LB161 TEARDOWN SLIDES

Each slide has a descriptive paragraph. Each paragraph has the main points outlined so reading the full text word for word is not necessary when presenting the slides.

There are two topics at the end, Literature, and Tools. These two topics have no slides but should be discussed.

This set consists of 19 slides; the narration consists of 10 pages including this cover.

#1 BLACKMER LB161

Title Slide

#2 LB161 COMPRESSOR

- **Suitable for many applications**
- **Liquid transfer/vapor recovery of:**
  - **propane**
  - **butane**
  - **ammonia**
- **Transfer without contamination**
- **Up to 90 GPM (340 lpm)**
- **Driven by 5 or 7½ HP motor at 650 to 800 RPM**

The LB161 Compressor is suitable for many applications but the most common is the transfer and vapor recovery of liquefied gases such as propane, butane and ammonia. The non-lubricated cylinder design of the LB161 allows the transfer of these products without contamination of the products and is capable of transferring up to 90 gallons per minute (340 lpm). Typically the LB161 is driven by a 5 or 7½ HP driver in the 650 to 800 RPM range. This unit is more fully described in Blackmer bulletins #501 and #901.

#3 NAMEPLATE

- **Model number**
- **Serial number**
- **I.D. number**
- **Piston rod inspection**
- **Have numbers handy when calling for assistance**

On the side of every Blackmer Compressor is a name plate which doubles as an access opening for piston rod inspection. This name plate will show the model number and the serial number of the compressor. Newer models also have an I. D. number. This is a coded number that fully describes the construction of the machine. Any time you call your Blackmer distributor or the factory for assistance, be sure to have these numbers handy.

#4 PRESSURE GAUGES

* **Suction & discharge**
* **Pulsation dampener - extends gauge life & makes it easier to read.**

Blackmer compressors are typically fitted with a pressure gauge on both the suction and discharge. In this picture the pressure gauge, elbow and the pulsation dampener are shown. The pulsation dampener eliminates much of the vibration of the pressure gauge needle making it easier to read and extending the life of the pressure gauge.

#5 VALVE CAPS AND HOLD DOWN SCREWS

* **Cap gasket - an O-ring on newer units, a metal gasket on older units**
* **Screws are removed with a spanner**

To gain access to the valves, the valve caps must be removed. Note the O-ring under each valve cap. This O-ring is typically Buna-N although PTFE, FKM, or Neoprene are occasionally used. Older units will have a metal gasket under the valve cap. The gasket will be either aluminum or iron. The O-rings (or gaskets) under the cap are not normally reusable. After the valve caps have been removed, the valve hold down screws can be removed with an adjustable spanner with ¼" pins or a flat ¼" bar.

#6 VALVES

* **Liquid relief device - ball & spring**
* **Post**
* **Valves**
* **Valve gaskets - usually aluminum**
* **Always replace gaskets**

With the hold down screws removed, the valve posts and valves may be taken out. The suction valve is shown on the left. The suction valve post contains a liquid relief device that helps protect the compressor in case liquid enters the cylinder area. This device consists of a ball and spring relief valve which will allow liquid to be returned to the suction piping if necessary. The discharge valve is held in by a post that slides into the top of the valve. Please note the valve gaskets as well. These gaskets are normally aluminum although other materials are occasionally used. Valve gaskets should be replaced anytime the valves are removed.

#7 CYLINDER HEAD

* **Two center head bolts have metal gaskets**

To remove cylinder head, unbolt the two center head bolts from the top of the head and four head bolts from the corners of the head. The two center head bolts have metal gaskets. These gaskets (aluminum or iron) are not normally reusable. After the cylinder head bolts have been removed the head may be lifted off the cylinder.

#8 HEAD 0-RINGS AND PISTON NUT

* **Head O-rings - not normally reusable**
* **Remove piston nut with spanner wrench**
* **Spanner has ¼" pins**

The head is sealed to the cylinder with four O-rings (usually Buna-N). O-rings seal each cylinder and both center head bolts and are not normally reusable. The piston nut is removed with an adjustable spanner as shown. This spanner has two ¼" pins which fit into holes in the top of the piston nut.

