



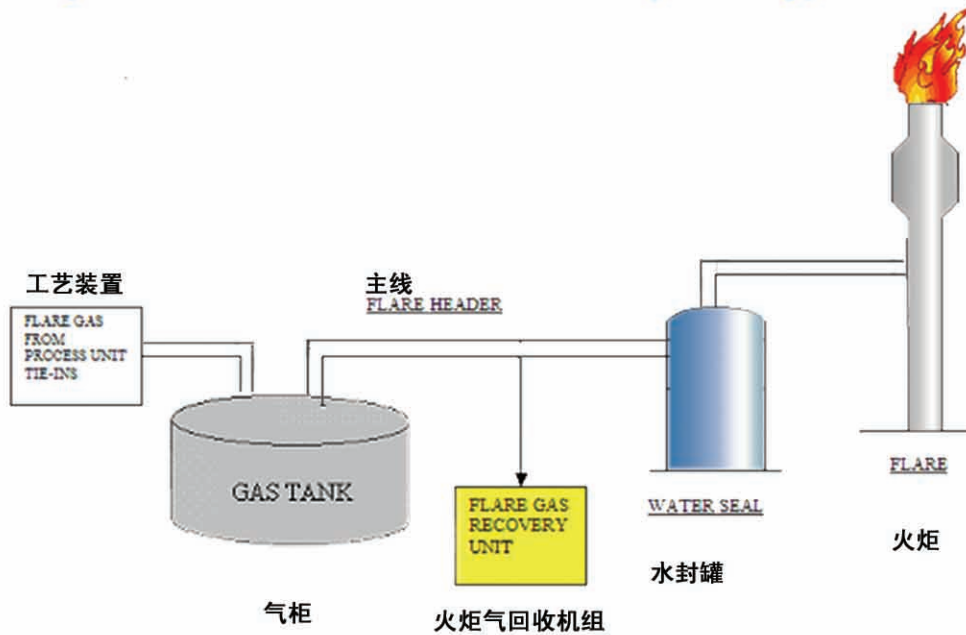
NASH
A Gardner Denver Product

NASH液环压缩机在火炬气回收中的应用
NASH Compressor Systems for the Flare Gas Recovery Unit



火炬气回收系统工艺对压缩机的基本要求

Flare gas recovery service main characteristics for compressor type selection



基本要求:

- 气量的变化较大，同时摩尔质量变化很大
- 气体中夹带固体及液体杂质
- 通常含有H₂S和其他腐蚀性气体
- 因为运行特点要求设备有很高的可靠性和有效性
- 维护成本低，以带来更好的经济效益。
- 要求有很高的操作灵活性，因为抽气量的变化非常不稳定。

- Flare gas specific characteristics, like wide flow variations and changes in molecular weight
- Presence of solid and liquid fraction, of moisture and gas condensation
- Possible high H₂S and other sour gases concentration
- High reliability and availability requirement, due to critical service, mostly in unattended areas
- Low maintenance costs requirement to contain operating costs
- Operation flexibility due to flare load variations

液环压缩机的原理及设计特点完全满足以上要求

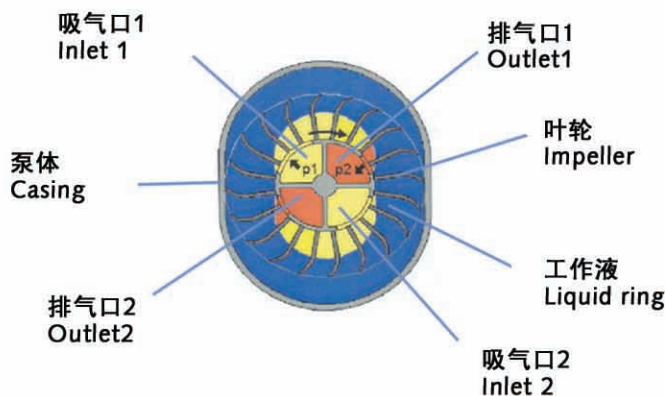
NASH compressors can fully meet above demand due to its design principle

液环压缩机的工作原理:

