TECHNICAL SPECIFICATION

LUBRICATION, SHAFT-SEALING AND CONTROL OIL SYSTEMS FOR SPECIAL-PURPOSE APPLICATIONS (AMENDMENTS/SUPPLEMENTS TO API 614)

DEP 31.29.60.32-Gen.

October 1992
(DEP Circulars 30/97 and 31/99 have been incorporated)

DESIGN AND ENGINEERING PRACTICE

USED BY

COMPANIES OF THE ROYAL DUTCH/SHELL GROUP

PREFACE

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The objective is to set the recommended standard for good design and engineering practice applied by Group companies operating an oil refinery, gas handling installation, chemical plant, oil and gas production facility, or any other such facility, and thereby to achieve maximum technical and economic benefit from standardization.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual operating companies to adapt the information set forth in DEPs to their own environment and requirements.

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APPENDICES

PART I INTRODUCTION

1.1 SCOPE

This DEP is a revision of that with the same number and title dated September 1983 and contains the minimum technical requirements for lubricating oil, seal oil and control oil supply systems for special-purpose applications. These systems may serve compressors, centrifugal pumps, special-purpose steam turbines, gas turbines, expanders, gears and electric motors.

This DEP is based on API Standard 614, second edition, January 1984. Part II of this specification amends, supplements and deletes various clauses/paragraphs of API Standard 614. Clauses of API Standard 614 which are not mentioned in this specification remain applicable as written. This specification shall be used in conjunction with the data/requisition sheet relevant to the equipment it serves. Equipment covered by this DEP shall comply with API 614, as amended and supplemented by this DEP.

1.2 DISTRIBUTION, APPLICABILITY AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by SIPM, the distribution of this document is confined to companies forming part of or managed by the Royal Dutch/Shell Group, and to Contractors and Manufacturers nominated by them (i.e. the distribution code is "F" as defined in DEP 0.00.05.05-Gen.).

This DEP is intended for use in oil refineries, chemical plants, gas plants, and exploration and production facilities.

If national and/or local regulations exist in which some of the requirements are more stringent than in this manual, the contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, economic and legal aspects. In all cases the contractor shall inform the Principal of any deviation from the requirements of this document which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the authorities concerned with the object of obtaining agreement to follow this document as closely as possible.

1.3 DEFINITIONS

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

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier/Vendor** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **Shall** indicates a requirement.

The word **Should** indicates a recommendation.

1.4 CROSS-REFERENCES

Where cross-references are made, the number of the part, section or subsection referred to is shown in brackets. All referenced standards invoked by this DEP are listed in Part III.

1.5 ACTION ITEMS

A bullet (•) in the margin before certain clauses (paragraphs) in API Std 614 indicates that alternative requirements are possible and a decision by the purchaser is required or that

further information is to be provided by the purchaser. This decision/information shall be indicated by the Principal in the space provided for in the data/requisition sheet.

In some cases these decisions have already been made by the amendment to the API clause (paragraph) in this DEP, effectively eliminating the bullet.

In other cases this DEP considers the specific option as not normally required or recommended.

In other cases this DEP does not address the specific bullet and the Principal is responsible for making the decision or providing the required information. Also, some amendments in this DEP have created additional items, where a decision from the Principal is required.

A summary of these three categories of bullets is shown below:

CATEGORY A		CATEGORY B	CATEGORY C
1.1.2	2.12.3	2.1.5	1.6.2
2.1.2	2.12.5	2.3.9	2.1.2.2
2.1.14	2.12.6	2.4.18	2.1.2.4
2.1.16	2.13.9	2.5.5	2.1.4
2.2.1	2.13.12.2	2.5.6	2.1.6
2.3.6.g	2.13.13	2.6.3	2.1.9
2.3.8	3.2.1	2.6.4	2.1.11
2.3.11	3.3.4	2.7.2	2.1.15
2.3.13	3.3.5	2.13.8	2.2.5
2.4.2	3.4.1.1	3.2.2	2.4.1
2.4.4	3.4.4.2	3.2.3	2.5.3
2.4.6	3.4.4.3	3.2.5	2.9.2.1
2.6.7	3.5.1	3.4.5.3	2.10.1
2.7.1	4.2.6	4.4.1	4.1.4
2.7.4	5.2.2.2	A.1.3	4.2.1.4
2.8.2.4	5.2.3.1		4.2.1.5.
2.9.1.2	5.2.3.2.c		4.3.1.3
2.9.1.5			5.2.2.1
2.11.1.1			5.2.3.6
2.11.3			A.1.7
			A.2 (schematics)

Category A = API paragraphs in which the bullet is effectively eliminated by this DEP.

