

MATERIAL AND EQUIPMENT STANDARD

FOR

LUBRICATION, SHAFT SEALING, AND CONTROL OIL SYSTEMS

FOR

SPECIAL PURPOSE APPLICATION

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0. INTRODUCTION

This specification gives the amendment and supplement to API Standard 614, second edition January 1984:

"Lubrication, Shaft Sealing, and Control Oil Systems for Special Purpose Application"

It shall be used in conjunction with data/requisition sheets for Oil System.

For ease of reference, the clause or section numbering of API Standard 614 has been used throughout this specification.

Clause in API Std. 614 not mentioned remain unaltered.

For the purpose of this specification, the following definitions shall hold:

- Sub (Substitution) : The API Std. Clause is deleted and replaced by a new clause.
- Del (Deletion) : The API Std. Clause is deleted without any replacement.
- Add (Addition) : A new clause with a new number is added.
- Mod (Modification) : Part of the API Std. Clause is modified, and/or a new description and/or condition is added to that clause.

1. GENERAL

1.1 Scope

This specification contains the minimum technical requirements for lubrication, shaft sealing and control oil systems for special purpose application, for use in refinery services, chemical plants, gas plants, and where applicable, in exploration, production and new ventures.

Compliance by the vendor with the provisions of this Standard does not relieve him of the responsibility of furnishing the equipments of proper design, mechanically suited to meet operating gaurantees at the specified operating conditions. (Sub.)

1.2 Alternative Designs

Unless otherwise specified equivalent SI Unit System dimensions and ratings shall be substituted. (Sub.)

1.3 Conflicting Requirements

In case of conflict between documents relating to the inquiry or order, the following priority of documents shall apply:

- first priority : purchase order and variations thereto.
- second priority : data sheets and drawings.
- third priority : this standard specification. (Sub.).

1.4 Definitions of Terms

1.4.4 The international nomenclature "**diameter nominal**" written as DN 15,20,32,40 etc., has been used for pipe sizes in accordance with ISO 6708-1980 and Appendix D in this standard specification. (Add.)

1.4.5 The international nomenclature "**pressure nominal**" written as PN20,50,68,100,150 etc., has been used for flange ratings in accordance with ANSI/ASME B16.5-1981,ISO 7268-1983 , and Appendix E in this standard specification. (Add.)

1.5 Referenced Publications

1.5.1 The latest editions of the following references and specifications shall be applied in addition to those stated in API Standard 614, Second Edition, 1984.

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

A 105	"Carbon Steel Forgings for Piping Components"
A 285	"Specification for Pressure Vessel Plates, Carbon Steel"
B 111	"Copper and Copper Alloy, Seamless"
B 148	"Aluminum-Bronze Castings"
B 171	"Copper-Alloy Condenser Tube Plates"
B 584	"Copper-Alloy Sand Casting for General Application"

BSI (BRITISH STANDARDS INSTITUTION)

BS 2871 "Copper and Copper Alloys"

DIN (DEUTSCHES INSTITUTE FUR NORMUNG Ev.)

DIN 178 "Wrought Copper and Copper Alloy Tubes for Condensers and Heat Exchangers"

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-M-PM-105 "Centrifugal Pumps for Process Services"

IPS-M-PM-140 "Positive Displacement Pumps-rotary"

IPS-M-PM-240 "Steam Turbine, General Purpose"

IPS-I-SF-900 "Noise and Vibration Control"

ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

6708 "Pipe Components-Definition of Nominal Size"

7268 "Pipe components -Definition of Nominal Pressure (Mod.)"

1.6 System Selection

1.6.1 The relevant data sheet shall specify whether or not a combined lubricating oil and seal oil system is to be applied.

Where the process gas contains H₂S, separate lubricating oil and seal systems shall be provided.

As a general rule, turbine control oil shall be combined with the lubricating oil system. (Mod.)

2. BASIC DESIGN

2.1 General

2.1.2 Equipment furnished shall comply with IPS-E-SF-900, "Noise and Vibration Control".

Unless otherwise specified, the following limits shall be met at any measuring location not less than 1 m from the equipment surface:

SOUND PRESSURE LIMIT IN dB RE 20 μPa	
OIL PUMP	87 dB (A)
OIL PUMP + DRIVER	90 dB (A)

If the equipment produces impulsive and / or narrow band noise, the above limits shall be taken 5 dB(A) lower, thus 82 dB(A) for the oil pump and 85 dB(A) for the oil pump and driver.

Noise levels shall have an upper tolerance of + 0 dB.

The above requirements apply in absence of reverberation and background noise from other sources, and for all operating conditions between minimum flow and rated flow . (Sub.)

2.1.9 Unless otherwise specified the system shall be suitable for outdoor operation in dusty atmosphere and shall be winterized for the particular plant atmosphere including the minimum temperature specified on the data sheets. (Mod.)

