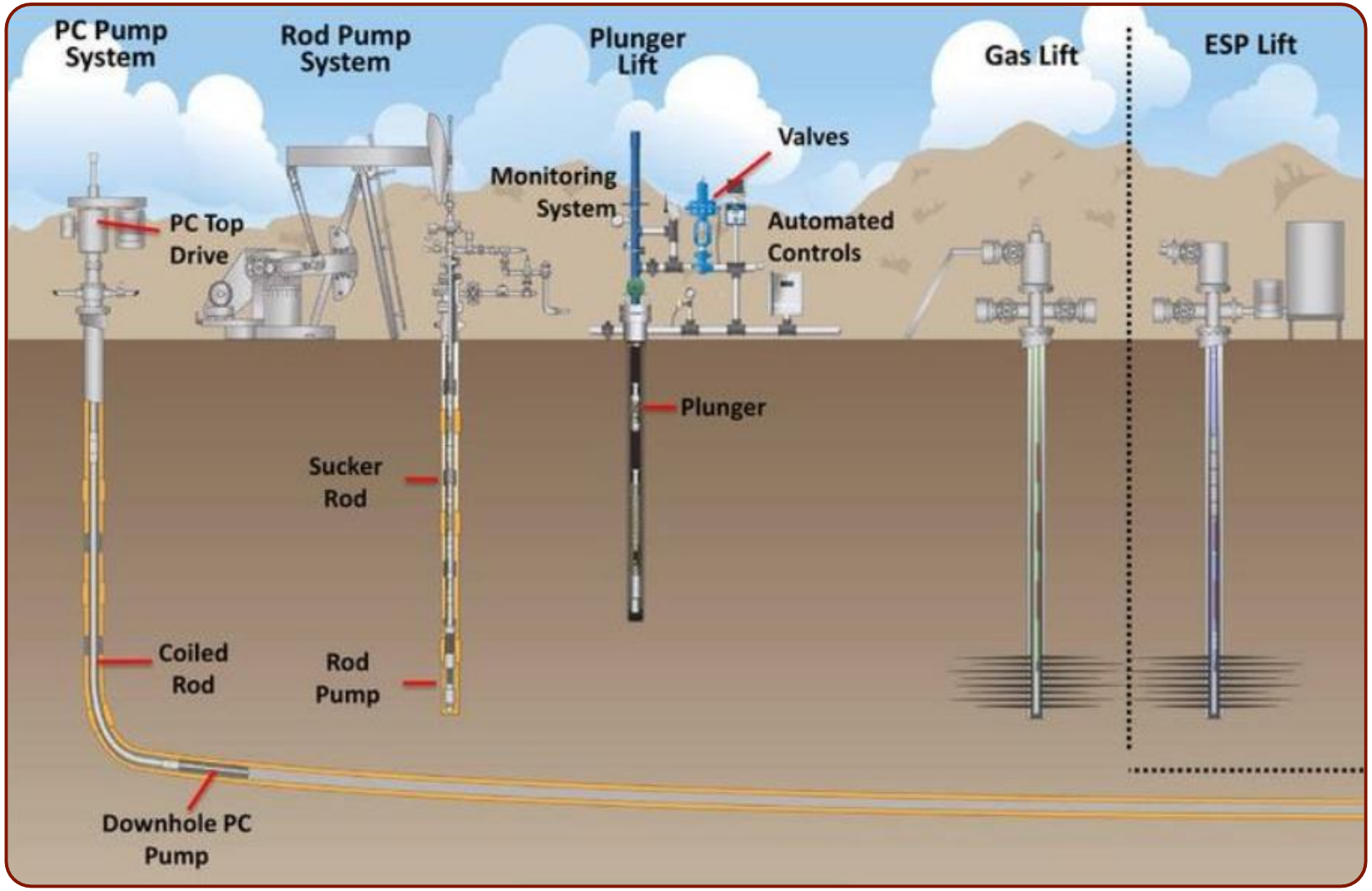
Selection Criteria for Artificial Lift Methods