Category B = API paragraphs in which the bullet remains but where this DEP does not recommend action by the Principal. (Consequently the data/requisition sheets do not provide specific space for decisions/information.)

Category C = Paragraphs in which the bullet remains, or where an amendment creates a 'new' bullet, requiring a decision and/or information by the Principal to be provided in the relevant space on the data/requisition sheet.

PART II AMENDMENTS/SUPPLEMENTS TO API STANDARD 614

For ease of reference, the clause (or paragraph) numbering of API Std 614 has been used throughout Part II of this specification.

SECTION 1 GENERAL

1.1 SCOPE

1.1.1 Delete this clause and replace by:

Refer to (PART I, 1.1).

1.3 CONFLICTING REQUIREMENTS

Delete this clause and replace by:

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

upper level:	purchase order and variations thereto.
second level:	data/requisition sheets and drawings.
third level:	this DEP.

1.5 REFERENCED PUBLICATIONS

1.5.1 Delete from this clause:

API Std 615: 'Sound Control of Mechanical Equipment for Refinery Services'.

NEMA MG 1 : 'Motors and Generators'.

NFPA 70 : 'National Electrical Code, Articles 500 and 501'.

Add to this clause:

The publications additional to those listed in this clause and referred to in this DEP are listed in Part III.

1.5.2 Delete this clause and refer to (Part I, 1.2).

1.6 SYSTEM SELECTION

1.6.1 Add to this clause:

The vendor shall base his offer on the requirements and recommendations of Appendix A. The final selection of the system shall be subject to the Principal's approval, irrespective of the schematics in the offer.

1.6.3 Add new clause:

The design of seal oil systems shall be such, that the release of process gas into atmosphere is positively prevented.

In case the process gas is not allowed to be contaminated by seal-oil, the design shall accommodate this requirement by appropriate buffering and filtration.

SECTION 2 BASIC DESIGN

2.1 GENERAL

2.1.2 Delete this clause and replace by:

NOISE

2.1.2.1 Noise Control

The Contractor shall comply with DEP 31.10.00.31-Gen. and thereby communicate to the Vendor the specified equipment noise limitations by using data sheet DEP 31.10.00.94-Gen., which forms part of the requisition. The Vendor is responsible for assuring that these equipment noise limitations have been specified.

2.1.2.2 Information to be Submitted with the Tender

The Vendor shall submit guaranteed sound power levels and sound pressure levels of the equipment, together with any other relevant information as requested in the data sheet, DEP 31.10.00.94-Gen. The Vendor shall indicate what special silencing measures, if any, are proposed in order to meet the specified levels.

2.1.3 Add to this clause:

In this specification various components are required to be provided in stainless steel. In this respect stainless steel shall be either AISI 316 L or AISI 316 Ti stainless steel only or appropriate equivalents according to internationally accepted standards.

The use of any other stainless steel of the AISI 300 series is subject to the specific approval of the Principal.

Oil system components covered by this clause are :

- strainers (2.3.6.i)
- reservoirs (2.3.14)
- accumulators (2.8.2)
- overhead tanks (2.9.1.1)
- run-down tanks (2.9.2.1)
- degassing drums and collecting drums (2.12.1)
- piping (2.13.12)
- flanges (2.13.12.2).

2.1.4 Add to this clause:

Separate lube-oil and seal-oil systems are required if one or more of the following is applicable:

a) The equipment served by the seal-oil system handles gases containing H_2S and/or other corrosive or hazardous gases (as indicated by the Principal on the data/requisition sheet).

b) A steam turbine driver is specified as main equipment driver. In this case the control oil for the turbine shall be taken from the lube-oil system. If applicable, control oil for compressor control shall also be taken from the lube-oil system.

c) ALL of the following conditions apply:

1) The main driver is an Electric Motor.
2) The main driver is lubricated from the compressor lube-oil system.
3) The process gas is flammable.
4) The system includes a degassing tank (in accordance with 2.12 of this specification), which returns the contaminated seal-oil direct into the main reservoir after degassing.

d) When specified by the Principal.

2.1.6 Add to this clause:

If specified by the Principal, the system shall also have sufficient turn-down capabilities to accommodate operation of part of the equipment served.

2.1.8 Add to this clause:

Start-up, parallel pump operation and "off-design" conditions (as indicated in the order) shall be accommodated without affecting the mechanical integrity of the various components in the system or exceeding its cooling capacity; this is particularly important in high pressure systems.

Furthermore, the controllability of the system shall be such that the complete range of specified operating pressures and temperatures can be handled by the system in a fully automatic mode without the need for manual adjustments.