2.1.14 The complete lube and seal oil systems piping arrangement shall be submitted to purchaser for approval. If required double block and bleed valves will be specified at the time of approval. (Mod.)

2.1.15 ASME code stamp is required. (Mod.)

2.1.16 The system shall be designed to permit safe shutdown of all equipment in the event of lube/seal oil supply failure. (Mod.)

2.3 Oil Reservoir

2.3.4 Oil connections

The main and standby lube and seal oil pumps shall each have a separate suction line from the reservoirs.

2.3.6 Features and appendages

g) A flanged vent, one pipe size larger than the sum of area of incoming seal drain lines shall be furnished for seal oil reservoirs and/or combined lube and seal oil reservoirs. (Mod.)

i) An internal float type low level alarm shall be furnished; mounted in a stainless steel stilling well. The float shall be protected by a static conducting shield. The alarm shall be set at minimum operating level.

The oil temperature indicator (required per API 614 Fig. A-22) shall be mounted in a thermowell below the low-level alarm oil level.

j) At the lowest point in the reservoir a piping connection shall be provided for drainage and for the connection to a portable centrifuge. These connections shall be DN50 flanged minimum with valve and blind flange. A second connection shall be provided a short distance from the normal oil level in the reservoir for the return of centrifuged oil. This connection shall be DN50 flanged minimum, with valve and blind flange.

k) Any and all connections likely to produce fumes or vapor shall be piped into a suitable point so that there is minimum pollution of the local environment. The vendor shall ensure that the selected connecting point is safe under all conditions and that no adverse pressure or other effects arise in the lube oil system, consequent upon this connection. (Mod.)

2.3.8 Heating

The steam heating element shall be external to the oil reservoir, and shall be full bottom design. (Mod.)

2.3.13 Special features

If the height of reservoir is more than 70 cm, no equipment shall be mounted on top of reservoirs. (Mod.)

2.4 Pumps and Drivers

2.4.1 Horizontally mounted pumps are preferred. (Mod.)

2.4.2 Coupling for horizontal pumps shall be of the flexible disc type with stainless steel disc.

Coupling rating for motor drivers shall be at least equal to the actual motor power rating. Coupling guards shall be base mounted, and fabricated from 2.8 mm galvanized steel sheet. (Mod.)

2.4.4 Centrifugal type pumps shall conform to API Standard 610 as amended/supplemented by IPS-M-PM-105. Rotary type pumps shall conform to API Standard 676 as amended/supplemented by IPS-M-PM-140. (Mod.)

2.4.5 The main oil pump may be driven by steam turbine, electric motor or shaft driven as specified in data sheet.

Unless otherwise specified, the standby pump shall be driven by electric motor. The use of shaft, air and/or gas driven pumps shall be subjected to purchaser’s approval. (Mod.)

2.4.6 Steam turbines shall conform to API standard 611 as amended/supplemented by IPS-M-PM-240. In no case shall the stand-by pump be steam turbine driven.

If specified, a permanent Y-type strainer shall be installed in the steam supply line to steam turbines. The strainer screen shall be monel with openings of approximately 3 mm. Strainers shall be provided with a blow-off connection .(Mod.)

2.4.8 The minimum requirements for sizing motor and steam turbine drivers for oil pumps shall be per the following:

Load factors shall be applied as multipliers to the power required by the pump to insure that the selected driver will be adequate to drive the load.

Driver power rating shall satisfy both of the following requirements:

I) DRIVER RATED POWER = Pump Rated Power × LOAD FACTOR

II) DRIVER RATED POWER = Maximum Pump Power at any alternate operating condition × LOAD FACTOR

where :

pump type	Electric Motor or Steam Turbine LOAD FACTOR (1)
Centrifugal	1.1
Positive Displacement	1.05

Note:

1) Other types of drivers require special consideration. Consult purchaser for details.(Mod.)

2.4.12 Seal, lube and control oil header pressures shall be regulated by automatic control valves. Hand control valves or restriction orifices are unacceptable in these services.

If a pressure control bypass line to the reservoir is required , it shall be located at the discharge of the coolers upstream of all filters. (Mod.)

2.4.15 The design, location and arrangement of strainers shall permit cleaning without removing the strainer body or interrupting the pumping service. (Mod.)

2.5 Coolers

2.5.3 Shell and tube type coolers shall be constructed in accordance with. IPS-E-ME-220 and air coolers shall comply with IPS-E-ME-245. (Mod.)

2.5.4 Unless otherwise specified, materials for the coolers shall be as follows:

- a) For fresh treated water : The manufacturer’s standard materials.

b) For brackish and salt water :

- Shell

Steel to ASTM A 285 Grade C or ASTM A 106 A⁽¹⁾ or B⁽¹⁾ or ASTM B 171 alloy C 63000.

