

## **Reciprocating Compressors For General Refinery Service**

### **API Standard 618 Fifth Edition, December 2007**

**Blackmer Compliance and Clarifications for HD Vertical Compressors Only**

#### **Forward**

Blackmer vertical compressors are vertically oriented machines and horizontal compressor standards are not applicable in certain areas due to differences in machine design and characteristics. These details include vertical cold run-out, rod sag, drainage, etc.

#### **Section 6.2 - Bolting**

6.2.1, 6.2.4, 6.8.1.7-6.8.1.10 : Threads are 2A and 2B UNC for easy assembly and disassembly of machine.

6.2.3, 6.13.1.2 - Packing cases are retained by a concentric, threaded, retainer ring using spanner-type bolting. This provides the required positive alignment.

6.2.4 - Manufacturer's markings are not located on fasteners.

#### **Section 6.6 - Rod and Gas Loads**

6.6.3 - Combined rod and gas loads are calculated every 10 degree interval.

6.6.4 - Rod Load reversal is zero on single acting machines, needle bearings are used to provide adequate lubrication.

6.6.5 - The machine should not be operated 10% above maximum operating conditions.

#### **Section 6.7 - Critical Speeds**

6.7.1 - Machines have not been studied for the elimination of any lateral or torsional vibrations that may hinder the operation.

#### **Section 6.8 - Compressor Cylinders**

6.8.1.5, 6.8.2.2 - Re-boring is not permitted as cylinders are readily available and inexpensive relative to boring. All pistons are less than 10" in diameter. Vertical machines do not wear in the same manner as horizontal machines.

6.8.1.7-10, 6.9.1.10 - Compressor utilizes hex head bolts and not studs and nuts as specified.

6.8.2.3 - Cylinder bore finish is 0.8 Ra due to cast iron material design.

6.8.2.5, 6.8.2.6 - Valve covers do not have radial captured O-rings. Valve cage has center nut design.

6.8.3.4.1 - 6.8.3.4.5 - Forced-liquid coolant systems, and cooling jacket systems are not provided.

6.8.3.5 - Cooling jackets are offered in machines, but cooling jacket systems are not provided.

6.8.4.1.1 - Cylinder connections are NPS.

6.8.4.1.2, 6.8.4.1.5 - Any threaded pipe connections do not exceed 1 1/2 NPS.

6.8.4.1.6 - Pipe nipples are used only on unit assemblies.

6.8.1.4.10-13 - Plugs used are appropriately sized for the operating pressures, select units are equipped with ANSI flange connections, studs are supplied on unit assemblies.

6.8.4.2.1-3 - The HD 942 model has 2" ANSI/ASME 300# studded face flanges. The model HDL342 has 1-1/2" ANSI/ASME 600# studded faces. The model HDL362 has 1-1/2" ANSI/ASME 300# studded faces. The other HD models have either NPT connections or optional weld companion flange.

6.8.4.2.6 - Through bolt flanges are not offered.

6.8.4.2.7 - Serrated flanges are not offered.

6.8.5 - External moments and forces are not offered, piping is to be externally supported.

#### **Section 6.9 - Valves and Valve Unloaders**

6.9.1.2 - Visual unloader indicators are not offered. Indication shall be by gauge pressure in supply line or control panel light.

6.9.2.6 - Unloader actuation gas is sealed from process gas using sealing rings.

## **Section 6.11 - Crankcases, Crankshafts, Connecting Rods, Bearings, and Crossheads**

6.11.2.1 - Crankshaft ultrasonic testing is not offered.

6.11.3 - Connecting rod bolt threads are not rolled, flexloc style nuts are used instead of castle nuts with cotter pins.

## **Section 6.12 - Distance Pieces**

6.12.1.1 - Packing rings are one piece, segmented packing used in double acting 942 machine. Provisions for a buffer gas are supplied with 1/4 NPT connections. 100 and 300 series machines contain oil slingers.

6.12.2.5 - Due to the size of the compressors external connections are less than 1" NPT.

## **Section 6.13 - Packing Cases and Pressure Packing**

6.13.1.5 - Smaller machines to not employ oil wiper packing but rely on the pressure packing for sealing oil.

## **Section 6.14 - Lubrication**

6.14.1, 6.14.2.1.2,4,6 - Oil pump and flow passages are internal, no piping used except drain. System is rated for 60 psig but maximum oil pressure required is 25 psig. Lubrication in partial compliance with API 614 Chapters 1-3. Oil heaters and low pressure switches are offered. Single oil filter is offered and sufficient. Dual oil filters, pressure relief, or temperature indicator are not offered. A bayonet dipstick is included to determine oil level.

6.14.2.1.9 - The oil reservoir is not equipped with oil sight glass.

6.14.2.4 - Oil filters are spin on automotive style.

6.14.2.7 - An oil temperature regulator is not offered.

## **Section 6.15 - Materials**

6.15.1.13 - Medium Low Carbon 1018 steel is used for steel components.

6.15.1.15 - Pressure containing bolts are hex head ASTM A307 Grade 5 black oxide, socket head bolts are ANSI B18.2.1.

6.15.3.2.2-5 - Material specimens and tests are not standard but could be available at a price and delivery to be determined at the appropriate time. Each cylinder lot is accompanied with a test certificate noting tensile, yield, hardness, chemical composition, and a photo of grain microstructure. Hardness tests and readings can be done prior to cylinder assembly as a priced option.

6.15.7.2,8 - The base compressor and standard accessories do not have welded components. Refer to the proposal details for specific comments. Heat treatment of welds is completed if necessary on special baseplates.

6.15.8 - The minimum design metal temperature for ductile cast iron is -20 degrees Fahrenheit.

## **Section 6.16 - Nameplates and Rotation Arrows**

6.16.2,3 - Machine can operate in either direction. Material is aluminum not stainless steel.

6.16.4,5 - Nameplate information does not include rated speed and stroke.

6.16.6 - Final inertia of rotating assembly is not supplied.