Selection Criteria for Artificial Lift Methods

Characteristic	Specific	Gas Lift	ESP	PCP	Rod Pump	Jet Pump
Recovery	Primary	Recommended	Recommended	Recommended	Recommended	Recommended
	Secondary waterflood	Recommended, however high WC reduces the ability to move large fluid volumes.	Recommended	Recommended	Recommended	Recommended
	Tertiary	Can be used	Can be used	Steam flood will cause a problem; elastomers may degrade.		Can be used
Production rate	Less than 1000 B/D	The full range of production rates can be handled. Cannot achieve as much drawdown as ESP	The full range of production rates can be handled.	Rate dependent on setting depth. Generally PCP is suitable for low rate wells.	Rate is dependent on setting depth. Feasible for low rates (<100 B/D) and low GOR (<250).	The full range of production rates can be handled.
	1000 to 10,000 B/D	Suitable	Suitable	Usually up to 4000 b/d at 3000 feet	Restricted to shallow depths using large plungers. In general, not recommended.	Suitable
	Greater than 10,000 B/D	Suitable	Suitable	Not available.	Not available.	Suitable
Pressure support	Yes	Well suited, however increasing water cut reduces the ability to move large fluid volumes.	Recommended as an ESP is able to move the same fluid volume no matter what water cut.	Recommended	Recommended	Recommended, as jet pump system is independent of water cut percentage producing from a well.
	No	Recommended as the flexibility of gas lift allows one installation to deal with falling pressure and production rates.	Not recommended when there is significant pressure drop	Not recommended when there is significant pressure drop	If there is no pressure support from the reservoir, production rate will decline and the well will be "pumped-off".	Not recommended when there is significant pressure drop in the reservoir

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Gas/oil ratio	Less than 500 scf/STB	Recommended	Recommended.	Recommended.	Feasible for low rate and low GOR	Recommended.
	500 to 2000 scf/STB	Recommended	The achievable pump rate will be limited by the amount of gas breaking out of solution.	The achievable pump rate will be limited by the amount of gas breaking out of solution.	Gassy wells usually have lower volumetric efficiency.	Target design is less than 1000 GLR.
	Greater than 2000 scf/STB	Recommended. Gas lift would be only expected to be of benefit at higher GOR.	FBHP will need to stay above the bubble point pressure to avoid gas cavitation.	Not recommended.	Not recommended	Not recommended. Gas above 2000 SCF/STB substantially reduces efficiency but helps lift.
Bubble point	High	Recommended for all bubble points.	Not recommended.	Not recommended.	Not highly recommended.	Not recommended.
	Low	Recommended for all bubble points.	Recommended.	Recommended.	Recommended.	Recommended.
Fluid viscosity (at reservoir temperature)	Less than 100 cp	Recommended	Recommended	Recommended	Recommended	Recommended
	100 to 500 cp	Recommended	Efficiency of ESP will be reduced.	Recommended. Pump efficiency will increase as viscosity increases.	Good for < 200 cp fluids and low rate.	Recommended
	Greater than 500 cp	Has been used with success up to 1000 cp but problems with very high viscosity.	Not recommended.	Recommended for all high viscosity crude. Up to 80,000 cp.	Not recommended, as pump efficiency will reduce.	The system is capable of handling high-viscosity fluid. Production with up to 800 cp possible.

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Oil Gravity		No limitations. Preferable > 15 API.	No limitations. Preferable > 12 API.	Not used for oil with gravity greater than 40 degrees API due to high aromatic content that will deteriorate elastomers.	> 8 API.	> 8 to 45 API.
Water Cut	Low	Recommended.	Recommended for the full range of water cut. The ESP is largely insensitive to increasing water cut.	Recommended	Recommended	Recommended
	Moderate	Reduced efficiency due to heavier column of fluid to lighten.	Recommended	Recommended	Recommended	Recommended
	High	Reduced efficiency due to heavier column of fluid to lighten.	Recommended	Recommended	Recommended	Recommended
Water coning		Gas lift effective	ESP effective	PCP can be effective	Rod pump effective	Jet pump effective
Gas coning		Gas lift can be effective in producing a well that cones gas.	Not recommended.	Usually can be used if free gas is < 40% by volume.	For gassy reservoir. Rod pump handling is fair to good.	Not recommended. Cavitation in jet pump likely.