2.1.9 Add to this clause:

As a minimum the systems shall be suitable for unsheltered outdoor operation. The anticipated weather and environmental conditions shall be indicated by the Principal on the data/requisition sheets, as shall the need for any special precautions (eg "winterizing").

2.1.10 Add to this clause:

Gauges, sight glasses and other instruments shall be installed such that they are not obscured from easy access and observation.
System components and pipework shall be installed so as not to interfere with the access for operation and maintenance of any part of the equipment.

2.1.11 Delete this clause and replace by:

All electrical components and installations located on the unit shall be suitable for the area classification, gas grouping and temperature classes specified by the Principal on the data/requisition sheet.

2.1.14 Replace this clause by:

Oil systems which are executed in pressure class ANS # 900 and above shall have, as a minimum, double block valves in the following services:

a) Pump discharge
b) Cooler vents on the oil side (ref. 2.5.7)
c) Filter vents (ref. 2.6.1)
d) Level gauges in pressurized services
e) Isolation valves of control valves and instruments which are to be serviced during full pressure operation of the system.

2.1.15 Commence this clause with:

Unless otherwise specified by the Principal,...

2.1.16 Add to this clause:

Rundown tanks should be used for emergency lube-oil supply. If the appropriate sizing of a rundown tank becomes impractical, an emergency lube-oil pump, including a separate single filter, should be applied. Emergency lube-oil pumps shall be driven from an uninterruptable emergency power supply.

The design of seal oil systems shall be such that, upon seal oil supply failure, uncontrolled release of process gas from reference gas lines into the atmosphere (via empty oil lines) is positively prevented.

2.2 BASEPLATES

2.2.1 Add to this clause:

The oil system shall be arranged in a single package, unless impractical in size.

2.3 OIL RESERVOIRS

2.3.1 Add to this clause:

Components such as pumps, coolers and filters shall not be top-mounted but shall be mounted on a common baseplate with the reservoir. Only a degassing drum or a contaminated seal oil collecting tank may be mounted on top of the main reservoir.

Pumps and drivers shall not be mounted on an unsupported section of the baseplate.

2.3.6 Features and appendages

Replace clause g) by:

g) Venting provisions to prevent overpressurizing of both lube-oil and seal-oil reservoirs in the event of gross leakage of the compressor seals. These vents shall be sized to handle the calculated gas flow or one standard pipe size larger than the respective main oil return lines, whichever is greater.

Since the reservoir vents must be directed outside the immediate area of the oil systems, it shall be the responsibility of the vendor of the oil systems to size the vents and to provide the flanged connections; however, the vent lines themselves and the required overpressure protection devices shall be supplied by the contractor. The design of the Nitrogen purge on the reservoir shall take this device into account.

Add new paragraph i):

i) A permanent coarse stainless steel filter in the reservoir at the suction locations of the pumps. The mesh openings shall be between 3 and 10 mm.

2.3.8 Heating

Replace in the first sentence of this clause

"When required by the vendor or specified by the purchaser," by:

"If the specified minimum ambient temperature is lower than the minimum lube- and/or seal-oil temperature required by the manufacturer for starting the oil system and/or the equipment it serves,..."

Add to this clause:

Electrical heaters shall be provided with a thermostatic temperature control and a separate over-temperature trip. Heaters shall also trip on low level of the oil reservoir.

2.3.10 Add to this clause:

The two connections required by this clause shall not be threaded but shall be welded and flanged and provided with blind flanges.

2.3.11 Provisions for oil conditioner

Delete from this clause:

In the first sentence: "When specified by the purchaser,".
In the second sentence: "When specified by the purchaser,".

2.3.13 Special features

Replace in this clause:

"When specified by the purchaser," by "When the top of the reservoir is 1 m or more above grade, .. "

2.3.14 Replace the first sentence by:

Unless otherwise specified by the Principal, reservoirs and all appendages shall be stainless steel.

2.4 PUMPS AND DRIVERS

2.4.2 Add to this clause:

Unless otherwise specified by the Principal, couplings shall be flexible all-metal non-lubricated disk or membrane type with spacer.

2.4.3 Add to this clause:

Mechanical seals shall have a balanced face design.

2.4.4 Add to this clause:

Rotary positive displacement pumps are normally required. Pumps shall be of the horizontal type, and should operate at 1500 or 1800 rev/m. Pumps shall have steel or nodular iron (ASTM A 395) casings and have a flange rating of ANS # 300 class or higher.

If centrifugal pumps are specified, they shall conform to DEP 31.29.02.30-Gen.

2.4.5 Replace the last sentence of this clause by:

Electric Motors shall conform to DEP 33.66.05.31-Gen.

