

Screw Compressor in Petrochemical and oil refining fields

Summary

At present, process gas screw compressor is widely used in atmospheric and vacuum distillation, tandem reforming, liquid gas recovery and torch gas recovery systems for petrochemical and oil refining industries.

Usually, operating condition for such system is hard. E.g., the process gas may contain liquid, solid particles or corrosion gas such as hydrogen sulfide; the composition level of Hydrogen is high; or the gas component change frequently and etc. This caused the plunger and valves on reciprocating compressor need being replaced and maintained frequently in the past. However, the fluid injected screw compressor can resolve these problems well.



Advantages of liquid injected screw compressor

Liquid injected process gas screw compressor takes little care about the change of the gas composition, mole mass or the pressure ratio; it can also compress gas with very little molecular weight and keep a normal operating when the Hydrogen content in process gas changes hard.

Rotors of liquid injected screw compressor don't touch each other and keep a suitable gap through the synchronizer gears. Liquid will be injected during the compress process to cool and wash the rotors, thus the compressor can be applied in compressing gas which is instability or easily got polymerized. Liquid injected can also seal the gaps between rotors, gaps between rotors and shell to raise the volumetric efficiency of the compressor.

Liquid injected screw compressor has a high reliability. It can keep a continuous and trouble-free operation over 24000 hours in most conditions.



Parameters of Compressor

Rotor Diameter ϕ	255	321	408
Swept Vol. m^3/h	600~1800	1800~3600	3600~9000
Inlet T $^{\circ}\text{C}$	-30~40		
Inlet P kPa	-20~20		
Outlet P MPa	0.2~1.0		
Outlet T $^{\circ}\text{C}$	< 90		
Power kW	45~355	355~710	710~1600
Size (L×W×H)	3200×1900×2200	4500×2200×2500	5500×2400×3200
Weight kg	~10000	~14000	~18000

Examples

Customer	Series No.	VF (m^3/h)	Outlet P (MPa G)	System	Time Limit
SINOPEC Jinshan Company	LG15/0.45	900	0.45	Flare Gas Recovery	1989
SINOPEC Tianjin Company	LG15/0.8	900	0.8	Flare Gas Recovery	1998
SINOPEC Daqing Refining Factory	LG30/0.8	1800	0.8	LPG Recovery	2001
SINOPEC HaiNan Refining Co., Ltd.	LG60/1.0	3600	1.0	A&V Distillation package	2005
CNPC Dalian 7 Factory	LG60/0.8	3600	0.8	Flare Gas Recovery	2007
SINOPEC Qingdao Refining Corp. Ltd.	LG80/1.0	4800	1.0	A&V Distillation package	2007
CNPC Karamay Company	LG80/0.5	4800	0.5	Continuous Reforming	2009

Styrene screw compressor



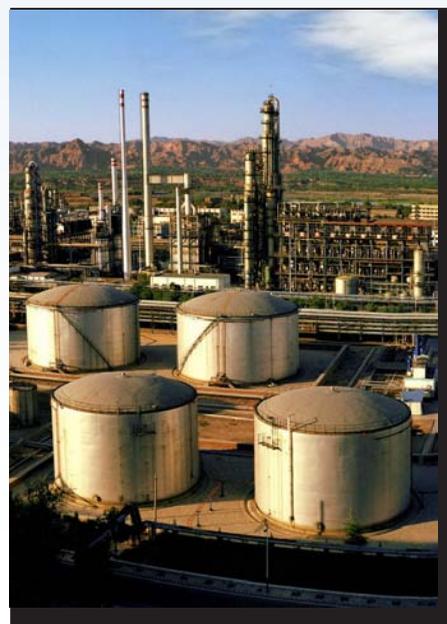
Summary

Being an important industrial raw material, Styrene is mainly used in the production of polystyrene plastics, styrene-butadiene rubber and which is possible to manufacture foam plastics. Also, being an important polymer monomer, it can be polymerized with multifunctional monomer to produce various kinds of engineering plastics and thermoplastic elastomers which are used in a wide range. Currently, our screw compressor is mainly used for Styrene off-gas recovery and dry gas pressure boosting in the Styrene production process.

Localization of Styrene gas-off screw compressor

Since Styrene off-gas contains mediums which are easily polymerized (such as Styrene), other types of compressors have difficulty in handling it while the process gas screw compressor injects a little softened water or ethylbenzene during the compression process. This can cool and wash the gas and avoid the discharge temperature from overheating and medium polymerization.

