the express analysis showed that the oil product is substandard, these data shall be verified by laboratory tests in the testing laboratory recognized by the Register.

Table 7.1-1

Recommended list of TE for the testing laboratory recognized by the Register

Nos.	Name of tested product. Product characteristics to be determined	Name of TE, type	Basic technical characteristics		Recommended equipment
			Measuring range	Measuring accuracy	
1	Density, in kg/m^3, and kinematic viscosity, in cSt, determined at different temperature (20, 40, 50 and 100 °C)	Liquid thermostat	20 — 150 °C	0,1 °C	Thermostat types: VIS-T-07, VIS-T-01, VT-17-02. Manufactured by TERMEX, Ltd., Russia
2	Density, in kg/m^3	Digital density meter	0 — 3 g/cm^3	0,0001	VIP-2M. Manufactured by TERMEX Ltd., Russia
3	Mass fraction of water, in % by volume	Distillation apparatus for determination of water content in oil	0,03 — 10 % by volume	0,03	Distillation apparatus AKOV-10
4	Closed cup flash point, in °C	Apparatus for determination of flash point and ignition point in a closed cup	12 — 360 °C	1 °C	Type TVZ, Russia Type TV, Russia
5	Open cup flash point, in °C	Apparatus for determination of flash point and ignition point in an open cup			
6	Neutralization number, in mg KOH/g; TBN, in mg KOH/g; total acid number (TAN), in mg KOH/g	Laboratory ESL-43-07 glass electrode. Auxiliary EVL-1MZ.1 silver-chloride electrode	 0 — 12 0 — 12	 0,2 0,2	ATP-01 and ATP-02 automated titrator manufactured by AQUILON, CJSC, Russia, or another apparatus meeting the technical requirements
7	Pour point, in °C; Cloud point, in °C	Low-temperature liquid thermostat	minus 80 ÷ plus 120	0,2	KRIO-VT-05-01 thermostat. Manufactured by TETREX Ltd., Russia, or another apparatus meeting the GOST requirements
8	Ash content, in % by weight; sulphated ash, in %	Muffle furnace	150 — 1160 °C	2,5 °C	Type MIMP-34 (SNO-1,7.2,5,6 (11/5-IG). Manufactured by SZNPT Ltd., Russia, or another apparatus meeting the technical requirements
9	Mechanical admixtures, in % by weight; total residue, in % by weight	Drying electric box	70 — 350 °C	1 °C	Type SNOL-3,5.3.3,5/3-IM, Russia, or another apparatus meeting the technical requirements
10	Conradson coking characteristics, in % by weight	Apparatus for determination of coking ability determining carbon residue	0,01 — 10	0,03	Conradson apparatus
11	Distillation characteristics, in °C	Apparatus for determination of distillation characteristics at atmospheric pressure	35 — 37 °C	1 °C	Type ARKS. Manufactured by Neftechimanalitic CJSC, Russia
12	Mass fraction of sulphur, in %	Sulphur analyzer	0,02 — 0,1 0,1 — 5,0	0,0005	X-ray fluorescence analyzer meeting the technical requirements

Table 7.1-1 — continued

Nos.	Name of tested product. Product characteristics to be determined	Name of TE, type	Basic technical characteristics		Recommended equipment
			Measuring range	Measuring accuracy	
13	Content of vanadium, aluminium, silicon and equipment component wear metal particles, in mg/kg (ppm)	Spectrometer	V — 2-500 ppm Al — 5-500 Si — 10-500 Metals: >5	2 ppm	Spectrometers: X-ray fluorescence atomic absorption, etc.
14	Bilge water, ballast water. Oil product content, in mg/dm^3	IR-photometric analyzer. Gas chromatograph	0,5 — 2000	0,05 mg/dm^3	FTIR spectrometer FSM-1201
15	Oil products. Waste lubricating oil. Ageing and oxidation, in abs/cm	IR-spectrometer	0 — 20 abs/cm		FTIR spectrometer meeting the technical requirements
16	Lubricating oils, hydraulic oils. Wear products, in mg/kg (ppm); number of particles/cm^3	Ferrograph	1 — 1000 ppm 1 — 250 particles/cm^3	1 ppm	Ferrograph: direct reading (DR) analytical