2.4.6 Delete this clause and replace by:

Steam turbines shall conform to DEP 31.29.60.30-Gen. and shall be equipped with a NEMA class A oil relay governor, as specified in API 611.

Steam turbines shall not be used for driving stand-by pumps.

2.4.7.1 Add to this clause:

All capacity requirements of this clause shall be met with only one pump in operation. Accumulators shall not be used to meet the transient oil capacity requirements.
If the main oil pump is shaft driven, the pump capacity shall be sufficient to meet the requirements of this clause at minimum operating speed of the main equipment.

2.4.7.3 Add to this clause:

Pumps shall be able to mechanically operate at 100 °C oil temperature and corresponding viscosity.

2.4.8 Add to this clause:

Centrifugal pump drivers shall be sized according to DEP 31.29.02.30-Gen.

2.4.11 Add to this clause:

Relief valves shall be installed in an upright vertical position.

Relief valve discharge lines shall be individually routed back to the main oil reservoir and shall be provided with a flow indicator, which shall be installed above the highest oil level in the main reservoir.

2.4.15 Replace by:

See (2.3.6.i)

2.4.18 Add to this clause:

The use of booster pumps requires the explicit approval of the Principal.

2.5 COOLERS.

2.5.3 Replace the 5th sentence of this clause by:

Shell-and-tube coolers shall conform to DEP 31.21.01.30-Gen.

Add to this clause:

When air-coolers are specified, they shall conform to DEP 31.21.70.31-Gen.

2.5.4 Delete this clause and replace by:

Cooler materials shall conform to DEP 31.21.01.31-Gen.

2.5.7 Add to this clause:

Vents on the oil side shall be valved and provided with a return line and flow indicator back to the reservoir. Vents on the water side and all drains shall be flanged, valved and provided with blinds.

2.6 FILTERS

2.6.1 Add to this clause:

Lubricating oil shall be filtered to 25 micrometer absolute or finer; control and seal oil to 10 micrometer absolute or finer.

The filter vents shall be valved and provided with a return line and flow indicator back to the reservoir.

Filter drains shall be flanged, valved and provided with blinds.

2.6.3 Replace the first two sentences of this clause by:

Filter cartridge materials shall be water and corrosion resistant. The application of stainless steel filter elements is subject to the approval of the Principal.

2.6.7 Delete from this clause:

"When specified by the purchaser,"

2.7 TRANSFER VALVES

2.7.1 Add to this clause:

Only individual transfer valves (Figure A 17) shall be used.

2.7.4 Replace the last sentence of this clause by :

In systems ANS 900 # class and above, spectacle blinds shall be used for tight shut-off purposes.

2.8 ACCUMULATORS.

2.8.2 Replace the first sentence of this clause by:

Accumulators shall be of the bladder type. The vessels shall be made of stainless steel. Pre-charge of the bladders shall only be done with dry nitrogen. The pre-charge pressure shall be indicated on the vessel.

2.8.2.4 Replace this clause by:

If the specified minimum ambient temperature is lower than the minimum oil temperature required by the manufacturer for proper functioning of the oil system, the accumulator shall be equipped with thermostatically controlled electrical tracing and insulation.

2.8.4 Add to this clause:

Accumulators shall be provided with a block valve and a drain valve to permit removal during operation of the oil system.

2.9 OVERHEAD TANKS

2.9.1 Seal oil tanks

2.9.1.1 Replace the last sentence of this clause by:

Unless otherwise specified by the Principal, the tank shall be stainless steel.

Add to this clause:

Overhead tanks shall be insulated and heat traced (either electrically or by steam).

2.9.1.2 Change in the first sentence of this clause:

"3 minutes" into "8 minutes"

2.9.1.3 Delete this clause and replace by :

Overhead seal-oil tanks shall be designed in accordance with the design code indicated by the Principal on the data/requisition sheets. If the ASME code is selected, they shall comply with DEP 31.22.20.31- Gen. If the BS 5500 code is selected, they shall comply with DEP 31.22.10.32-Gen.

2.9.1.4. If the overhead tank is isolated from the seal oil by a bladder accumulator, replace c) in this clause by:

c) For oil systems with a pressure rating of ANS class 600 maximum a full length level gauge arrangement, which covers from 25 mm above the high-level alarm (or trip) to 25 mm below the rundown level. Level gauge arrangements shall be in accordance with the requirements of DEP 31.38.01.11-Gen. For systems executed in ANS class 900 and above, the manufacturer shall provide an alternative level instrument arrangement suitable for the prevailing pressure rating. Proposals are subject to the approval of the Principal.