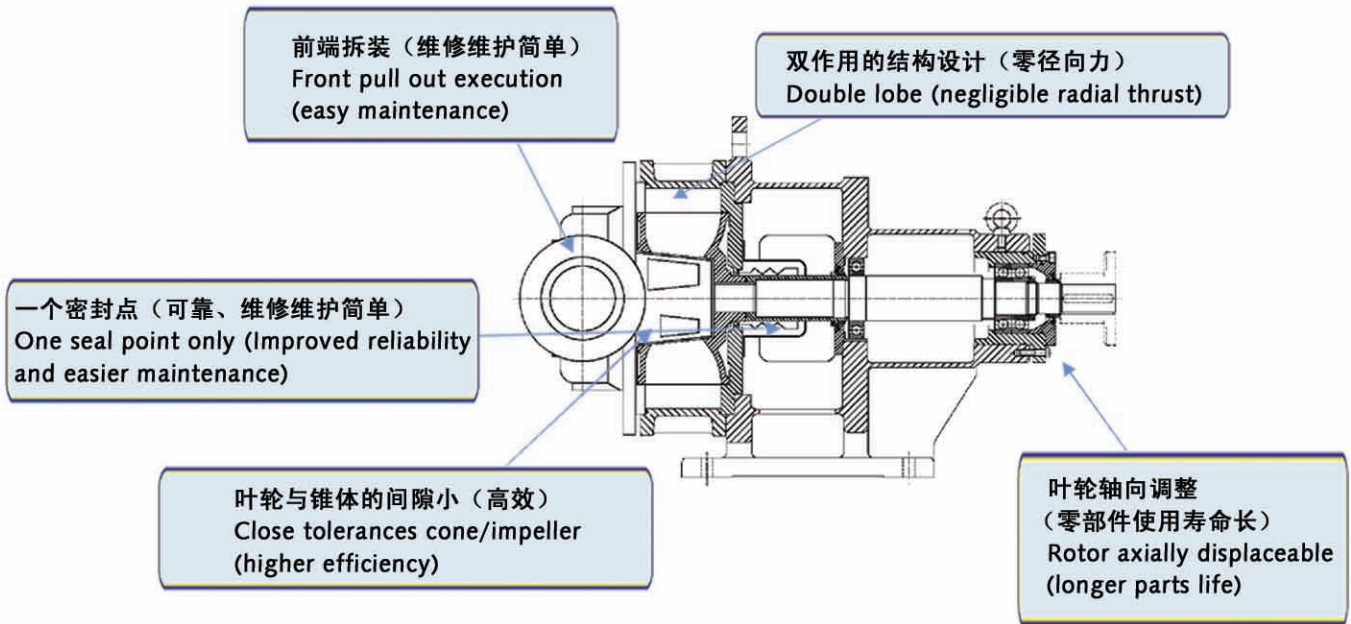
叶轮是NASH液环压缩机唯一的转动部件，旋转的叶轮起到机械压缩机的活塞、旋片、螺杆相同的功能。叶轮的推进使密封液（工作液）沿椭圆形的双作用壳体形成液环，每两个叶片与液环之间形成的密封空间随叶轮的旋转，体积不断增大、减小，完成气体的吸入和压缩过程，NASH双作用的压缩机壳体，叶轮每旋转一周完成吸排气过程各两次。

How liquid ring compressors work

The balanced cast rotor in a NASH liquid ring compressors is its only moving part. Such simplicity is possible because the function of mechanical pistons, vanes, screws, or rotating lobes are performed by the rotating of liquid. Propelled by the rotor and guided by the oval shaped of double-lobe pump body, the compressant or seal liquid almost fills, then almost empties each rotor chamber twice each revolution. This set up the piston action. Inlet and discharge ports in the stationary cone provide flow paths at the inner edges of the rotor chambers.



