

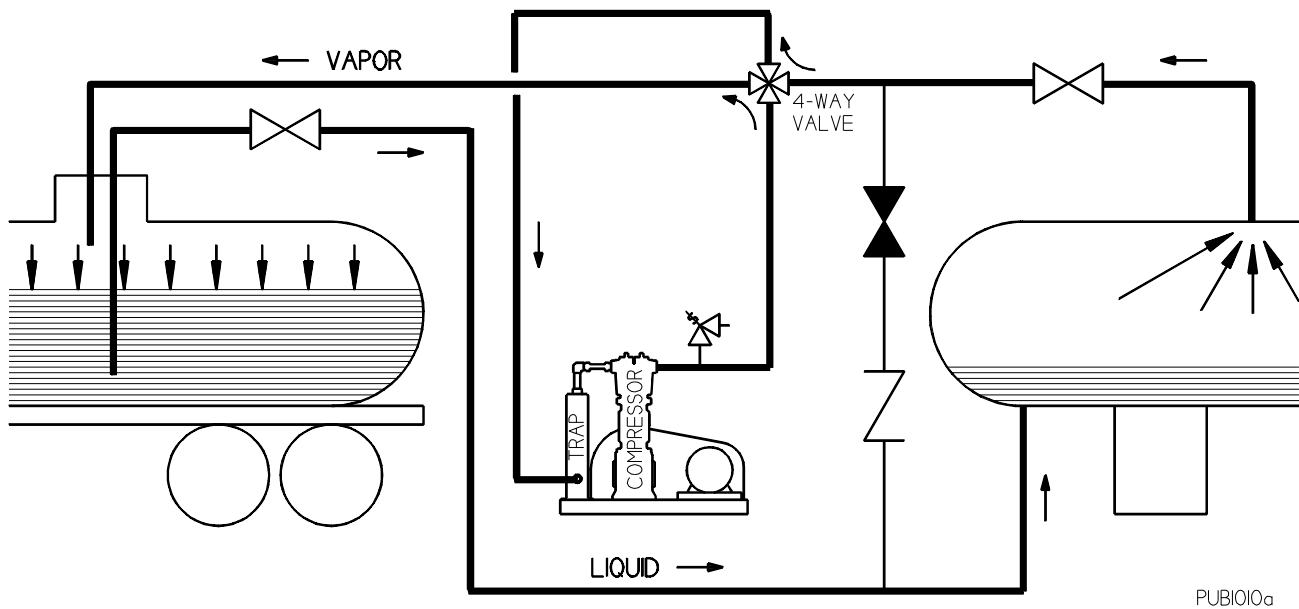
## USE A COMPRESSOR TO MAXIMIZE CO<sub>2</sub> TRANSFER RATES

Use a compressor instead of a pump to transfer liquid CO<sub>2</sub> from rail cars to trucks or storage. A compressor will transfer liquid CO<sub>2</sub> faster, with less noise and less maintenance. In addition, a compressor can go far beyond a pump's capabilities by transferring all the liquid and recovering most of the vapors from the rail car.

Pumps face severe operating conditions when confronted with drawing the liquid CO<sub>2</sub> up the dip tubes and out the top of the rail car. The poor NPSH (Net Positive Suction Head) condition and resultant cavitation seriously reduce the pump's capacity, produce high noise levels, and cause severe wear and tear on the pump. The situation becomes even worse as the pump lowers the liquid level in the rail car, further magnifying the NPSH and cavitation problems. When the pump has to call it quits, liquid will still be above the bottom of the dip tube - a considerable amount of product is still in the rail car.