In our country, the Styrene screw compressor industry used to be monopolized by foreign compressor manufacturers, which caused the manufacturing and maintenance costs to be quite expensive. After years of studying and developing, the screw machine engineering department has completed the localization of a 150,000 tons/year Styrene off-gas screw compressor, which was used in the Changzhou DongHao Chemical plant successfully. Presently, the screw machine engineering department has developed two off-gas screw compressor series for motor and steam turbine-driven, whose maximum gas displacement can reach 36,000 m³/h. Each single set of compressor can meet the need of a 150,000 tons/year Styrene Recovery system.



Main Parameter of Compressor

Compressor Type	Styrene dry-gas compressor		Styrene off-gas compressor	
Rotor Diameter ϕ	321	408	510	630
Volume m^3/h (Inlet)	1800~3600	3600~9000	9000~18000	18000~36000
Inlet T $^{\circ}C$	0~40			
Inlet P MPa (A)	0.4~0.8		0.02~0.03	
Outlet P MPa (A)	1.2~1.4		0.16~0.18	
Outlet T $^{\circ}C$	< 90			
Power kW	355~1200	710~2000	450~750	750~1200
Size (LxWxH)	5500x2500x2500	5500x2500x2500	6000x2500x2500	7000x2200x2500
Weight kg	~14000	~18000	~22000	~25000

Examples for Styrene Screw Compressor

Customer	Series No.	Volume(m^3/h)	Time Limit
Lanzhou Dohaw Chemical Co.Ltd.	LG520/0.0276-0.162	31200	2004
Hainan Shihua Jiasheng Chemical Co. Ltd.	LG252/0.025-0.163	15120	2006
Jiangsu Shuangliang Company(EPS)	LG573/0.0276-0.163	34380	2008
Ningbo Dohaw Chemical Co. Ltd.	LG293/0.028-0.162	17580	2008
Shandong Huaxing Group	LG297/0.0276-0.163	17820	2009
Shandong Heze Yuhuang Chemical Co. Ltd.	LG550/0.023-0.162	33000	2009
SINOPEC Qingdao Refining Corp. Ltd.	LG340/0.028-0.163	22400	2009
CNPC Fushun Company	LG236/0.028-0.163	14160	2009

Introduction of Screw Compressor



Performance Features

Process gas screw compressor is widely used in industry fields such as coal plants, steel plants, chemical plants, petrochemical plants, oil refining plants, oil fields and so on. Special designs of the compressor can be supplied to satisfy different process requirements.

Advantages:

- 1 Screw compressor can deal with process gas contains dust and liquid.
- 2 Changes of gas component, molecular weight and pressure composition do little impact to the flow volume.
- 3 Screw compressor allows liquid to be injected to cool and clean the polymer of process gas.
- 4 Screw compressor uses rigid shaft to have a wide range of speed control.
- 5 No surge.
- 6 Outstanding performance of frequency control in part loaded condition.
- 7 Lube oil needs no touch with the process gas.
- 8 No rub parts which needs frequent maintain.
- 9 No balanceless mass and simple base plate.



Atmospheric and vacuum distillation compression package



Styrene exhaust gas reclaimer compression package



flare gas reclaimer compression package

Table below listed all the 7 type of screw compressors SMED have which cover the process requirements under 3000rpm standard inlet state with gas displacement among 100 to 360000m³/h. The maximum discharge pressure can reach 2.4MPa. Users can chose [Liquid injected screw compressor](#) or [Dry screw compressor](#) for different process requirements.

	Radial Split						Axial Split	
Rotor Diameter (mm)	153	178.5	255	321	408	510	630	
Discharge P (MPa)	~2.4						0.8	0.4
Flow Volume (m ³ /h)	100~300	200~600	600~1800	1800~3600	3600~9000	9000~18000	18000~36000	
Shaft Seal	Mechanical Seal					Carbon Seal		
Bearing	Rolling Bearing	Rolling/Journal Bearing				Journal Bearing		