Table 7.1-2

Recommended list of ME for the testing laboratory recognized by the Register to perform fuel, lubricating oil and oily water analyses

Nos.	Product characteristics to be determined	Name of ME, type (model)	Basic technical characteristics	
			Measuring range	Measuring accuracy
1	Density, in kg/m^3	Hydrometer ATN-2 ATN-2	 830 — 910 910 — 990	 ±0,5 ±0,5
2	Kinematic viscosity, in cSt	Capillary viscosimeter VNZh VPZh	 ∅1,41 ∅1,91 ∅1,77 ∅1,31 ∅2,37	
3	Temperature, in °C	Glass thermometer TN-1 TN-2M TN-4 TL-4 TN 4M	 0 — 170 0 — 260 0 — 150 0 — 50 0 — 150	 +1,0 ±1,0 ±1,0 ±0,1 ±1,0

Nos.	Product characteristics to be determined	Name of ME, type (model)	Basic technical characteristics	
			Measuring range	Measuring accuracy
		TL-4 TN-7 TN-8 TIN 10-8 TIN 10-1 TIN 10-4 TIN 10-3	50 — 150 0 — 360 minus 80 ... plus 60 38,6 — 41,4 8,6 — 21,4 98,6 — 101,4 48,6 — 51,4	±0,2 ±1,0 ±0,1 ±0,1 ±0,1 ±0,1
4	Time, in s	CITIZEN Digital Stopwatch	1 — 1000	±0,01
5	Mass, in g	Electronic laboratory balance	0,0002 — 200	±0,0002
6	Mass, in g	Universal electronic counter balance	0,02 — 150	±0,1
7	Volume, in ml	Trap receivers 2,0 ml 5,0 ml 10,0 ml	 0,05 — 2,0 0,1 — 5,0 0,03 — 10,0	 ±0,05 ±0,1 ±0,03
8	Volume, in ml	Measuring pipette 2,0 ml 5,0 ml 10,0 ml	 0,02 — 2,0 0,05 — 5,0 0,1 — 10,0	 ±0,02 ±0,005 ±0,1
9	Volume, in ml	Volumetric flask 50,0 ml 100,0 ml 500,0 ml 1000,0 ml	 50,0 100,0 500,0 1000,0	 ±0,12 ±0,20 ±0,5 ±0,8
10	Volume, in ml	Cylinder 10,0 ml 50,0 ml 100,0 ml 500,0 ml	 0,2 — 10,0 0,5 — 50,0 1,0 — 100,0 5,0 — 500,0	 ±0,2 ±0,5 ±1,0 ±5,0
11	Volume, in ml	Measuring glass 500,0 ml	 10,0 — 500,0	 ±12,5
12	Relative humidity, in %; temperature, in °C	Psychometric hydrometer VIT-1	20 — 90 0 — 25	±2,0

Table 7.1-3

SSS data used by the recognized testing laboratories

Nos.	Name of SSS	SSS designation (SI system graduation, measuring accuracy check)	Certified characteristic	Range of values	Certified value accuracy
1	Standard samples of sulphur mass fraction in oil and oil products	Verification of X-ray fluorescence spectrometer for the analysis of sulphur in oil, calibration, measuring check	Mass concentration of sulphur, in % by mass	Mass concentration of sulphur, in % by mass 0,054 — 0,066 0,450 — 0,550 0,900 — 1,100 2,250 — 2,750 4,500 — 5,500	Relative accuracy, in % 3,0 2,5 2,5 2,5 1,5
2	Standard samples of closed cup flash point	Temperature measurement accuracy check	Flash point, in °C	Flash point, in °C 77 — 87 165 — 200	Absolute accuracy, in % 1,0 2,0
3	Standard samples of viscosity	Viscosity measurement accuracy check	Kinematic viscosity, in mm^2/s, in cSt	Kinematic viscosity, in mm^2/s, in cSt 85 — 116 255 — 345 15 — 21 4 — 6	Relative accuracy, in % 0,2 0,2 0,2 0,2
4	Standard samples of liquid density	Density measurement accuracy check	Density at 20 °C, in kg/m^3	Density at 20 °C, in kg/m^3 865,0 — 870,0 877,0 — 885,0 898,0 — 908,0 997,0 — 1001,0	Absolute accuracy, in % 0,05 0,05 0,05 0,05
5	Standard samples for determination of water content	Water content measurement accuracy check	Water content, in % by mass	Water content, in % by mass 0,450 — 0,550 1,35 — 1,65	Relative accuracy, in % 2,0 2,0
6	Standard samples of mechanical admixtures in oil	Mechanical admixtures measurement accuracy check	Mechanical admixtures content, in % by mass	Mechanical admixtures content, in % by mass 0,045 — 0,055 0,200 — 0,300	Relative accuracy, in % 5,0 5,0

