

## TECHNICAL BULLETIN

### API (AMERICAN PETROLEUM INSTITUTE) GUIDELINES FOR COMPRESSORS OPERATING ON CARBON DIOXIDE OR HYDROGEN SULFIDE

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#### HYDROGEN SULFIDE (H<sub>2</sub>S)

##### **15.3.1 Concentrations Of H<sub>2</sub>S Of Up To 2% By Volume**

15.3.1.1 General. Unless otherwise specified by the purchaser, the manufacturer's standard materials will be utilized in the compressor, cooling system and package. All metal gaskets shall be soft iron and all O-rings shall be suitable for the intended service.

##### **15.3.2 Concentrations Of H<sub>2</sub>S From Greater Than 2% And Up To 5% By Volume**

15.3.2.1 General. All the requirements of Paragraph 15.3.1 shall be followed plus the requirements in paragraphs 15.3.2.2 thru 15.3.2.9

15.3.2.2 Carbon Steel Parts. Unless otherwise specified by the purchaser, the hardness of carbon, low alloy and 12 CF steel parts which come in contact with the process gas stream shall not exceed Rockwell C22. The yield strength of these parts shall not exceed 90,000 psi.

15.3.2.3 Piston Rod. A precipitation hardened stainless steel piston rod or 4140 steel piston rod annealed to C22 with hardening in the packing area either by chrome plating or tungsten carbide coating shall be provided. A NACE material equivalent piston rod shall be provided when specified by the purchaser.

15.3.2.4 Compressor Valves. Compressor valves will be of the manufacturer's standard material.

15.3.2.5 Packing and Piston Rings. Packing and piston ring material shall either be non-metallic or contain no copper bearing metals.

15.3.2.6 Distance Piece. Unless specified otherwise by the purchaser, the manufacturer's standard distance (Type 1 or Type 2) shall be furnished.

15.3.2.7 Piping and Vessels. All process piping, pulsation drums, scrubbers and coolers will comply with NACE MR-01-75 and shall have a minimum 1/16" corrosion allowance.

15.3.2.8 Instrumentation. All instrumentation that comes in contact with the process stream (liquid level controls, shutdowns, bourdon tubes, process valving, relief valves etc.) shall be suitable for corrosive gas service.

15.3.2.9 Vents and Drains. All vents (including crankcase breather) and drains shall be piped to the edge of the skid.

### **15.3.3 Concentrations of H<sub>2</sub>S From 5% By volume and Greater**

15.3.3.1 General. All the requirements of Paragraphs 15.3.1 and 15.3.2 shall be followed plus the requirements in Paragraphs 15.3.3.2 thru 15.3.3.8.

15.3.3.2 Compressor Valves. Compressor valve seats and guards shall be stainless steel or ductile iron. Metallic plates shall be stainless steel.

15.3.3.3 Distance Piece. Unless specified otherwise by the purchaser a long distance piece (\*Type 3 – See Paragraph 2.9.1) with pressure packing between the distance piece and the compressor frame shall be furnished.

15.3.3.4 Compressor Bolting. All compressor cylinder and distance piece bolting, which comes in contact with the process gas stream, shall conform to ASTM A-193-B7M.

15.3.3.5 Piping and Vessels. Unless otherwise specified by the purchaser, all process piping pulsation drums, scrubbers and cooler headers will be 100% radiographed and post heat-treated and shall be a minimum 1/8inch corrosion allowance. Threaded connections over 3/4" inch are not allowed. 100% ASME inspection criteria is to be used.

15.3.3.6 Instrumentation. All instrumentation that comes in contact with the process stream (liquid level controls, shutdowns, bourdon tubes, process valving, relief valves, etc.) shall meet the full requirements of NACE MR-01-75 except stainless steel tubing fittings.

15.3.3.7 Purge Systems. Packing cases shall be purged with inert gas or sweet natural gas. The distance piece (Type 2 with partition packing or Type 3 if specified by the purchaser) shall be evacuated with a vacuum pump system or purged with inert gas or sweet natural gas. The purchaser should provide for a sweet gas purge of the process gas piping system.

15.3.3.8 Cooler Tubes. When water is present in the process gas stream, the gas cooler tubes shall be furnished in 304 or 316 stainless steel.

### **15.3.4 Stainless Steel Parts.**

When specified by the purchaser, austenitic or 12 CR stainless steel will be utilized in the gas piping, vessels and instrumentation components which come in contact with the process gas stream.

## **CARBON DIOXIDE**

**15.4.1 General.** The following chart and material requirements assume a wet gas phase.

### **15.4.2 Concentrations of CO<sub>2</sub> From 5% at 1200 PSIG to 50% at 400 PSIG – ‘A’**

15.4.2.1 General. Unless otherwise specified by the purchaser, the manufacturer's standard material will be utilized in the compressor, cooling system and package. All metal gaskets shall be soft iron and all O-rings shall be suitable for the intended service.

### **15.4.3 Concentrations of CO<sub>2</sub> Above 5% at 1200 PSIG to Above 50% at 400 PSIG – ‘B’**

15.4.3.1 General. All the requirements of Paragraph 15.4.2 shall be followed plus the requirements found in Paragraphs 15.4.3.2 thru 15.4.3.4.

15.4.3.2 Piston Rod. A precipitation hardened stainless steel piston rod or 4140 steel piston rod annealed to C22 with hardening in the packing area either by chrome plating or tungsten carbide coating shall be provided.

15.4.3.3 Compressor Valves. Compressor valve seats and guards shall be stainless steel or ductile iron. Metallic plates shall be stainless steel.

**15.4.4 Stainless Steel Parts** When specified by the purchaser, austenitic or 12 CR stainless steel will be utilized in the gas cooling sections gas piping, vessels and instrumentation components which come in contact with carbon dioxide and water.

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