#9 PISTON

* **Unscrew piston with same spanner**
* **Washer & shims are under piston**
* **Shims adjust deck height**
* **3 rings & expanders on each piston**
* **Ring gap is 180° from expander gap**
* **Ring gaps should be staggered around the piston**
* **Bevel on inside edge of ring faces up**
* **Piston nut has plastic insert**

Once the piston nut has been removed, the same spanner can be used to unscrew the piston from the rod. Under each piston there is a thick washer and one or more adjustment shims. These shims adjust the height of the piston in the cylinder. This is called the deck height. Unless a major part like a piston, cylinder, or crosshead has been changed, the deck height should never need adjustment. Once the first piston has been removed, the crankshaft can be rotated to bring the other piston to top dead center at which time it can be removed. Each piston is fitted with three piston rings. Each ring has a stainless steel expander behind it. Note that when reinstalling the piston rings and expanders, each piston ring should be installed with its gap 180° from the expander's gap. The gaps of the piston rings should be staggered equally around the piston. Each ring has a bevel on one inside edge. This bevel should face upwards. Notice that the piston nut has a plastic insert that keeps it from backing off.

#10 CYLINDER

* **Two O-rings**
* **Passage between bores**

With the pistons removed, the cylinder can be unbolted. There are six bolts at the bottom of the cylinder. Once the cylinder has been removed the packing boxes are visible. Two O-rings seal the bottom of the cylinder. Notice the passage in the bottom of the cylinder between the bores. This allows gas to move from one cylinder to the other under the pistons as the pistons move up and down.

#11 PACKING BOX REMOVAL

* **Remove hold down screw with spanner**
* **Hold down screw has plastic insert**
* **O-rings seal bottom of packing box**

The packing boxes are secured by a hold down screw which is removed with the same adjustable spanner that was used on the piston nut and piston. Notice that the hold down screw also has a plastic insert that keeps it in place. Next the packing boxes themselves may be lifted off the rod. O-Rings seal the bottom side of the packing boxes.

#12 REMOVAL OF THE PACKING FROM THE CARTRIDGE

* **Use inside snap ring pliers on top snap ring**
* **Use screwdriver handle to depress spring**

To remove the packing from the cartridge, a pair of inside snap ring pliers is used to remove the top snap ring. The handle of a screwdriver can be used to slightly depress the packing spring to make this operation easier.

#13 ROD PACKING

* **Female packing ring on bottom**
* **V-rings**
* **Male packing ring on top**

With the snap ring out, the top washer, the spring, the middle washer and the packing can all be removed. Although not necessary, it may be easier to remove the packing if the bottom snap ring and washer are also removed as shown here. Note that the packing consists of three types of rings. One ring is a male ring, next is a series of V-rings, then a female ring. On LB161 compressors, the male ring will be at the top and the female ring will be at the bottom.

#14 CROSSHEAD GUIDE

* **Can inspect piston rods with nameplate removed**

With the nameplate removed, the piston rods and the top of the crossheads are visible. The crosshead guide is secured to the crankcase by six bolts.

#15 CRANKCASE AND CROSSHEADS

* **Gasket on left fits between crankcase & guide**
* **Access cover & gasket on right**
* **Dipstick**
* **Oil viscosity & capacity tag**
* **Connecting rod nuts are removed to take out crosshead & con rod**

With the crosshead guide removed, the crossheads/piston rods are visible. The gasket on the left fits between the crosshead guide and crankcase. This is a flat gasket that will typically need to be removed with a flat scraper. On the right is the access cover and its gasket. The oil dipstick is located in the access cover. This cover also includes a tag with the oil viscosity recommendations and capacity. The crossheads must be removed from the crankcase along with the connecting rod assembly. To do this the access cover on the side of the crankcase is removed and the nuts at the bottom of each connecting rod are removed. After the bottom cap of the connecting rod has been removed, the piston rod/crosshead and the top half of the connecting rod may be lifted off from above.

