DEP SPECIFICATION

ROTARY-TYPE POSITIVE DISPLACEMENT COMPRESSORS (AMENDMENTS/SUPPLEMENTS TO API 619)

DEP 31.29.40.32-Gen.

February 2011
(DEP Circular 63/11 has been incorporated)

DESIGN AND ENGINEERING PRACTICE

DEM1

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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for dry and flooded helical lobe rotary compressors.

This DEP is based on API 619, 5th edition, December 2010. Part III of this DEP amends, supplements and deletes various clauses and paragraphs of API 619.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual DEM 1 – Application of Technical Standards.

This is a revision of the DEP of the same number dated January 2010; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process should be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP 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, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that 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** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. 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 capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Very toxic (substances)	substances that are very hazardous for the environment or human health

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1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets. Other documents referenced by this DEP are listed in (Part IV).

1.5 SUMMARY OF MAIN CHANGES

The previous edition of this DEP was dated January 2010. This revision has been extensive and it is impractical to summarise the changes here.

1.6 COMMENTS ON THIS DEP

Comments on this DEP may be sent to the Administrator at standards@shell.com, using the DEP Feedback Form. The DEP Feedback Form can be found on the main page of "DEPs on the Web", available through the Global Technical Standards web portal http://sww.shell.com/standards and on the main page of the DEPs DVD-ROM.

1.7 DUAL UNITS

Amended per
Circular 63/11
Dual units have been incorporated throughout this DEP.

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

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PART II GENERAL

Part III of this DEP is written as amendments and supplements to API 619, fifth edition, December 2010. Wherever reference is made to API 619, it shall be understood to mean API 619, fifth edition, December 2010, as amended/supplemented by this DEP.

For ease of reference, the clause numbering of API 619 has been used throughout Part III of this DEP.

Clauses in API 619, which are not mentioned in this DEP, shall remain valid as written.

A bullet (•) in the margin against certain clauses in API 619 indicates that a decision by the Principal is required. This DEP addresses the decisions required by most of the API 619 bullet clauses. The remaining decisions shall be indicated directly on the relevant data/requisition sheet when provisions are made for them; otherwise they shall be indicated on the data/requisition sheet(s) under the heading 'Additional Requirements' or stated in the purchase order.

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PART III AMENDMENTS/SUPPLEMENTS TO API 619

1. SCOPE

Replace the first sentence of this clause by:

See Part I, section 1.1 of this DEP.

2. NORMATIVE REFERENCES

Add to this clause:

Standards referenced by this DEP are listed in (Part IV).

Add new clause:

4.5 CONFLICTING REQUIREMENTS *:*

Replace this clause by

In the event of conflict between documents relating to the enquiry or purchase 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

5. BASIC DESIGN

5.1 GENERAL

5.1.1 *In this clause, replace the words* "at least 3 years" *by* "at least 5 years".

Add to this clause:

If the Vendor proposes to supply prototype equipment or novel components then the quotation shall state that the offered equipment is a prototype and it shall be accompanied by sufficient data for the Principal to thoroughly investigate its suitability for the intended duty.

NOTE: Equipment is not considered to be prototype if at least 3 units of similar type and size have each accumulated an uninterrupted operating time of at least 8000 hours in a duty similar to that pertaining to the enquiry in question.

5.1.3 *Add to this clause:*

The number of casings specified in the data/requisition sheet shall be reviewed by the Vendor, and any changes agreed in writing with the Purchaser.

5.1.7 *Add to this clause:*

The Manufacturer shall specify the operating limits of the compressor with respect to pressure and temperature, for both running & non-running pressurized conditions.

5.1.8 *Add to this clause:*

Provision shall be made for complete venting and draining of the system or systems.

5.1.10 *Add to this clause:*

a) All left-handed threads shall be clearly marked.

b) Any maintenance item with a mass greater than 20 kg (44 lb) should be provided with lifting lugs or similar dedicated fixed lifting point(s). Screw-in eye-bolts may be used only for bearing housing covers and for internal components where other lifting arrangements are impractical. Holes for eye-bolts shall be permanently marked with the correct bolt size to be used. If this marking is impractical, bolt size information shall be clearly indicated in the instruction manual.

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5.1.13 *Add to this clause:*

Throughout the service life specified in (5.1.1), spare parts for all components of the unit shall be available for purchase and all manufacturing drawings shall be retained.

5.1.16 *Delete the words* "If specified"

5.1.17 *Delete the words* "If specified"

5.1.18 *Replace this clause by:*

All electrical components and installations SHALL [PS] be suitable for the area classification, gas grouping and temperature classes specified by the Principal in the data/requisition sheets.

5.1.19 *Replace this clause by:*

Information to be submitted with the tender

The Manufacturer 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 Manufacturer shall indicate what special silencing measures, if any, are proposed in order to meet the specified levels.

If noise enclosures are supplied, the full access to the equipment for operations and maintenance purposes shall be ensured by means of an appropriate design.

5.1.21 *Delete the words* “jointly by the purchaser and”

5.1.22 *Add to this clause:*

If specified in the data/requisition sheets, for offshore installations, the total compression package shall be suitable for the worst ambient offshore conditions, as specified for that location. Compressor units, including auxiliaries, which are installed on floating stations or barges shall be capable of operating at the specified static vessel positions and also of accommodating any specified dynamic vessel movement while in operation.