- Channel + flanges + nozzles

Tin bronze to ASTM B 584 alloy C 90500 or ASTM B 148 alloy C 95800.

- Tubes

Aluminum brass to BS 2871 Part 3 CZ 110, or ASTM B 111 alloy C 68700 or DIN 1785 Cu Zn 20 A1.

- Fixed tube sheet

Steel to ASTM A 105⁽²⁾ with a layer of copper alloy to ASTM B 171 alloy C 63000 welded on to the water side.

Notes:

1) C max. 0.23%

2) C max. 0.23% normalized (Substitution 2.5.4) (Sub.)

2.5.5 Utility conditions and design requirements are as indicated in the individual heat exchanger data sheets.

Lube oil header temperature shall be controlled automatically by bypassing oil around the coolers. Instrumentation required per API standard 614 Fig. A-17 shall be furnished. (Mod.)

2.6 Filters

2.6.1 Filters shall be provided with an indicator mounted on the filter assembly and indicating when the particular filter element in use exceeding the allowable pressure drop. Suitable connection for remote indicating differential pressure sensors shall also be furnished. (Mod.)

2.7 Transfer Valves

2.7.1 Transfer valves common to filters and coolers are not acceptable. Piping arrangement of transfer valves shall be in accordance with Fig. A.17 shown in API standard 614. (Mod.)

2.9 Overhead Tanks

2.9.1 Seal oil tanks

2.9.1.1 Equipment mounted overhead tanks are not permitted. (Mod.)

2.9.1.5 Sweet gas buffering shall be supplied where process gas contains poisons or contaminants such as H₂S, and provisions shall be made for sweet gas buffering in other services. (Mod.)

2.10 Oil Conditioners

2.10.1 A conditioner (centrifugal type, as specified) for removal of water from the lube oil shall be provided for systems serving steam turbine driven equipment. The equipment shall be permanently connected to reservoir, suitable for outdoor installation and shall be furnished complete with accessory equipment to take oil from and return oil to the reservoir at equal flow rates. (Mod.)

2.11 Seal Oil Drain Traps

2.11.3 Traps shall be vented to the compressor suction system unless otherwise specified. Traps shall be equipped with mist eliminators suitable for the process service and arranged per API standard 614 Fig. A-12. (Mod.)

2.11.4 Drains from traps shall be piped to return oil to the degassing drum, or to a holding tank for oil reclamation. (Mod.)

2.12 Degassing Drum

2.12.1 A degassing system shall be furnished where inner seal oil drain is returned to the reservoir and the oil contains dissolved process gas which can be readily separated. Arrangement shall be per API standard 614 Fig. A.3 (including a heating device). Where the inner seal oil is contaminated with hydrogen sulfide, a sour oil reclamation system shall be provided instead of degassing system. (Mod.)

2.13 Piping

2.13.3 Provisions shall be made for bypassing the seals and bearings so as to flush the piping at the time of start up. (Mod.)

3. INSTRUMENTATION, CONTROL, AND ELECTRICAL SYSTEM

3.2 Instrument Gage Boards and Panels

3.2.2 A free standing local panel shall be furnished. It shall be mounted off the main machinery, its baseplate and associated piping, and foundation. (Mod.)

3.3 Alarm and Shutdowns

3.3.7 Provision shall be made for the highest rating possible specially for standby pump start and shutdown switches.

3.4 Instrumentation

3.4.1 Thermometers

3.4.1.1 Thermocouples shall also be mounted at the outer oil drain line from each seal. The Vendor may elect to mount the thermocouples directly into the bearing metal instead of the oil outlet. Thermocouples shall be type J with stainless steel material. Minimum wire size shall be 0.519 mm². (Mod.)

3.4.4 Pressure gages

3.4.4.1 Differential pressure gages shall be furnished for:

- a) oil filters
- b) seal oil differential for each compressor casing or pressure level in the system. (Mod.)

4. INSPECTION AND TESTING

4.1 General

The Vendor shall operate a quality management system to ensure that the technical requirements of this Standard are achieved. Purchaser may require demonstration of the quality system, but this may be waived if the system has been verified recently by an accreditation scheme acceptable to purchaser.

The Vendor shall ensure that QA requirements specified in the enquiry and purchase documents are applied to all materials, equipment and services provided by sub-contractors and to any free-issue materials. (Mod.)

4.2 Inspection

4.2.1 The manufacturer shall furnish assurance by means of appropriate certificates that the materials of construction used for all pressure vessels, pressure containing parts and other specified equipment or components are in accordance with the requirements of the purchase order.