#16 CONNECTING ROD AND CROSSHEAD

- **Lubrication channels**
- **Press out wrist pin**
- **Plastic retainer plugs**
- **Never remove piston rod from crosshead**
- **Ductile iron rod**
- **Rifle drilled for wrist pin lubrication**
- **Split bearing on crank end**
- **Tabs on bearings fit in slots in rod and cap - keeps the bearing from spinning and lines up hole with rifle drilled port.**
- **Wrist pin bushing must be pressed in then honed to proper dimension**
- **Hole in bushing must line up with the rifle drilled port**
- **Keep rod caps on correct rod and oriented properly - match marks**

The connecting rod & crosshead assembly can be separated by removing the wrist pin in a bench press. Note the plastic retainer plugs on each end of the wrist pin. The piston rod and crosshead are permanently attached with a nut and a pin and should never be separated. The grooves in the crosshead are lubrication channels.

The connecting rod is made of ductile iron. A rifle drilled port connects the two ends of the connecting rod. The rod features an automotive type split bearing on the crankshaft end and a bronze bushing on the wrist pin end. Tabs on the bearings fit into slots in the rod and cap. These keep the bearing from spinning and line up the hole with the rifle drilled port. When the wrist pin bushing is replaced, it must be honed to the final dimensions after being pressed into the connecting rod. The hole in the bushing must also align with the rifle drilled port. Be certain to keep each connecting rod cap with its matching rod. The rod caps must also be oriented correctly on the rod. Match marks are provided on the rod as shown.

#17 VIEW FROM THE TOP OF THE CRANKCASE

- **Lubrication holes in bearing journals**
- **Spray nozzles**
- **Crankcase breather**

Once the connecting rods and crosshead assemblies have been removed, the crankshaft is readily visible. Note the lubrication holes on the bearing journals. Also note the spray nozzles on the crankshaft which spray oil up into the crosshead guide. A breather is fitted on top of the crankcase to prevent entry of foreign material into the crankcase but will allow any excess pressure in the crankcase to be safely vented.

#18 BEARING COVER PLATE

* **Shims adjust preload on main bearings**
* **Lip seal**

On the flywheel side of the crankcase is the bearing cover plate. Behind this plate are a series of shims which adjust the preload on the main bearings. These shims are normally reusable and the shim thickness will not have to be adjusted unless the crankshaft and/or main bearings are replaced. The bearing cover plate also contains a crankshaft oil seal.

#19 OIL PUMP

* **Top, arrows indicate direction of rotation**
* **Rotate pump cover to change direction of rotation**
* **Oil pressure gauge**
* **Oil pressure adjustment screws & locknut**
* **Oil strainer - clean when servicing**
* **Oil drain plug**

The oil pump is secured to the crankcase by six bolts. Note the word "TOP" and an arrow at the twelve O'clock position on the oil pump cover. This arrow indicates the compressor's direction of rotation. If the compressor is to run in the opposite direction, the oil pump cover must be removed and rotated 180°. The oil pressure gauge will also have to be relocated. Once this is done the word "TOP" will then again appear at the twelve O'clock position but the corresponding arrow will now point in the opposite direction. On the side of the oil pump housing is the oil pressure adjusting screw and locknut. With the locknut loosened, turning the screw in will increase the oil pressure setting while turning it out (counter-clockwise) will decrease the oil pressure setting. Once set, the lock nut can then be tightened. Beneath the oil pump is the strainer. During servicing, the strainer should be removed and cleaned. If any abnormal foreign material is noted, its source should be quickly identified to prevent reoccurrence of the problems. The oil drain plug is also visible in this view.

LITERATURE

* **Parts list**
* **Installation, operation, & maintenance manual**
* **Other instructions with valves, packing**
* **Call Blackmer distributor for literature**

Before starting work on your compressor be sure you have the appropriate literature handy. This should include the parts list and the installation operation and maintenance instructions. In addition you may have additional instruction sheets included with such items as valves and packing. If you do not have the proper literature, call your Blackmer distributor.

TOOLS

* **Standard wrenches, etc.**
* **Inside snap ring pliers**
* **Spanner wrench with ¼" pins**
* **Blackmer tool kit available**

In order to service your Blackmer compressor a suitable selection of tools must be available. You probably already have most of the standard wrenches and other tools that will be needed. Be sure you have a pair of inside snap ring pliers, and the spanner wrench with ¼" pins. Blackmer offers a complete tool kit for those who want to keep tools near the compressor.