

**THE FOLLOWING PARAGRAPH NUMBERS REFER TO API 617, SIXTH EDITION, FEBRUARY 1995  
WHICH IS A PART OF THIS PRACTICE**

**SECTION 1 - GENERAL**

**1.1 SCOPE**

- |     |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| I   | a. | (Exception) This practice covers axial compressors in process air service.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| I   | b. | All requirements specified in this practice are additions to those of <b>API 617</b> unless specifically noted as exceptions. Paragraph numbers in this practice which do not appear in <b>API 617</b> are new paragraphs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| I   | c. | <b>An asterisk (*)</b> indicates that a decision by the purchaser is required or that additional information is furnished by the purchaser.<br><b>Note:</b> A <b>bullet (•)</b> is shown in <b>API 617</b> indicating that a purchaser's decision is required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| I   | d. | The following references are synonymous: BP and IP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| O,R | e. | <b>Vendor Qualification.</b> Compressor systems shall be supplied by <b>vendors qualified by experience in manufacturing the units proposed.</b> To qualify, the vendor must have manufactured at the proposed point of manufacture, at least two compressors of comparable speed, power rating, and discharge pressure. These compressors must have been in service for at least one year and be performing satisfactorily. Also see <b>Par. 1.1h.</b><br><br>Alternatively, the vendor may satisfy this <b>experience requirement on an individual component and service condition basis.</b> Experience need not be concentrated in a single compressor, but may be spread through several operating compressors. To qualify, each of these compressors must have been in service for at least one year and be performing satisfactorily.<br><br>The <b>critical areas relative to service conditions</b> which must be demonstrated to the satisfaction of the Owner's Engineer include, but are not limited to the following: <ol style="list-style-type: none"> <li>1. Pressure</li> <li>2. Volumetric capacity</li> <li>3. Power rating</li> <li>4. Speed</li> <li>5. Temperature</li> </ol> The <b>critical areas relative to mechanical design</b> which must be demonstrated to the satisfaction of the Owner's Engineer include, but are not limited to the following: <ol style="list-style-type: none"> <li>1. Sealing system</li> <li>2. Bearing design and loading</li> <li>3. Number of stages and staging arrangement</li> <li>4. Casing size and design</li> <li>5. Casing joint design</li> <li>6. Rotor dynamics</li> <li>7. Blade and disk mechanical design and performance</li> <li>8. Material selection</li> <li>9. Power transmission components - design and arrangement</li> </ol> |
|     | f. | In the area of component mechanical design, the vendor must show that each component has operated under the same conditions as those of the proposed compressor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|     | g. | Compressors manufactured under a license agreement shall carry the <b>licenser's written guarantee.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| *   | h. | Where the vendor qualification requirement of <b>Par. 1.1e</b> prevents the application of the latest technology, the vendor shall submit a <b>second alternative proposal</b> incorporating such features for evaluation by the Owner's Engineer. The proposal shall specifically identify the undemonstrated features and state their advantages.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

|                  |           |                                          |                                                                                   |
|------------------|-----------|------------------------------------------|-----------------------------------------------------------------------------------|
| <b>IP 10-3-4</b> |           | <b>Axial Compressors for Air Service</b> |  |
| Page 2 of 7      |           |                                          |                                                                                   |
| Rev. 0           | June 1997 |                                          |                                                                                   |

(This practice is appropriate for attachment to Inquiry or Purchase Document)

(This practice is appropriate for attachment to Inquiry or Purchase Document)

1.5

## REFERENCED PUBLICATIONS

- I 1.5.3  
\* a. **Table 1** lists the practices and standard which shall be used with this practice.  
b. **Table 2** lists the practices and standard which shall be used with this practice as specified by the purchaser.

**TABLE 1**

| PRACTICES                  |                                                                                                   |
|----------------------------|---------------------------------------------------------------------------------------------------|
| IP 2-1-1                   | Equipment Noise Level Data Requirements                                                           |
| IP 3-16-1                  | Flanged Joints, Gaskets, and Bolting                                                              |
| IP 10-11-1                 | Sizing of Drivers and Transmissions for Compressors, Fans, and Pumps                              |
| IP 10-12-1                 | Vibration, Axial-Position, and Bearing-Temperature Monitoring Systems for Compressors and Drivers |
| IP 10-14-1                 | Lube and Seal Oil Systems for Machinery                                                           |
| IP 18-12-1                 | Positive Material Identification                                                                  |
| IP 20-1-1                  | Inspection of Equipment and Materials                                                             |
| STANDARD                   |                                                                                                   |
| <b>API Standard</b><br>617 | Centrifugal Compressors for Petroleum, Chemical, and Gas Industry Services                        |