All certificates shall contain the following information :

- Name of manufacturer
- Purchase order number and date
- Manufacturer's order number
- Identification number of certificate and its date of issue
- Material specification(s)
- Dimensions in SI units
- Material charge number, batch number or heat-lot number
- Chemical composition recorded from results of chemical analyses
- Mechanical properties recorded from test results
- NDT methods and results, where applicable
- Heat treatment procedures, furnace charge number and heat treatment records, where applicable
- Such supplementary or additional information as may be required (Mod.)

4.3 Testing

4.3.1 General

4.3.1.3 The purchased oil system shall be used during the shop testing of the main equipment. (Mod.)

4.3.2 Hydrostatic tests

4.3.2.1 Wetting agent shall be added to water whenever it is used as test liquid. (Mod.)

4.3.3 Optional tests

4.3.3.1 Satisfactory operation of all instruments and auxiliary equipment on the lube and seal oil console shall be demonstrated, including the main and standby pumps, control and relief valves, alarm and other safety devices and/or switches and the overall integrity of the system. (Mod.)

4.3.3.5.8 Transient conditions shall be continuously recorded in the form of chart showing pressure, overhead tank level versus time. (Add.)

4.4 Preparation for Shipment

4.4.2.2 Unless otherwise specified, the rust preventive to exposed machined exterior surfaces shall be of a type:(1) to provide protection during outdoor storage for period of twelve months exposed to a severe industrial environment, and (2) to be removable with mineral spirits or any recommended solvent. (Sub.)

4.4.2.9 Parts with a wall thickness in excess of 5 mm, except those items manufactured from austenitic stainless steel or from nickel alloys, shall be legibly marked by hard-die stamping on to a painted background, and at a point clearly visible later. Pipes should be marked at a point approximately 250 mm from one end.

Only low-stress stamps shall be used for hard-die stamping, and the stamps shall be round-nosed with a minimum radius of 0.25 mm.

For items manufactured from austenitic stainless steel or from nickel alloys, and for items with a wall thickness of 5 mm or less, the marking shall be applied by stencil using a water insoluble ink which contains no injurious substances such as metallic pigments, sulfur, sulfides or chlorides which could attack or harmfully affect the material.

The stamping/markings as a minimum shall include:

- manufacturer's symbol; the stamp shall be identical to symbol on certificate;
- material and product identification;
- size and schedule. (Mod.)

5. VENDOR'S DATA

5.1 Proposal

5.1.1 Add following statement to item I:

Vendor's proposal for spare parts shall include proposed method of protection from corrosion during shipment and subsequent storage. (Mod.)

5.1.2 Vendor shall state type of rust preventive to be applied to interior surfaces of components and piping. (Add.)

5.2 Contract Data

5.2.1 General

5.2.1.1 All drawings and other data shall be in accordance with specific requirements. Additional drawings required to completely define the unit and accessories being furnished shall be supplied in time. (Mod.)

5.2.3 Data

5.2.3.5 Parts drawings or sketches shall be attached to facilitate material handling and identification. (Mod.)

APPENDICES**APPENDIX A****TYPICAL SCHEMATICS OF SYSTEM COMPONENTS AND COMPLETE SYSTEM****A.1 GENERAL NOTES**

A.1.1 The schematics and legend of API standard 614 shall comply except as modified or supplemented otherwise in this standard specification.

**APPENDIX B
LUBRICATION, SHAFT SEALING, AND CONTROL - OIL SYSTEM DATA SHEETS**

B.1 SI Units data sheets shall comply, unless otherwise specified.

**APPENDIX C
VENDOR DRAWING AND DATA REQUIREMENTS**

C.1 All specified requirements of API standard 614 shall comply except as modified or supplemented in this standard specification.

**APPENDIX D
PIPE COMPONENTS - NOMINAL SIZE**

The purpose of this Appendix is to establish an equivalent identity for the piping components-nominal sizes in Imperial system and SI system.

TABLE D-1

NOMINAL SIZE		NOMINAL SIZE		NOMINAL SIZE		NOMINAL SIZE	
DN (1)	NPS (2)	DN	NPS	DN	NPS	DN	NPS
15	½	100	4	500	20	1000	40
20	¾	125	5	600	24	1050	42
25	1	150	6	650	26	1100	44
32	1¼	200	8	700	28	1150	46
40	1½	250	10	750	30	1200	48
50	2	300	12	800	32	1300	52
80	3	400	16	900	36	1500	60
90	3½	450	18	950	38	1800	72

1 Diameter nominal, mm.

2 Nominal pipe size, inch.

**APPENDIX E
PIPE FLANGES PRESSURE TEMPERATURE RATING**

The purpose of this Appendix is to establish an equivalent identity for the pipe flange nominal pressure temperature ratings in Imperial system and SI system.

TABLE E-1

PN (1)	PSIG (2)
20	150
50	300
68	400
100	600
150	900
250	1500
420	2500

1 Pressure nominal , bar.

2 Pounds per square inch, gage.