Nos.	Name of SSS	SSS designation (SI system graduation, measuring accuracy check)	Certified characteristic	Range of values	Certified value accuracy
7	Standard samples of oil products (hydrocarbons) in carbon tetrachloride	Measuring accuracy check of oil product content in bilge (ballast) water	Oil product content, in mg/l	Oil product content, in mg/l 50,0	Relevant accuracy, in % 5,0
8	Standard samples for monitoring TBN determination	Base (alkali) concentration measurement accuracy check	Base concentration, in mg KOH/g	Base concentration, in mg KOH/g 3,70 6,30	Relevant accuracy, in % 2,0 2,0
9	Standard samples for determination of pour point	Pour point measurement accuracy check	Pour point, in °C	Pour point, in °C −28 …−31	Absolute accuracy, in % 3,0
10	Standard samples for determination of crystallization point	Crystallization point measurement accuracy check	Crystallization point, in °C	Crystallization point, in °C −54,3	Absolute accuracy, in % 3,0

N o t e . SSS developed by the State Research Center of the Russian Federation “D.I. Mendeleyev All-Russian Institute for Metrology” and manufactured by Ekros, CJSC, St. Petersburg, may be used as state standard samples.

9 RECOGNITION OF TESTING LABORATORIES PERFORMING OILY WATER ANALYSIS (CODE 21002200) AND FUEL AND OIL ANALYSIS (CODE 21002300)

9.1 Recognition of testing laboratories is carried out to establish and confirm their competence and readiness to perform oily water, fuel oil and oil analyses in compliance with the requirements of:

MARPOL 73/78, recommendations of relevant IMO resolutions and other international and national documents relating to environment pollution prevention;

IACS, RS and industry standards on assessment of the technical condition of ship items to be surveyed with respect to the necessity of submitting analyses results of bunker oils, lubricating oils and oils currently in use in onboard machinery.

Recognition of testing laboratories by the Register is carried out in compliance with the requirements of Section 9, Part I "General Regulations for Technical Supervision" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

The inspections are carried out directly in the testing laboratories in terms agreed with the applicant according to the following programme:

.1 *organizational support and management system*:

adequacy of actual testing laboratory organizational chart;

availability and efficiency of testing quality control system;

.2 *facilities and normative and technical documentation*:

arrangement of personnel, measuring and testing equipment;

condition of laboratory spaces;

availability and metrological condition of measuring and testing equipment;

normative documentation support, its updating and maintenance condition;

.3 *competence and readiness to perform analyses*:

personnel qualification and experience within the area of recognition;

performance of check tests.

Российский морской регистр судоходства

Методические рекомендации по обеспечению проведения анализов топлива, смазочного масла, груза нефтепродуктов и нефтесодержащих вод

Russian Maritime Register of Shipping

Methodological recommendations for fuel, lubricating oil, oil product cargo and oily water analyses

The edition is prepared
by Russian Maritime Register of Shipping
8, Dvortsovaya Naberezhnaya,
191186, St. Petersburg,
Russian Federation
Tel.: +7(812) 312-89-59
Fax: +7(812) 312-89-86