Add to this clause:

Plate-type level gauges are not allowed. Magnetic type level gauges shall be used.

2.9.1.5 Delete this clause and replace by:

If the specified gas(es) contains abrasive or corrosive elements or elements that negatively affect the oil properties (see NOTE below), the seal oil overhead tank shall be separated from the seal oil supply line by one or more bladder-type accumulators in accordance with fig. A 14.

The bladder material shall be fully compatible with the process gas.

NOTE: It is impossible to state precise allowable levels in this specification. In all cases the Principal shall be consulted.

2.9.2 Lube-oil tanks

2.9.2.1 Replace the last sentence by:

Unless otherwise specified by the Principal, the tank shall be stainless steel.

Add to this clause:
Run-down tanks serving steam turbines shall be insulated and heat traced (either electrical or by steam) to bearing oil supply temperature.

2.9.2.2 Add to this clause:

The bottom outlet connection of emergency lube oil run-down tanks shall extend at least 25 mm inside the vessel in order to retain foreign matter. In addition a flush mounted 1 inch flanged drain connection shall be provided.

2.9.2.3 Delete this clause and replace by:

If pressurized tanks are specified, they shall comply with the requirements of 2.9.1.3.

2.11 SEAL-OIL DRAIN TRAPS

2.11.1.1 Delete this clause and replace by:

Drain traps shall be automatic and shall discharge oil and liquids and vent the separated gas without operator interference.

2.11.3 Delete from this clause:

"When specified by the purchaser, "

2.12 DEGASSING DRUM

2.12.1 Delete this clause and replace by:

Unless otherwise specified by the Principal, degassing facilities shall be provided if the contaminated seal oil does not contain corrosive elements and can be restored to original 'clean' reservoir conditions by degassing only. Proven types are required. The manufacturer shall provide references in his proposal.

The drum and internals shall be made of stainless steel.

If corrosive elements or any other constituents which may affect a proper degassing of the contaminated oil are present, a collecting tank for the contaminated seal oil shall be supplied instead of degassing facilities.

The tank shall be sized for at least the quantity of three days' seal oil consumption. With the exception of the heater and the nitrogen degassing arrangement (2.12.2), the collecting tank shall comply with all requirements for degassing drums.

Unless otherwise specified by the Principal, degassing drums and sour seal oil collecting tanks shall be designed for a minimum pressure of 3.5 bar (ga).

If separate seal oil recovery facilities are specified, packaged seal oil recovery units shall be supplied.

These units, typically comprising a combined oil heating and vacuum stripping system, are subject to the approval of the Principal.

The oil recovery unit shall utilize the same utilities as the oil system and its design shall comply with the overall oil system requirements.

As far as practical, the unit shall be designed not to remove essential additives from the oil.

2.12.2 Add to this clause:

In order to enhance liquid-gas separation, the degassing drum shall be provided with an inert gas (nitrogen) purge arrangement, which consists of a perforated ring line on the bottom of the tank.

2.12.3 Replace the first sentence of this clause by:

Unless otherwise specified by the Principal, an electrical immersed heater shall be provided to assist in degassing the oil.

2.12.5 Delete from the second sentence in this clause:

"When specified by the purchaser,"

2.12.6 Delete from this clause:

"When specified by the purchaser,"

2.13 PIPING

2.13.3 Add to the clause:

f) Avoidance of pockets, traps, etc which may accumulate debris and prevent thorough flushing and drainage.
g) Headers shall terminate with blind flanges to accommodate flushing and/or cleaning.

2.13.4 Add to this clause:

All flange connections shall be made with stud bolts. Unless otherwise specified by the Principal, studs shall conform to ASTM A 193, Grade B7.

2.13.9 Delete from the second sentence of this clause:

"When specified by the purchaser,"

2.13.12 Delete this clause and replace by:

All oil and gas piping shall be stainless steel. This includes the supply and drain piping parts connected to the main equipment casing or bearing housing.

2.13.12.1 Delete this clause and replace by:

Schedule 40 shall be used as a minimum for pipe sizes DN 80 (3 in.) and smaller. For larger sizes Schedule 10 shall be used as a minimum. Connections shall be welded and/or flanged.

Tubing and tube fittings shall not be used.

2.13.12.2 Delete this clause and replace by:

Amended per Circular 30/97

Unless otherwise specified by the Principal, stainless steel weld neck flanges, RF, with spiral wound gaskets, shall be used for all flanged connections. Flange facing finish shall be in accordance with ASME/ANSI B16.5.

2.13.13 Delete this clause.

2.13.14 Replace the second sentence of this clause by:

Welded fittings shall be butt welded; socket welding shall not be used.