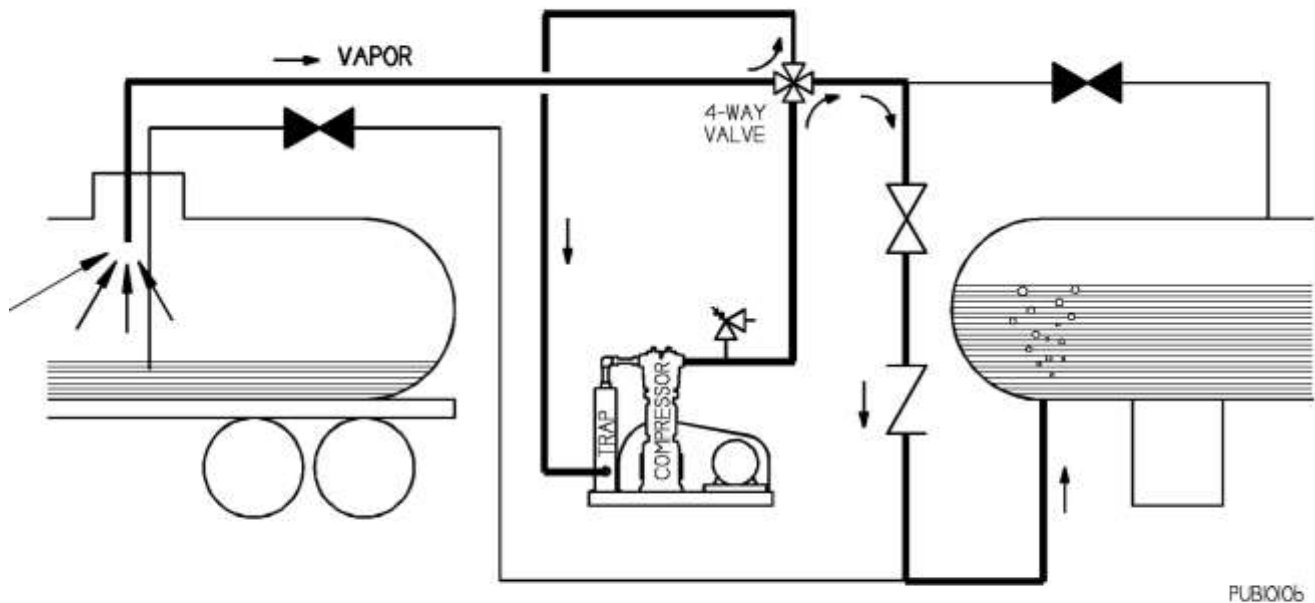
Compressors use an entirely different method to transfer the liquid CO<sub>2</sub> that totally eliminates the problems associated with liquid pumps. In addition, a compressor will transfer much more product per rail car. A CO<sub>2</sub> compressor draws vapor from the storage vessel and boosts the pressure about 30 psi (2 bar) into the top of the rail car. The increased pressure in the rail car and slightly decreased pressure in the storage vessel results in a pressure differential between the two tanks that will easily push the liquid from the rail car to storage. The compressor will continue to push the liquid out of the rail car until the liquid level falls all the way to the bottom of the dip tube. The result is a fast and quiet transfer operation with no NPSH problems or pump cavitation.

