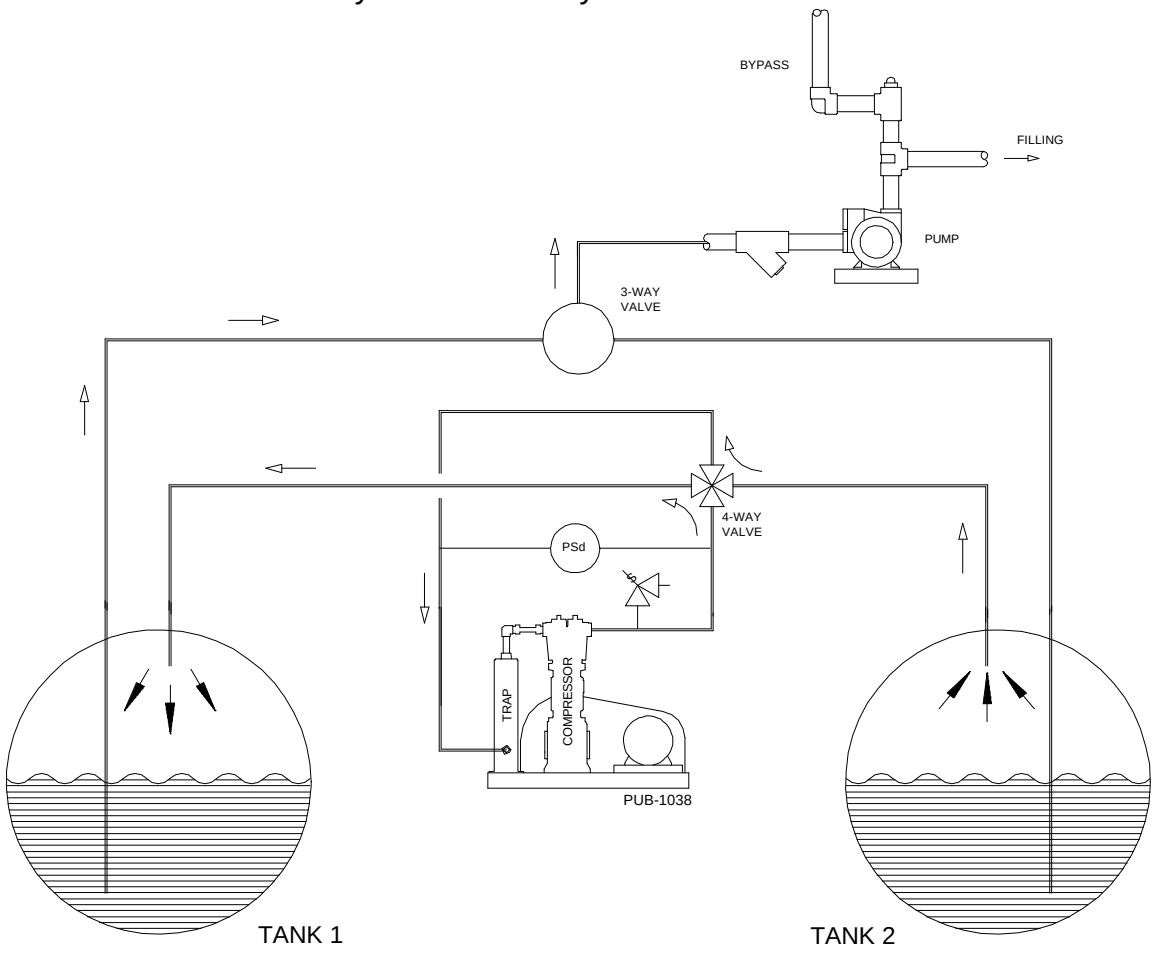
Transfer LPG From Underground Tanks With a Compressor / Pump Combination

Transfer of LPG from underground tanks with an above ground pump is difficult. Although the sliding vane design of Blackmer pumps make them the best available for this duty, pump performance will always be lower than for a pump positioned below the tank. For those difficult-suction-applications requiring high performance – continuous operation and / or high differential pressures – adding a compressor to the system may be the best solution.

The sketch below shows the layout of such a system.



System Operation:

1 Vapor is drawn from the top of Tank 2, compressed slightly and discharged into the top of Tank 1.
2 The introduction of compressed vapor into the top of Tank 1 raises its pressure and pushes the liquid in Tank 1 to the pump.
3 The pump, provided with sufficient suction head, adds the pressure needed to push the liquid to the vessel being filled.
4 When Tank 1 is empty of liquid, the positions of the 4-way valve at the compressor and the 3-way valve at the pump suction are reversed. This will then allow withdrawal of vapor from Tank 1 and transfer of liquid from Tank 2.

System Components

Compressor – The compressor is a standard LPG transfer compressor. Typically the LB161-LU or LB361-LU would be used. The –LU configuration includes a suction liquid trap, a 4-way flow reversing valve, an inlet strainer, and a baseplate with V-belt drive system. Normal piping recommendations should be followed. Compressor performance will be about the same as 'normal' applications.

Pump – The pump is a standard LGLD2 or LGLD3 pump. Piping sizes, fittings, etc. should all be the same as if an above ground tank were being used. Pump performance will be about the same as 'normal' applications.

Tanks – Two tanks are needed: one to supply vapor to the compressor, and one to supply liquid to the pump. No special fittings or access openings into the tanks are needed. Foot-valves at the bottom of the dip-tubes are not needed.

3-Way Valve – The 3-way valve is used to select which tank is to supply liquid to the pump. This valve could be replaced with two 'ON / OFF' valves if desired.

Differential Pressure Switch (PSd) – This switch is used to adjust for any capacity difference between the compressor and the pump. The switch monitors the difference between the compressor's suction and discharge pressure (the compressor's differential pressure). When the differential pressure reaches about 2 bar (30 psi) the compressor is stopped. When this pressure falls to about 0.3 bar (5 psi) the compressor is restarted.

Equipment Sizing

In general, the compressor is sized for a slightly larger nominal capacity than the pump. This will ensure that the pump always has proper suction conditions; if the compressor 'gets ahead of the pump', the Differential Pressure Switch (PSd) will stop the compressor until the pump catches up. Here is a chart of suggested equipment sizes:

Nominal Capacity	Compressor	Pump	Minimum Tank Size (each tank)
150 lpm (40 gpm)	LB161 @ 400 rpm	LGLD2 @ 420 rpm	15,000 l (4,000 gal)
190 lpm (50 gpm)	LB161 @ 490 rpm	LGLD2 @ 520 rpm	19,000 l (5,000 gal)
300 lpm (80 gpm)	LB361 @ 400 rpm	LGLD3 @ 420 rpm	30,000 l (8,000 gal)
400 lpm (105 gpm)	LB361 @ 480 rpm	LGLD3 at 520 rpm	40,000 l (10,500 gal)
490 lpm (130 gpm)	LB361 @ 580 rpm	LGLD3 at 640 rpm	49,000 l (13,000 gal)

Other Considerations

- Start the compressor first when starting the system that has been idle for some time. Allow the pressure in the liquid supply tank build, then start the pump. This process may take 5 – 10 minutes. If desired, the Differential Pressure Switch (PSd) could be used during system startup to automate this operation.
- If the pump is to operate at higher differential pressures (above 6 bar or 85 psid), decreasing the pump speed or increasing the compressor speed one selection should be considered.
- Although the flow capacity of the system will decrease as the amount of butane increases, the relative sizes of the pump and compressor need not change.