2.13.16 Delete this clause and replace by:

Except for instrument connections, threaded connections shall not be used.
Flanges shall be in accordance with ANSI B16.5. Socket-welded constructions shall not be used.

2.13.17 Delete this clause and replace by:

If threaded connections are used (for instrument connections only, see 2.3.16) they shall not be seal welded.

SECTION 3 INSTRUMENTATION, CONTROL, AND ELECTRICAL SYSTEMS

3.1 GENERAL

3.1.2 Delete this clause and replace by:

Amended per Circular 31/99

Unless otherwise specified by the Principal, all on-skid instrumentation, instrument piping and cabling shall be supplied by the vendor. Instrumentation of overhead and run-down tanks is included.

The scope of instruments shall include pressure and temperature indicators, pressure and level transmitters, level switches, thermocouples and/or RTD's for the indication, control, alarm and/or shut-down functions in 3.3.1 of this specification. Instruments shall be installed and lined up to a common junction box on the edge of the baseplate.

Instruments make and type shall be subject to the approval of the Principal and/or shall be choosen from a list of acceptable instruments, which will be provided by the Principal.

If the supply of above instrumentation is deleted by the Principal on the data/requisition sheets, only the instrumentation considered to be an integral part of the equipment shall be supplied by the vendor. Furthermore only the various instrument connections and level indicators, as specified in 3.3.1 of this specification, are required.

For instruments and connections to instruments, see DEP 32.31.00.32-Gen. and DEP 32.31.09.31-Gen.

3.1.4 Delete this clause.

3.1.7 Delete this clause.

3.2 INSTRUMENT GAUGE BOARDS AND PANELS

3.2.1 Replace the first sentence of this clause by:

If specified by the Principal, a gauge board and/or a panel shall be provided for the system.

3.3 ALARMS AND SHUTDOWNS

3.3.1 Delete this clause and replace by:

Unless otherwise specified by the Principal, the vendor shall furnish as a minimum the following for indication, alarm and/or shut-down purposes:

a) for pressure indication: (valved and flanged connections required)

- discharge of lubricating oil and seal oil pumps (upstream of discharge valves)
- control oil, if applicable.
- differential across lubricating oil and seal oil filters
- lubricating oil at the bearings
- seal oil at seals
- downstream of each pressure controller
- gas reference pressure
- seal liquid to gas reference differential.

b) for temperature indication: (thermowell connection required)

- lubricating oil and seal oil at inlet and outlet of lube and seal oil coolers
- lubricating oil and seal oil reservoirs at pump suction location
- degassing drum

c) for level indication: (including valved and flanged level indicator)

- lubricating oil/seal oil reservoir
- contaminated seal oil separators
- seal oil overhead tank
- degassing drum or collecting tank

d) for alarm and/or cut-in of stand-by pumps:(connections required as under (a),(b),(c))

- low lubricating oil/control oil pressures
- high lubricating oil temperature downstream of cooler
- low level in seal oil overhead tank*
- high level in seal oil overhead tank*
- high seal oil temperature downstream of cooler
- low level in seal oil reservoir
- low level in lubricating oil reservoir
- seal liquid (in seal ring cavity) to gas reference differential pressure **
- low level lube oil emergency rundown tank
- high level contaminated seal oil separators

e) for shut-down: (connections required as under (a),(b),(c))

- low-low lubricating oil pressure
- low-low level in seal oil overhead tank *
- high-high level in seal oil overhead tank in the case where no accumulator is installed
- low-low seal liquid to gas reference differential pressure **

* In the case of liquid film seals
** In the case of mechanical contact seals

Separate connections shall be provided for each of above functions.

3.3.2 Delete this clause.

3.3.3 Delete this clause.

3.3.4 Delete this clause.

3.3.5 Delete this clause.

3.3.6 Delete this clause.

3.4 INSTRUMENTATION

3.4.1 Thermometers

3.4.1.1 Delete the first two sentences of this clause and replace by:

Temperature indicators shall conform to DEP 32.31.09.31-Gen.

3.4.2 Level switches

Delete this clause and replace by:

Displacer operated type level switches shall not be used. Level switches shall conform to DEP 32.31.09.31-Gen.

3.4.3 Thermowells

Delete from this clause :

..."except those located in atmospheric drain lines"...

Add to this clause:

Thermowells shall be installed in accordance with DEP 31.38.01.11-Gen.

3.4.4 Pressure gauges

3.4.4.1 Delete this clause

3.4.4.2 Replace this clause with:

Pressure gauges shall conform to DEP 32.31.09.31-Gen. 3.4.4.3

Delete this clause

3.4.5 Flow indicators

3.4.5.1 Add to this clause:

Flow indicators shall have a stainless steel body.

