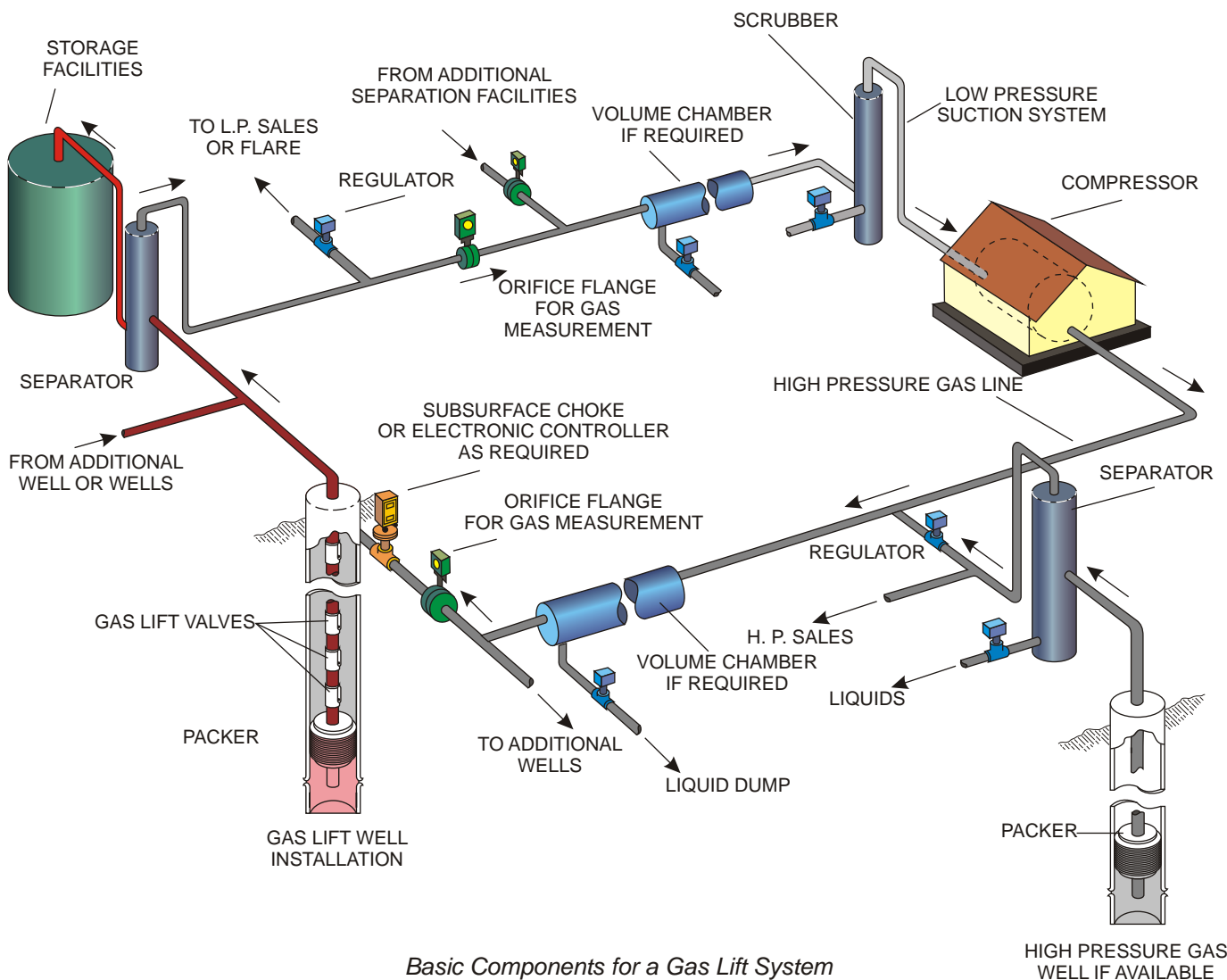


## COMPLETION SYSTEMS

In order to boost production from wells, which do not flow at all or do not flow at optimum level, artificial system using a variety of methods are used. These methods use Gas Lift, Plunger Lift, Chamber Lift, Rod Pumps, Submersible Pumps and so on. PARVEEN provides a complete line of Equipment and Services for such applications, e.g. Gaslift, Plunger Lift and Chamber Lift.