### LIQUID TRANSFER



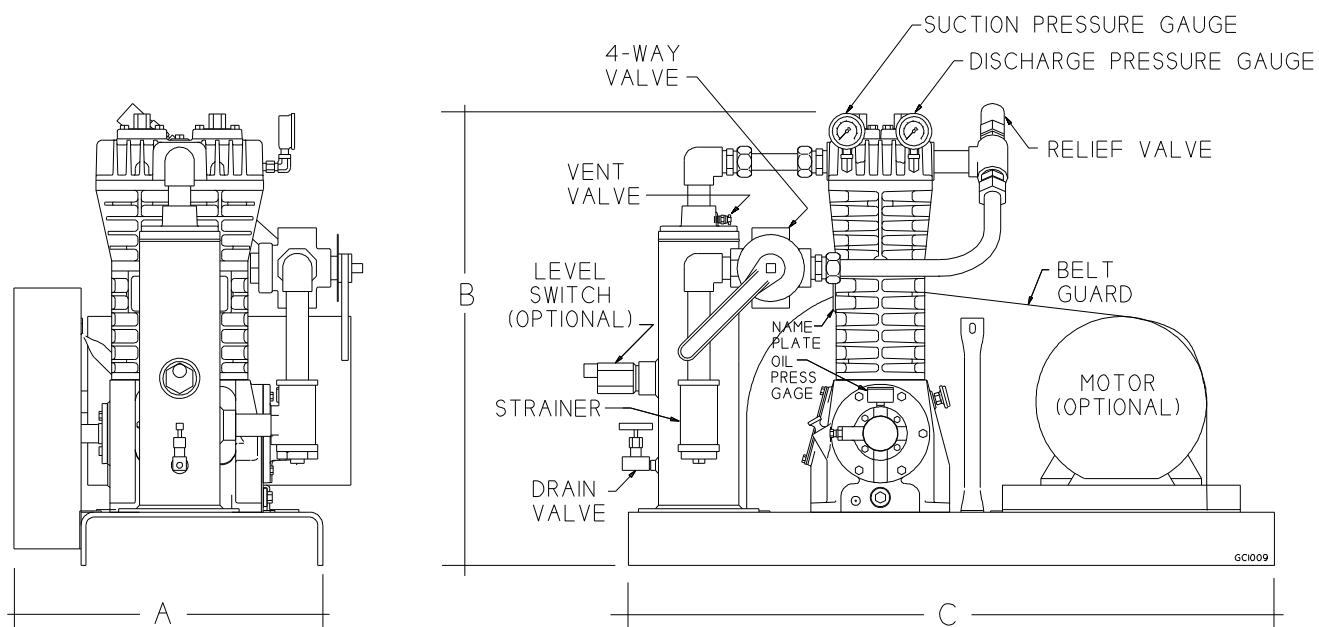
# LIQUID BOIL-OFF and VAPOR RECOVERY

## VAPOR RECOVERY



At this point a compressor really comes into its own - going far beyond any pump's capabilities. The liquid line is blocked, and the four-way valve is used to reverse the compressor's suction and discharge lines. Vapor is now drawn off the top of the rail car and pushed into the bottom of the storage vessel where it is recondensed by bubbling up through the liquid. As the vapor is removed, the liquid begins to boil off until only vapor remains. The compressor continues to remove vapor from the rail car until the pressure drops to the 150 to 200 psig (10 to 14 bar-g) range. By transferring all the liquid and most of the vapor, a compressor can recover about 97% of the rail car's total capacity - far beyond the 88% a pump typically recovers.

Two Blackmer compressor models are particularly well suited to most CO<sub>2</sub> transfer operations. The HD362-LU is a 15 HP (11 KW) compressor capable of transfer rates in the 160 to 180 gpm (600 to 680 lpm) range, while the HD602-LU (30 HP, 22 KW) will empty rail cars at over 300 gpm (1,135 lpm).



In. (mm)

| Model    | A       | B        | C        | D       |
|----------|---------|----------|----------|---------|
| HD362-LU | 23 (58) | 39 (99)  | 48 (122) | 1¼" NPT |
| HD602-LU | 25 (64) | 46 (117) | 52 (132) | 1¼" NPT |

The -LU mounting configuration includes the compressor, pressure gauges, V-belt drive with guard, inlet strainer, inlet liquid trap, and 4-way valve to allow both liquid transfer and vapor recovery operations. Numerous accessories and both larger and smaller compressor models are available to suit most any application.

|                                               | HD362                   | HD602                      |
|-----------------------------------------------|-------------------------|----------------------------|
| No. of Cylinders                              | 2                       | 2                          |
| Bore x Stroke<br>in. (mm)                     | 4.0 x 3.0<br>(102 x 76) | 4.625 x 4.0<br>(117 x 102) |
| MAWP, psia (kPa)                              | 350 (2,413)             | 350 (2,413)                |
| Piston Displacement, CFM (m <sup>3</sup> /hr) |                         |                            |
| @ 350 rpm                                     | 15.3 (26.0)             | 27.2 (46.3)                |
| @ 825 rpm                                     | 36.0 (61.2)             | 64.2 (109.0)               |
| Max. BHP (kw)                                 | 15 (11)                 | 40 (30)                    |
| Weight, lb. (kg)                              | ~365 (166)              | ~705 (320)                 |
| Inlet/Outlet Connections                      | 1.5" 300# ANSI          | 2" 300# ANSI               |

## FEATURES

Ductile Iron Head & Cylinder provide toughness & strength unmatched by cast iron.

High efficiency PEEK (Poly Ether Ether Ketone) valve plates provide extended life due to the low mass and self-lubricating qualities of the PEEK material. In addition, the slight 'give' of a plastic versus a metal plate allows it to survive more abuse and provide better sealing throughout the life of the valve.

Extra thick piston rings provide more wear surface to provide greater ring life.

O-ring head gaskets provide positive sealing under all operating conditions. No asbestos to worry about.

Double-Seal (single distance piece), and Single-Seal (no distance piece) models available.

The center head bolts do not pass through the gas chambers and thus do not require a head bolt gasket. No gasket, no leakage source!

One piece steel pistons are attached to the piston rod via one positive locking nut.

ANSI Flanged Connections allow maximum piping flexibility.

Self-adjusting PTFE piston rod seals provide maximum sealing & minimum friction.

Cast Iron crossheads feature special machined lube channels and porting for maximum lubrication and wear resistance.

Pressure lubricated crankcase via an oil pump directly driven by the crankshaft. Oil is fed to all bearing surfaces, including the crosshead. In addition, an automotive type spin-on oil filter is available.

## OPTIONS

External automotive type oil filter.

Aluminum or Stainless Steel belt guards.

Pressure Switches.

Temperature switches.

Temperature gauges.

Control panels and starters.

Liquid traps.

NPT or welded piping systems.

Repair tool kits.

Extended crankshaft.

Epoxy paint systems.

Pressure gauges - all types

Relief valves.

Shutoff Valves - Manual or powered

Motor or engine drives.

Level switches.

Inlet filters or strainers.

Spare parts kits.