3.4.5.2 Delete in this clause:

"preferably"

Add to this clause:

Flow indicators which consist of a threaded type sight glass in the drain line shall not be used. Flow indicator sight glasses shall be made of non-flammable permanently transparent material.

Flow indicators shall be mounted outside noise enclosures.

3.5 ELECTRICAL SYSTEMS

Delete this section and replace by:

All electrical equipment shall be in accordance with the relevant DEPs stated in the order.

SECTION 4 INSPECTION, TESTING, AND PREPARATION FOR SHIPMENT

4.2 INSPECTION

4.2.1 Delete this clause and replace by:

The manufacturer shall provide the purchaser with assurance that all materials of construction are in accordance with the purchase order and its related documents.

The requirements for material certificates giving the chemical composition and the mechanical properties and test data for the materials used for the fluid-containing parts of the oil system are as follows:

4.2.1.1 The following types of material certificates shall be used by the manufacturer to demonstrate that the requirements of the specification and contract are met.

TYPE A

Certificates by which the manufacturer confirms that the supplied product corresponds to what was specified, on the basis of test results taken from the in-production testing of products of the same material and the same manufacturing method as the delivery concerned.

TYPE B

Certificates by which the manufacturer's inspector confirms that the supplied product corresponds to what was specified, on the basis of tests carried out on the delivery itself or on standard-specified test specimens related to the delivery.

The necessary testing shall have been carried out by a independent testing centre which shall not form part of the production department in the manufacturing works. It shall report directly to the management of the company. It shall have the necessary facilities at its disposal.

TYPE C

Certificates as described under Type B with the additional requirement that the tests shall be witnessed by an independent inspector who shall be approved by the Principal. Type C Certificates shall only be valid when stamped and signed by this independent inspector.

4.2.1.2 Type "A", "B" and "C" certificates shall contain the following information as a minimum:

- name of material manufacturer
- purchase order number and date
- identification number of certificate and its date of issue
- material specification (including class, grade and heat treatment condition, where applicable)
- dimensions in SI units
- name, job title and signature of the person authorising the certificate
- any supplementary or additional information as may be required by the purchase order

Additionally, type "B" and "C" certificates shall state:

- material charge number, batch number or heat lot number or other references required to demonstrate that the testing and inspection has been performed on the required number of test units
- test and inspection results

Additionally, type "C" certificates shall state:

- name of independent inspection company
- name of independent inspector who has witnessed the test(s)
- this independent inspector's identification symbol and signature

4.2.1.3 As a minimum, material certificates in accordance with Type A are required for pressure-containing components with a MAWP of 20 bar (ga) or below.

4.2.1.4 As a minimum, material certificates in accordance with Type B are required for pressure-containing components with a MAWP above 20 bar (ga) and for components as indicated

by the Principal on the data/requisition sheet.

4.2.1.5 If specified by the Principal, Type C material certificates are required for the components indicated under 4.2.1.4.

4.2.1.6 Material certificates shall also comply with the requirements of the relevant standards and codes, unless otherwise specified by the Principal.

4.2.6 Delete from this clause: "When specified"

4.2.8 Insert new clause:

MARKING

4.2.8.1 Marking is required for components parts certified under a Type B or C certificate; see (4.2.1.4) and (4.2.1.5).

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 place clearly visible later. Pipes should be marked at a point approximately 250 mm from one end.

Only low-stress stamps (dot-type or round-nosed with a minimum radius of 0.25 mm) shall be used for hard-die stamping.

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, sulphur, sulphides or chlorides which attack or harmfully affect the material.

4.2.8.2 The stamping/marking shall include:

- material manufacturer's symbol and, where applicable, the independent inspector's symbol; these symbols shall be identical to the symbols on the material certificate
- material and product identification
- heat, charge or batch number to relate to the certificate
- heat treatment symbol or code, where applicable
- NDT symbol or code, where applicable
- size and schedule
- hydrostatic test pressure in bar, where applicable

NOTE: Where the size of the part does not permit complete marking, the identification marks may be substituted by a unique code which shall be fully traceable to the material certificate for the item.

4.4 PREPARATION FOR SHIPMENT

4.4.1 Add to this clause:

Preparation for shipment shall be in accordance with the requirements of the order.

SECTION 5 VENDOR'S DATA

5.1 PROPOSALS

Add to this clause under a):

The relevant data/requisition sheet(s) and API data-sheets (SI units) shall be completed to the fullest possible extent.