Which artificial method will be most effective for a particular well can be determined by evaluating several factors such as well's production potential, Gas/Oil ratios, well bore deviation and size as well as corrosion / erosion potential of produced fluids. Other factors include availability of power source such as compressed gas, electricity, surface facility, service availability, space limitation and personnel capabilities.

The diagram below provides the basic components of a Gas lift System. In many fields, a high pressure well provides a readily available energy source. If sufficient gas pressure or volume is not available, a compressor can be utilized to operate a closed system. The Gas is recirculated through a compressor facility. Only minor amount of make up gas is needed to replenish gas lost in separation processing or as fuel for compressor facilities.

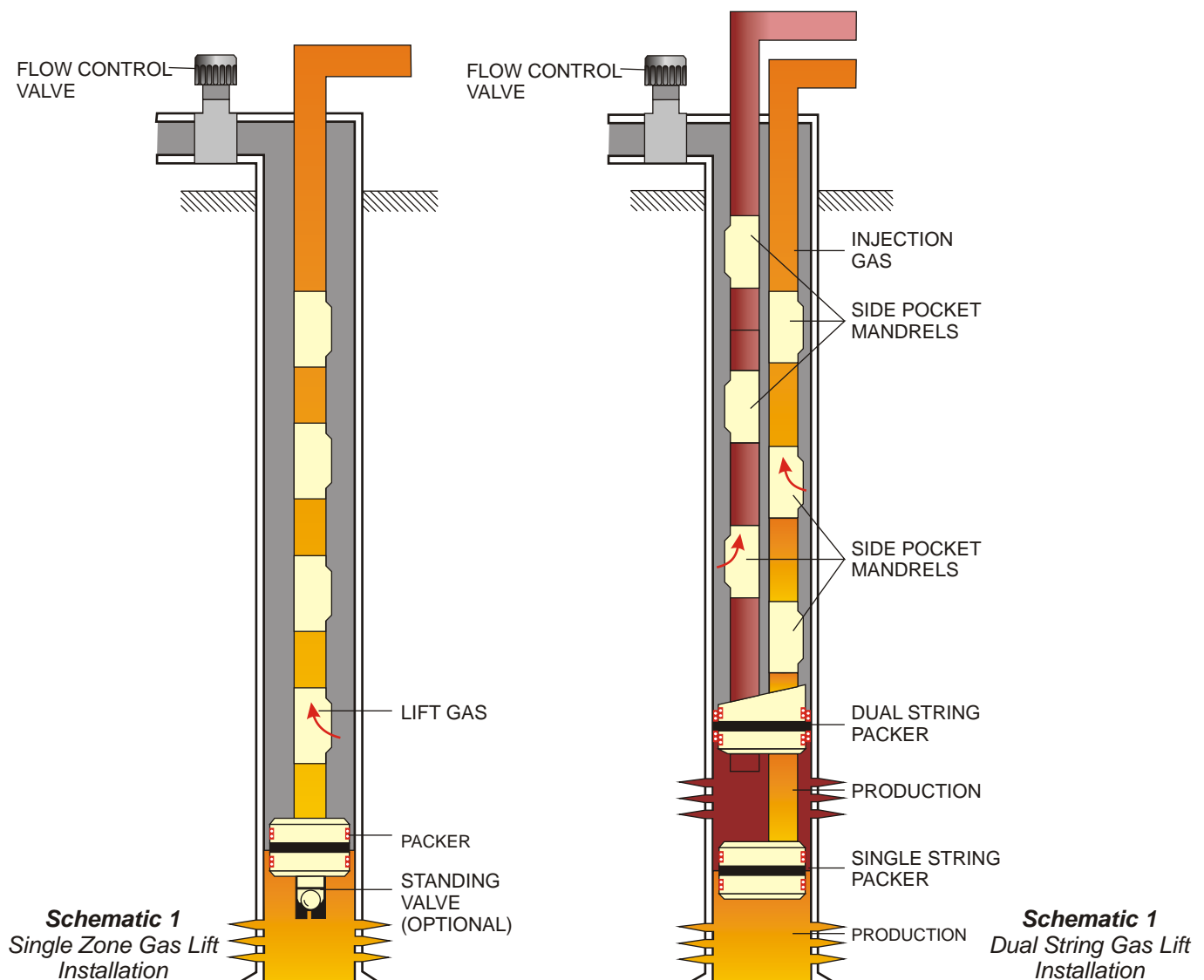


*Basic Components for a Gas Lift System*

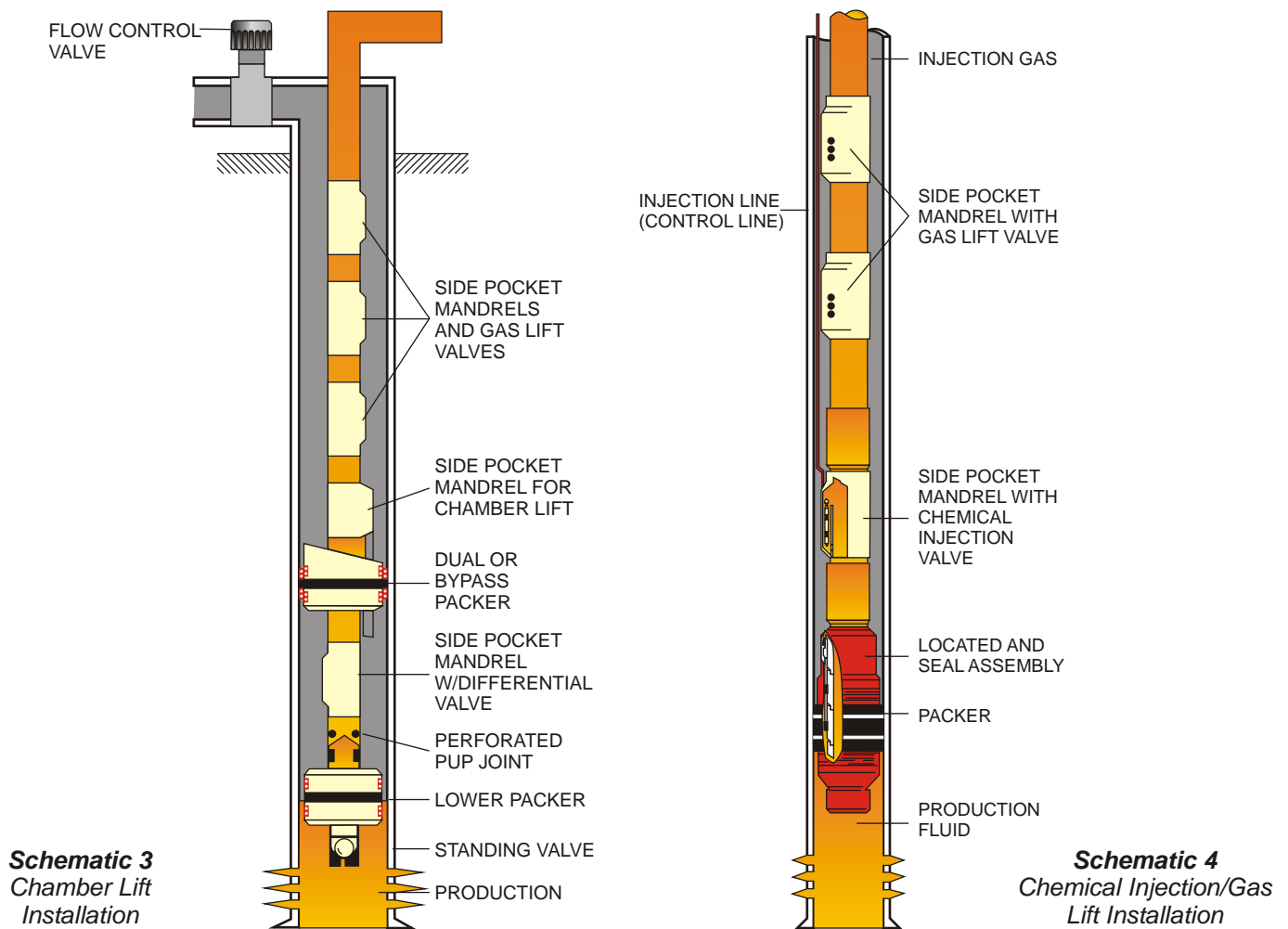
## COMPLETION SYSTEMS

**Schematic 1** - The single string Gas lift completion for intermittent lift applications utilizes a standing valve near bottom of the tubing to prevent Gas pressure surges against the reservoir during cyclic operations. A single zone continuous lift installation would not require a standing valve but otherwise it will be identical. In