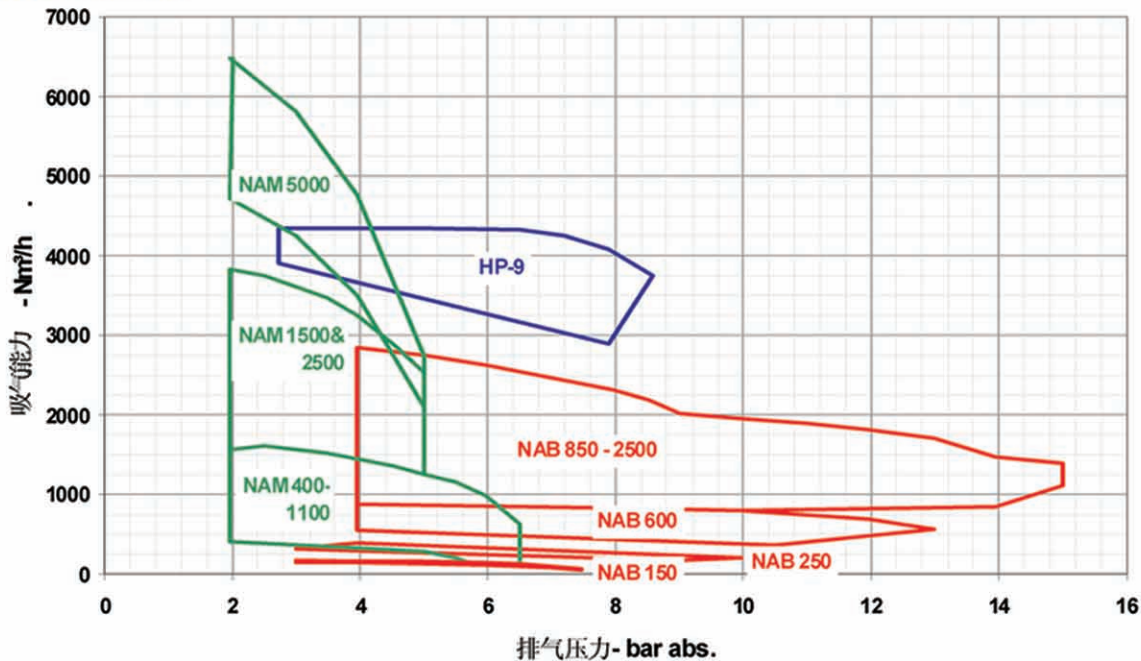
内部结构 Internal Structure



- 允许气体中夹带固体颗粒和液体
- 抽气量的变化不会对泵带来任何影响
- 介质摩尔质量的变化对泵运行没有任何影响
- 入口压力的波动对泵的影响也很小, 抽气量分配非常容易
- 通过气体回流装置可以很方便的的控制抽气量
- 几乎等温的压缩过程 (最大10°C 温升)
- 结构简单, 维护成本低廉; 无油压缩; 不会污染介质
- 可以非常安全的压缩各种易燃, 易爆, 及各种对温度敏感的危险气体
- 有多种的材质选择来满足不同的气体, 可以满足API标准

- Not sensitive to carry minimal solid and liquid
- Not sensitive to flow variations
- Not sensitive to changes in molecular weight
- Little sensitive to inlet pressure fluctuations, Easy load sharing
- Easy capacity control through gas recirculation
- Nearly isothermal compression (max. 10°C Delta T)
- Simple design, Lower maintenance cost, Oil free service
- Safe compression of hazardous explosive or thermally sensitive process gases
- Various materials of construction can be selected, and meet the demand of API standard.

性能曲线 Performance



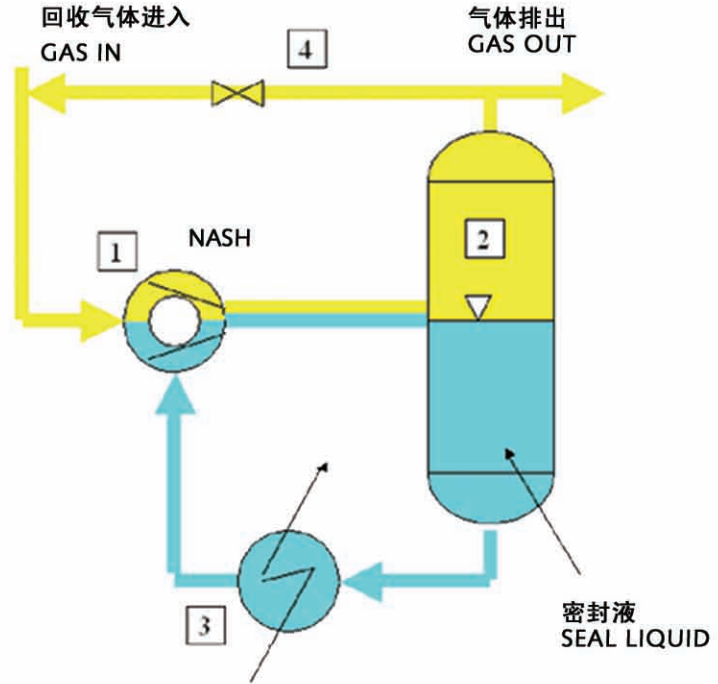
NASH 液环压缩机可达到15bar abs 压缩压力, 单台气量可达到4000m³/h。