Liquid Injected Screw Compressor

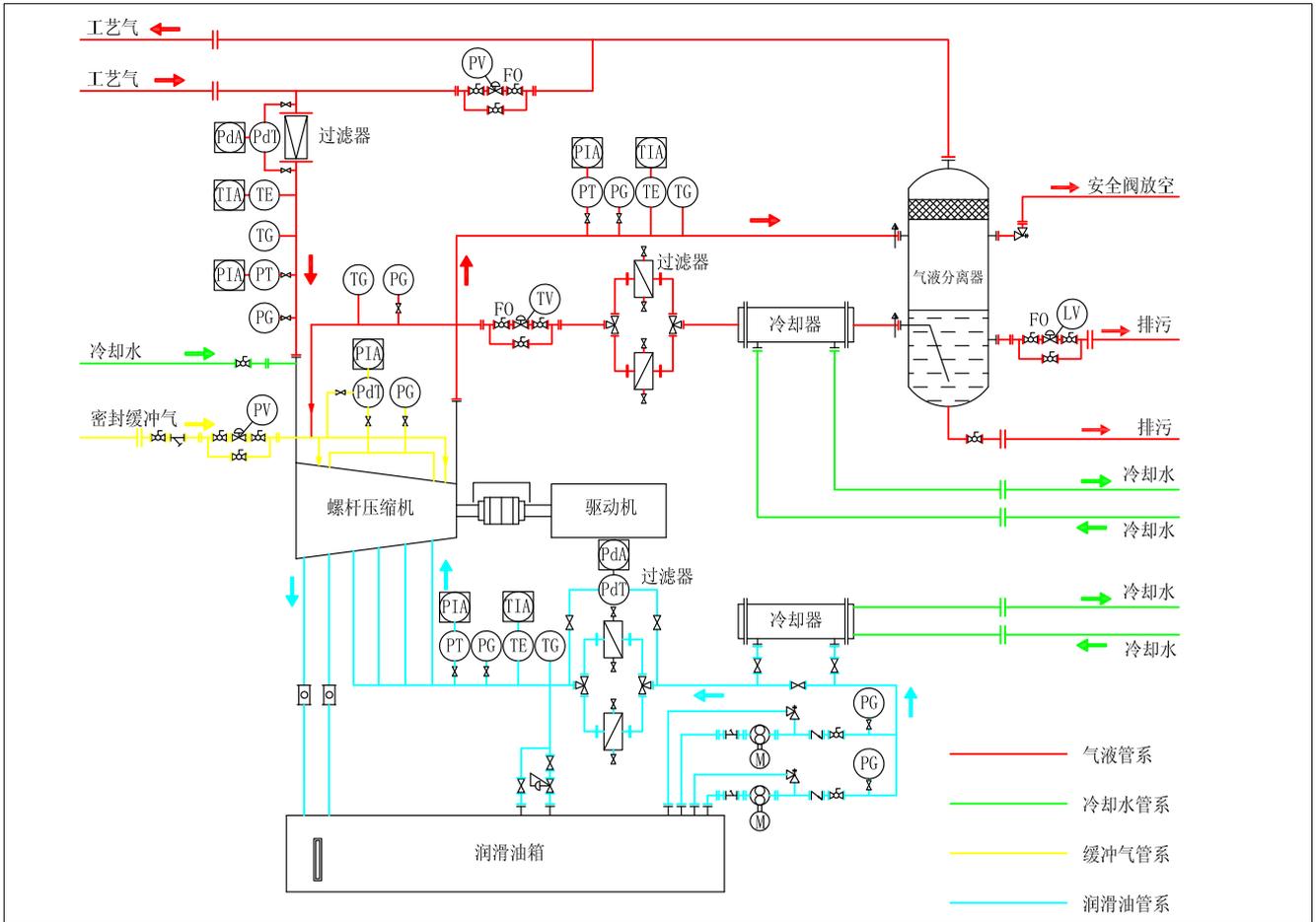


Figure above gives the details of the operating process of liquid injected screw compressor:

Liquid injected screw compressor let liquid injected through the compression process. Liquid injected cool and seal the spacing between male rotor and female rotor, rotor and casing. Thus causing the liquid injected screw compressor reach a high pressure ratio. Generally, the single pressure ratio can be 11 and a higher pressure ratio can be completed through the series form of two or more compressor units.

Liquid injected screw compressor applies for process gas which is astable and easily get together such as flare gas, Styrene and ethyne. Usually, water or other kind of liquid which is easily to be separated and does not reaction with process gas is selected as the liquid injected into the compressor. Liquid injected can form a protective film on the profile of rotors and block to protect rotors and casing and raise the operating life of the compressor.

Liquid injected screw compressor is also fit for handling process gas with little molecular weight such hydrogen. It is insensitive to the change of molecular weight and has no surge which radial compressor has.

Liquid injected screw compressor has a good performance chart. There is a linear relationship between its flow volume, power and speed. Gas displacement can be adjusted in an economic way which the speed of motor or steam turbine selected.