either application Conventional or Side Pocket Mandrel can be used. Side Pocket Mandrels are designed to provide the facility of removing and replacing Gas Lift Valves without removing the tubing. These service operations are performed either by using wireline, through - flow line (TFL) or coiled tubing methods depending on the completion configuration. Wire line installations are more economical for servicing wells with vertical access, especially remote, offshore or other hard - to - reach locations, since wireline units are light and portable. TFL and coil tubing service methods can provide production maintenance for wells that require tubing loops, such as ocean floor completions, highly deviated wells, extremely deep wells and any well where there is no straight or vertical access for wireline service.

**Schematic 2** - This illustrates dual-string installations where Gas Lift Valves lift fluids from two zones using gas from a common annulus. An installation can be designed, with proper well information to produce and carry both zones to depletion. The conditions affecting dual string design are casing size, distance between zones, well bore deviation, continuous or intermittent lift and operator's preference. Gas lift valves should be of proportional response or production pressure operated if the operation has to be trouble free.



## COMPLETION SYSTEMS



**Schematic 3** - In the chamber lift system, one normally utilizes two packers, a standing valve, a perforated pup above the bottom packer, and a differential vent valve just below the top packer in addition to the Gas Lift Valve necessary to unload and produce the well.

While the bottom injection pressure operated valve is closed, the standing valve is open. Fluid fills both the tubing and annular space (chamber) between the two packers. The differential valve is open, and allow gas in the top of the annular part of the chamber to bleed into the tubing as the chamber fills. When the chamber has filled to the point that the liquid level is near the differential valve, the operating gas lift valve opens. A calculated gas volume enters the top of the chamber, closing the bleed valve and standing valve, forcing accumulated liquids to U-tube from the chamber to the tubing. Liquids are produced as a slug to the surface. As the tubing is cleared, the operating gas lift valve closes, the standing valve and bleed valve open, and liquids again refill the chamber. The cycle then repeats.

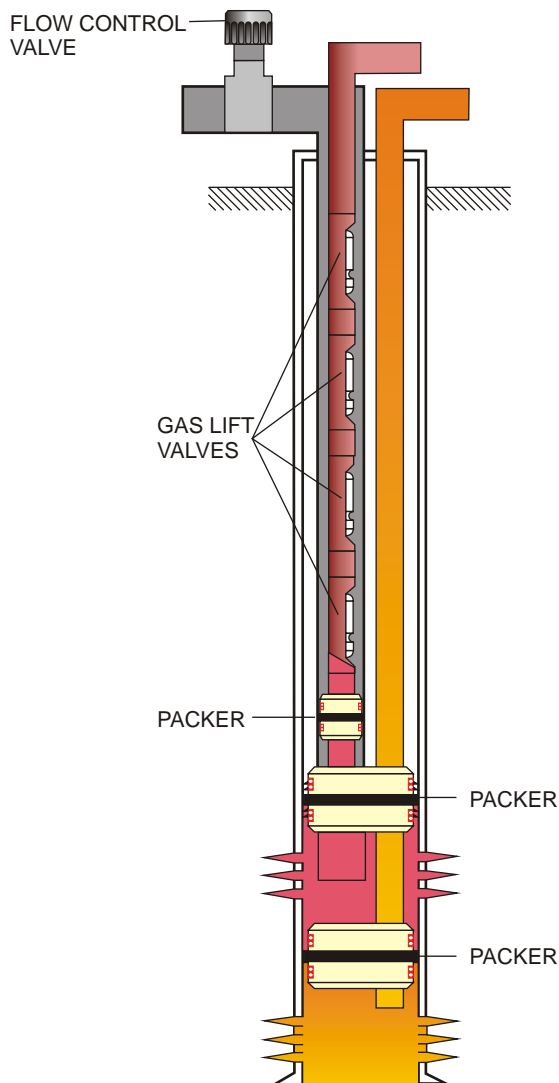
If properly planned, a chamber lift system permits a larger volume of fluid to be produced by intermittent lift from wells with a high productivity index and low-to medium bottom hole pressure.