5.1.26 *Insert new clause:*

The use of liquid injection into the gas stream to control the discharge temperature and/or to prevent fouling requires the explicit approval of the Principal.

5.1.27 *Insert new clause:*

For variable-speed drive, the Manufacturer shall state the minimum allowable speed of the compressor, and shall include in his proposals a suitable safeguarding system.

5.1.28 *Insert new clause:*

The process gas discharge temperature at the normal operating point shall be at least 20°C (36 °F) below the maximum allowable temperature.

5.1.29 *Insert new clause:*

For reference purpose the physical properties of the process gas (Cp/Cv, molecular weight etc.) may be given on the data/requisition sheets in order to facilitate the compressor calculations. However, the Manufacturer shall base his performance calculations on the gas composition as stated in the data/requisition sheets.

The Manufacturer shall calculate the performance of all proposed compressors using his standard methods for computing the physical properties of the specified gases. The Manufacturer shall specify the values of all physical properties of the process gas used in his computations

Manufacturer shall perform dew point analysis for various operating cases and gas compositions specified in the data sheets and confirm that no condensation of hydrocarbons from the process gas nor water would occur during the process of compression & cooling. Dew point calculations shall be submitted for review.

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5.2 PRESSURE CASING

5.2.7 *Add to this clause*

If specified, relief valves on the oil separator shall be furnished by the Vendor

5.2.8 *Add to this clause:*

Nodular cast iron (only in accordance with ASTM A 395 or ASTM A 571) is an acceptable material for flammable or toxic service. Other materials require the written approval of the Principal.

Grey cast iron shall not be used.

5.2.10 *Add to this clause:*

Gasket materials shall be asbestos free and suitable for the gas handled. Soft metal gaskets are preferred.

5.2.12 *Add to this clause:*

Amended per Circular 63/11

Shim packs for vertical alignment shall be between surfaces that do not have relative movement. Shim packs shall have a total thickness of at least 5 mm (3/16 in) and shall be made of stainless steel. The maximum number of shims under each foot is 3.

5.2.15 *Replace this clause by:*

Overlay, cladding or plating shall not be applied unless approved by the Principal.

5.3 CASING CONNECTIONS

5.3.2 *Add to this clause:*

All casing openings for pipe connections shall be welded to the casing and flanged or, alternatively, machined and studded. All welded connections shall be full penetration butt welded. Openings smaller than DN 25 (NPS 1) may be self-reinforced branch fittings of the 'weldolet' type.

Threaded connections shall not be used. Socket welding shall not be used, except where other connection methods are not possible and then only with the approval of the Principal.

For wet gas duties, the suction shall be on the top and the discharge on the bottom.

5.3.6 *Replace this clause by:*

Auxiliary connections shall be in accordance with (5.3.2).

5.3.7 *Replace this clause by:*

A pipe nipple, preferable not more than 150 mm (6-1/8 in) long, shall be used for all auxilliary connections which are welded to the compressor. Pipe nipples shall be at least Schedule 80

5.3.8 *Replace this clause by:*

The pipe nipple shall be provided with a welding-neck flange.

5.3.11 *Replace this clause by:*

For casings containing process gas, openings that are not connected to piping shall be provided with a blind flange.

5.3.13 *Replace the words* "cast iron" *by* "nodular cast iron".

5.3.15 *Replace this clause by:*

Flat-faced flanges may be used only on nodular cast iron casings and shall have full raised-face thickness.

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5.4 EXTERNAL FORCES AND MOMENTS

5.4.1 *Replace the last sentence of the first paragraph by:*

For each main process nozzle, the Manufacturer shall furnish in tabular format the following data:

- the maximum allowable forces and moments and combinations thereof for satisfactory continuous operation;
- the maximum allowable forces and moments and combinations thereof under transient conditions such as start-up and (emergency) shut-down;
- expected nozzle movements due to thermal expansion between the cold static and normal full load operating conditions;
- any expected movement in addition to the above as a result of transient conditions.

5.5 ROTATING ELEMENTS

5.5.1 Rotors

5.5.1.1 *Replace this clause by:*

Rotor stiffness shall be adequate to prevent contact between the rotor bodies and the casing and between gear-timed rotor bodies at the most unfavourable specified conditions including 110% of the relief valve set pressure. Rotors and shafts shall normally be manufactured from one piece.

For non-corrosive duties, rotors of built-up construction may be used. Rotor bodies not integral with the shaft shall be permanently attached to the shaft to prevent relative motion under any condition. Structural welds on rotors shall be full-penetration continuous welds and shall be stress relieved in accordance with the material specification.

5.5.1.6 *Add to this clause:*

The corners of keyways shall have radii of at least 1.5 mm (1/16 in).

5.5.1.7 *Insert new clause:*

Seal strips shall be integral with the rotor bodies unless otherwise approved by the Principal.

5.6 SHAFT SEALS

5.6.1 General

5.6.1.6 *Replace the word* “should” with “shall”

5.6.1.7 *Add to this clause:*

The type of shaft seal shall be specified on the data/requisition sheets. Liquid Film type seals shall not be specified.

5.6.3 Shaft seals for dry screw compressors

5.6.3.3 Mechanical (contact) type

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