Process gases suitable for liquid injected screw compressor are listed as below:

- ethyne
- light hydrocarbon
- coke-oven gas
- CO₂
- Styrene gas
- N₂
- propane
- natural gas
- city gas
- styrene dry gas
- ammonia
- hydrogen
- CO
- other combustible gas



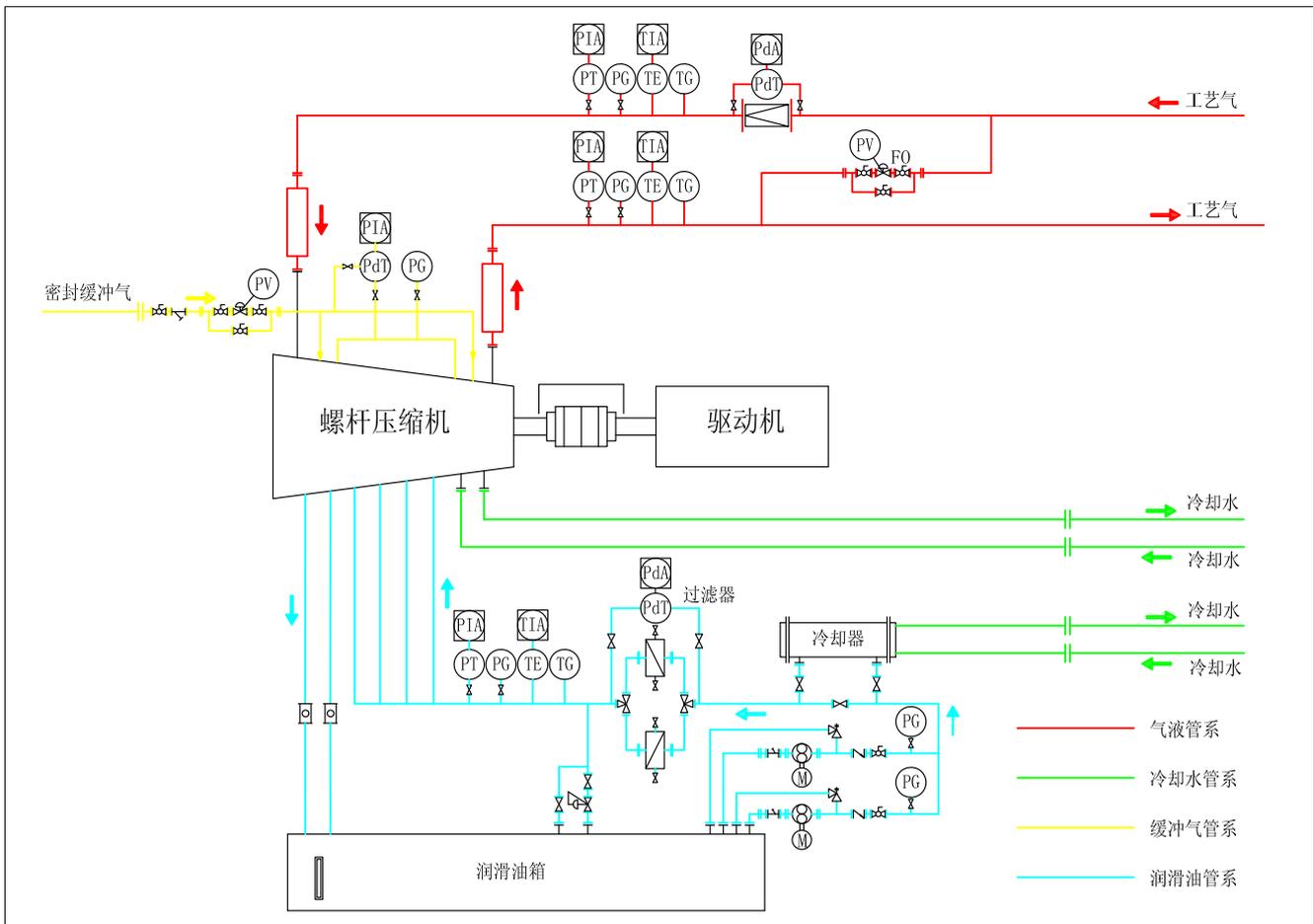
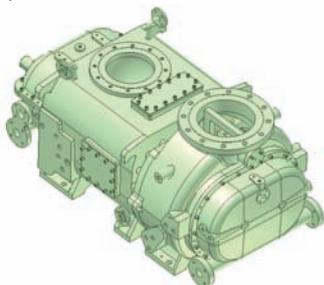


Figure above gives the details of operating process of dry screw compressor:

Dry screw compressor of SMED can fully satisfy the process requirements which gas in the production process can not be polluted by lube oil. Dry screw compressor uses a reliable sealing system to isolate process gas from lubrication system so that process gas can keep clean through the compression process.

Speed of dry screw compressor is about 3000 to 5000 r/min and muffler is installed on inlet and outlet port to reduce the noise caused by gas compression. Meanwhile, an interlayer of water on casing is used to lower the temperature of process gas being compressed.

With different compression medium, single ratio of dry screw compressor can reach 2-3 even over 6 through the series form of two or more compressor units.



Process gases suitable for dry screw compressor to handle:

- butadiene
- epoxy chloropropane
- VCM etc.