

## Multiphase Jet Pump, MJP

The jet pump, or ejector, transfers kinetic energy from a high velocity jet to a secondary fluid. Since each stream may be a liquid, gas or multiphase fluid, a wide variety of jet pumps is possible. The jet pump is characterized by a simple structural design, absence of moving parts and small dimensions. On the other hand, when the ejector is fed with multiphase fluids, significant modelling problems arise and no established methods are available for the design of multiphase ejectors.

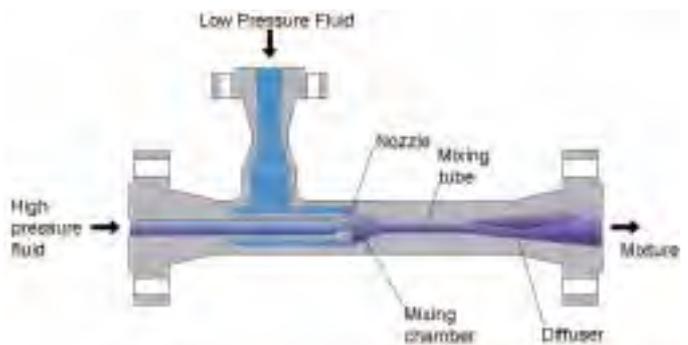
In the Petroleum Industry, the jet pump can be used as gas compressor, Liquid Jet Gas Pump, LJGP, or as multiphase pump, Liquid Jet Multiphase Pump, LJMP. In both cases the motive fluid is a high velocity liquid stream, which is circulated by a pump.

In the Multiphase Jet Pump, MJP, a high pressure multiphase jet is used as motive fluid. The MJP can be used to enhance the production from a depleted well using the production of a high pressure well. This configuration is particularly simple as no pump or power supply are required.

- **The MJP Design**

The MJP is characterized by low efficiency (20-30%), but in most cases the mechanical energy of the motive fluid would be lost through a choke or flow control valve. This makes the application of a MJP particularly attractive. In the last 5 years ENI E&P and TEA developed a novel design MJP and optimised the main geometrical parameters to improve the ejector performance at varying operative conditions.

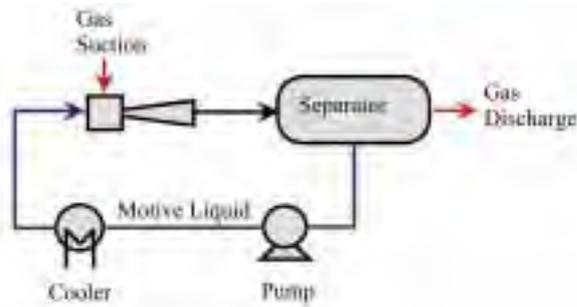
The software package used to design a multiphase ejector simulates the behaviour of MPJs operating with two-phase, compressible fluids and single phase, both compressible and incompressible fluids. The thermodynamic equilibrium between the phases is simulated using black oil correlations or compositional data.



Scheme of a jet pump.

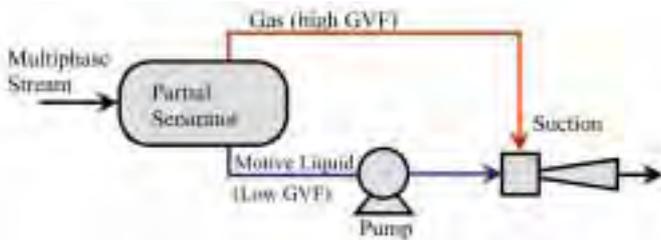


Application of a MJP in Allegheny TLP, GOM.



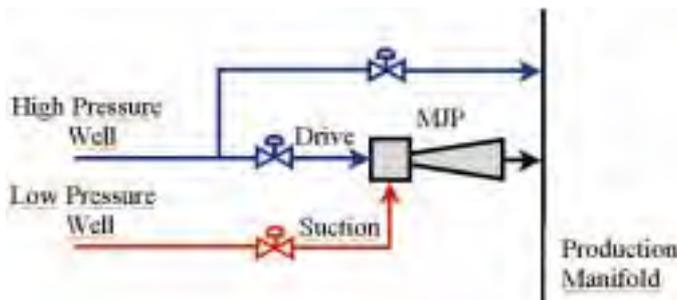
- **Liquid Jet Gas Pump**

In the Liquid Jet Gas Pump a high velocity liquid jet compresses a gas in a mixing tube. The resulting mixture is discharged through a diffuser to increase the static pressure of the mixture. The efficiency of a LJGP can be larger than 40%. A similar configuration can be used when the gas stream contains an appreciable liquid fraction.



- **Liquid Jet Multiphase Pump**

In a Liquid Jet Multiphase Pump, the mechanical energy of a high velocity liquid jet is transferred to a multiphase fluid. In these applications the gas volume fraction in the multiphase fluid can range from 100% (LJGP) to values close to zero (Liquid-Liquid Jet Pump).



- **Multiphase Jet Pump**

Several MJ pumps have been designed and installed by TEA in oil/gas fields operated by ENI E&P. In 2002 a novel design MJP was installed in Allegheny TLP, Gulf of Mexico, to boost the production of a depleted well by means of a drive well available at 120 Bar. In this application one-day oil production from the depleted well paid back the cost of the pump.