**Schematic 4** - In certain cases, Chemical injection is desirable to be coupled with Gas Lift. Side Pocket Mandrels may be run at pre-determined depths for Gas lift valves to be installed. An additional mandrel with a chemical injection valve and injection line may also be run to desired depth on the same tubing string. Tubing / Casing annulus can be used for gas injection and the injection line for chemical injection.

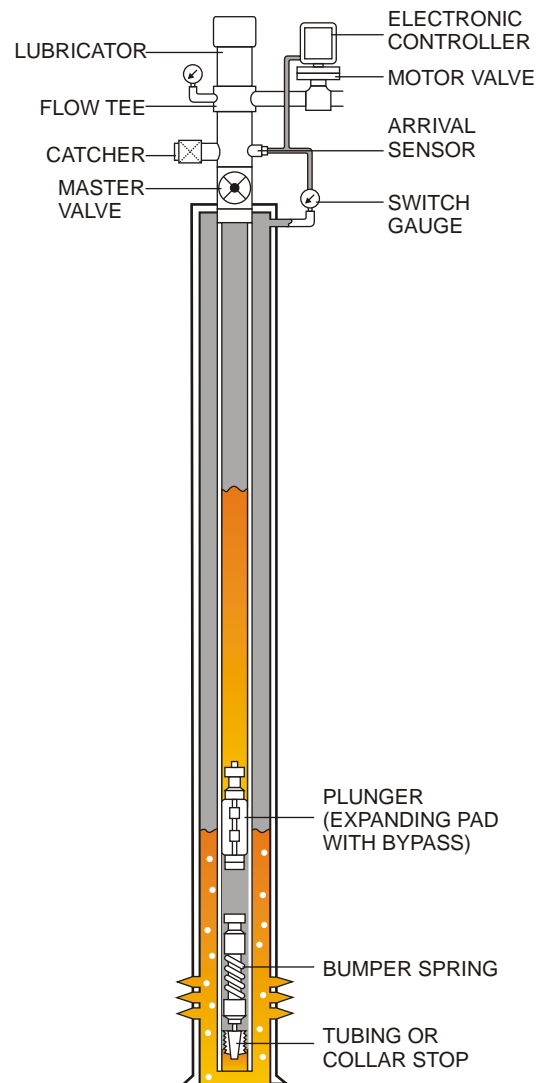
## COMPLETION SYSTEMS

**Schematic 5** - Macaroni tubing installation work well in either intermittent or continuous Gas Lift System. Essentially the installation is same as a single zone installation except the size of the macaroni string is the limiting factor due to ultra-slim hole conditions. It is an ideal method of artificial lift for slim hole completions.

**Schematic 6** - This fig. shows a simple installation without packer application for unloading fluids in a gas well. Plunger lift systems can effectively produce high GOR wells, water producing gas wells, or very low bottom hole pressure oil wells (used with gas lift). Depending upon individual well requirements surface/subsurface equipment varies. Installation may or may not require a packer and/or additional gas.



**Schematic 5**  
Macaroni Installation



**Schematic 6**  
Single Zone Plunger  
Lift Installation