5.2. CONTRACT DATA

5.2.2 Drawings

5.2.2.1 Add to this clause:

The information shall include the documents for controls and instrumentation as specified in DEP 32.31.09.31-Gen.

The required number of copies of drawings and the time within which these have to be submitted shall be specified in the order.

As a minimum the following drawings (listed in Appendix C) are required for review and approval: 1 to 11.

5.2.2.2 Delete in the 1st and 2nd sentence:

"If specified by the purchaser,"

5.2.3. Data

5.2.3.1 Delete from this clause:

"When specified by the purchaser,"

5.2.3.2.c Delete from this clause:

"When specified by the purchaser,"

5.2.3.6 Delete from this clause:

"When specified by the purchaser,"

Add to this clause:

The required extent, frequency and details of reporting shall be specified in the order.

APPENDIX A TYPICAL SCHEMATICS OF SYSTEM COMPONENTS AND COMPLETE SYSTEMS

A.1 GENERAL NOTES

A.1.3 Add to this clause:

In general the manufacturer's recommendation is required in the proposal. If strong reasons exist to apply direct acting control valves, a detailed description shall be included.

A.2 LEGEND FOR SCHEMATICS

Add to this sub-section:

Drawings for approval and final drawings shall use the symbols for instrumentation in accordance with DEP 32.10.03.10-Gen.

SCHEMATICS

Figure A- 1	:	Refer to 2.1.4
Figure A- 2	:	The incorporation of booster pumps is only allowed if approved by the Principal.
Figure A- 3	:	Option A- 3b is required.
Figure A- 4A	:	Shall be used.
Figure A- 4B	:	Shall not be used.
Figure A- 8	:	Note 3: Accumulators shall be bladder type. (A-15)
Figure A-10	:	Note 2: Accumulators shall be bladder type. (A-15)
Figure A-11	:	Note 6: High temperature alarms in the oil drain lines are not required. General: Irrespective of the coupling type a coupling guard drain line, including FG, shall be provided.
Figure A-12	:	Option A-12d is required.
Figure A-13A	:	Option A-13a is required.
Figure A-13B	:	This arrangement should not be used.
Figure A-14	:	Option A-14c is required for separate seal oil systems. Option A-14a and-b to be replaced by LSHH trip of main compressor driver if direct contact type overhead tank is used. Option A-14d: FC action required. Note 5: a valved and flanged vent is required.
Figure A-15	:	Option A-15a is required, located as high as possible in the shell.
Figure A-16	:	Deleted.
Figure A-17	:	Option A-17c, TAH alarm, is required.
Figure A-18	:	Deleted.
Figure A-19	:	Deleted.
Figure A-20	:	Option A-20b is required for oil systems executed in ANS pressure class # 900 or above.
Figure A-22	:	Option A-22f required in accordance with chapter 3.5. The drain connection shall be minimum 2 inch size.
Figure A-23B	:	Shall not be used.
Figure A-23C	:	Shall be used. Option A-23d is required.

Note: Each instrument installed in the pressure measurement line shall have its own dedicated isolation and bleed valve.

PART III REFERENCES

**Amended per
Circular 30/97**

In this DEP, reference is made to the following publications:

NOTE: Unless specifically designated by date, the latest edition of each publication shall be used, together with any amendments/supplements/revisions thereto.

SHELL STANDARDS

Index to DEP publications and standard specifications	DEP 00.00.05.05-Gen.
Noise control	DEP 31.10.00.31-Gen.
Data/requisition sheet for equipment noise limitation	DEP 31.10.00.94-Gen.
Shell-and-tube heat exchangers	DEP 31.21.01.30-Gen.
Selected materials for shell-and-tube heat exchangers	DEP 31.21.01.31-Gen.
Air cooled heat exchanger equipment	DEP 31.21.70.31-Gen.
Pressure vessels (Amendments to BS 5500)	DEP 31.22.10.32-Gen.
Pressure vessels (Amendments to ASME VIII)	DDD 31.22.20.31-Gen.
Centrifugal pumps	DEP 31.29.02.30-Gen.
General-purpose steam turbines	DEP 31.29.60.30-Gen.
Piping-General requirements	DEP 31.38.01.11-Gen.

**Amended per
Circular 31/99**

Instrumentation symbols and identification on Process Engineering Flow Schemes	DEP 32.10.03.10-Gen.
Instruments for measurement and control	DEP 32.31.00.32-Gen.
Instrumentation for equipment packages	DEP 32.31.09.31-Gen.
Electric motors	DEP 33.66.05.31-Gen.

AMERICAN STANDARDS

Lubrication, Shaft-Sealing and Control Oil Systems for Special- Purpose Applications	API Std 614

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