**TABLE 2**

| PRACTICES                              |                                                                     |
|----------------------------------------|---------------------------------------------------------------------|
| IP 10-7-2                              | Special Purpose Steam Turbines                                      |
| IP 10-8-1                              | Combustion Gas Turbines                                             |
| IP 10-10-1                             | Special Purpose Gear Units                                          |
| IP 15-1-2                              | Instrumentation for Compressors and Drivers                         |
| IP 15-7-1                              | Electric Power Branch Circuit Design for Instrumentation            |
| IP 15-7-2                              | Protective Systems                                                  |
| IP 15-11-1                             | Instrument Control Panels                                           |
| IP 16-9-1                              | Low Voltage A-C Motors Up to 200 HP (150 kW)                        |
| IP 16-9-2                              | A-C Motors: Medium Voltage and Low Voltage Over 200 HP (150 kW)     |
| IP 18-6-1                              | Impact Requirements for Materials                                   |
| STANDARD                               |                                                                     |
| <b>ASTM Standard</b><br>A 488 / A 488M | Steel Castings, Welding, Qualifications of Procedures and Personnel |

## SECTION 2 - BASIC DESIGN

2.1

### GENERAL

O,C

2.1.3

**For constant speed compressors**, the specified capacity shall be guaranteed with the understanding that the head shall be within +5% and -0% of that specified; the power shall not exceed stated power by more than 4%. These tolerances are not additive. See **Par. 4.3.6.1.4**.

O \* 2.1.4 The rise in pressure ratio from normal capacity to the surge point at normal speed shall not be less than that specified.

I,R

\* 2.1.9

- a. **Compressors and auxiliaries** shall be suitable for **outdoor installation**.  
b. **Compressors and auxiliaries** shall be winterized for the **climatic zone** specified.

E,I

2.1.10

**Noise.** Compressor vendors shall submit noise emission data for the quoted machine with their proposal per **IP 2-1-1**.



**Documents**

Document Sharing Hub

- R 2.1.19 The following spare parts shall be furnished for and delivered with each axial compressor:
- Rotor.
  - Set of stator blades. Blades to be installed in carriers if such design is available.
  - A fully instrumented set of bearings (radial and thrust).
  - Shaft seals.
  - Renewable labyrinths and other seal types for all internal close clearance points.
- If two or more axial compressors are duplicates, a single set of spares will suffice.
- 2.3 INTERSTAGE DIAPHRAGMS AND INLET GUIDE VANES
- I a. (Exception) **API Paragraphs 2.3.1 through 2.3.5 are deleted since they are not applicable and are replaced by the following Subpar. b.:**
- R b. ROTORS AND STATORS-BLADING
- Campbell Diagrams for the blades of each stage** shall be submitted to purchaser for review by the Owner's Engineer. The diagrams shall show fundamental (natural) blade frequencies and their first harmonics in bending, edgewise, torsional and coupled modes over the range of excitation sources.  
  
**The operating speed range considered** shall be 10% below minimum operating to 10% above maximum continuous speed, and natural frequency corrections reflecting actual operating temperatures and speeds shall be shown. These diagrams, if based on theoretical calculation and prediction shall be verified within 6 months of receipt of an order, by actual blade test data. The data shall represent a sample of the testing of at least 25% of the number of blades installed in each stage of the proposed machine.
  - Sources of excitation for rotating blades** shall include but not be limited to: the first and second harmonics of blade and nozzle passing frequencies, the first ten compressor speed harmonics, meshing frequencies in geared units, and periodic impulses caused by nozzle segment design. **Sources of excitation for stationary blades** shall include but not be limited to: the first and second harmonics of blade passing frequencies.
  - Goodman Diagrams for all blades** shall be submitted to purchaser for review by the Owner's Engineer.
- 2.4.2 CASING CONNECTIONS
- I 2.4.2.2 (Exception) Flanges shall be per [IP 3-16-1](#).
- 2.4.3 AUXILIARY CONNECTIONS
- M 2.4.3.8 Casing shall have features that permit direct visual inspection of the first stage compressor blading.
- 2.6 ROTATING ELEMENTS
- I,R 2.6.2 **Coupling hubs** shall be **removable** and **nonkeyed (tapered bore, hydraulically fitted)**.
- I 2.6.7 (Exception) **This API paragraph as well as API Paragraphs 2.6.8, 2.6.9, and 2.6.10 are deleted since they are not applicable.**
- 2.7 BEARINGS AND BEARING HOUSINGS
- 2.7.1 GENERAL
- I 2.7.1.2 **Thrust and radial bearings** shall be fitted with **bearing metal temperature sensors** per [IP 10-12-1](#).
- 2.7.4 BEARING HOUSINGS
- I 2.7.4.2 (Exception) All compressors shall have drive end bearing housing shaft seals on the coupling side to prevent oil leakage toward the coupling.
- I 2.7.4.7 The **probe installation** shall be as specified in [IP 10-12-1](#).
- 2.8 SHAFT SEALS
- I,R \* 2.8.3 **Shaft seals** shall be of the **labyrinth type**.
- 2.9 DYNAMICS
- 2.9.2 LATERAL ANALYSIS
- O,R \* 2.9.2.1 The vendor shall provide a **stability analysis** considering all **sources of cross coupling**.