NASH liquid ring compressors can be up to 15(220psig) bar and have a suction capacity up to 4,000m³/h(2,400acfm)

设计理念

Design method

1. NASH 液环压缩机
NASH Compressor
2. 气液分离器
Vertical gas liquid separator
3. 密封工作液换热器
Heat exchanger for seal liquid
4. 循环管线
Recycle line



三种基本的模块化设计

Modular design based on three basic models

- 从600 到 2500 am³/h-"S"系列：使用一台压缩机
 - 从1200 到 5000 am³/h-"D"系列：使用两台压缩机
 - 从1800 到 15000 am³/h-"T"系列：使用三台压缩机
- FGR unit with one compressor for 600 to 2500 am³/h – type "S"
 - FGR unit with two compressors for 1200 to 5000 am³/h – type "D"
 - FGR unit with three compressors for 1800 to 15000 am³/h – type "T"



单泵机组—S型
FGR UNIT -TYPE S



双泵机组—D型
FGR UNIT -TYPE D



三泵机组—T型
FGR UNIT - TYPE T

实例分析 Instance analyse

安装我们的回收装置带来的经济效益的实例分析（某炼油厂—2005年）
Example of FGR unit pay-back calculation (i.e one refinery-year 2005)

INSTALLATION COSTS 安装费用

NASH compressor package NASH 液环压缩机	850,000
other equipment (out of fgr unit scope of supply) 其他辅助设备	50,000
engineering 工程化费用	35,000
pipng 管道费用	70,000
instrument air, power supply, data link to dcs 仪表用气, 电力供应, DCS 连接费用	30,000
civil works 内部工作	65,000
commisioning and start up 试车、调试费用	10,000
3 years ordinary/extra maintenance 三年维护费用	9,000
Total installation costs 总装配费用	1,119,000
Operation costs per year (as per chart here below) 操作费用 (分项见附表)	176,328
Savings per year (as per chart here below) 每年节约费用 (分项见附表)	1,760,800

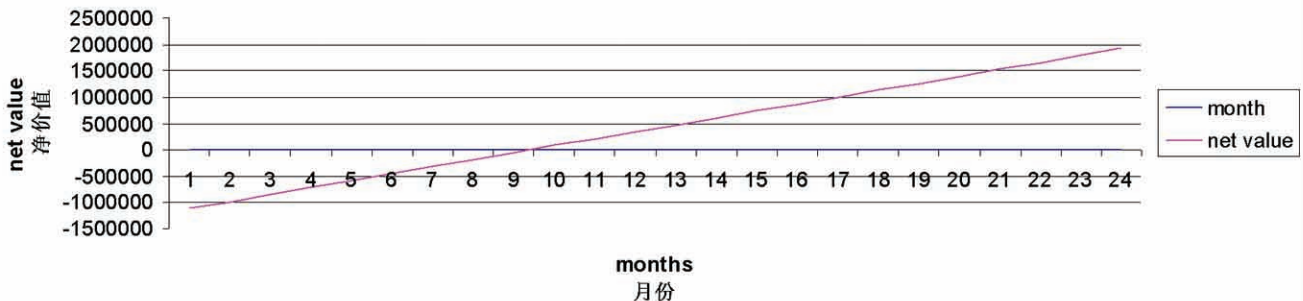
OPERATION COSTS 运行费用

compressor 压缩机	working h/y 工作时数 h/y	kW / h 千瓦/小时	make up 补充水 water l/h	cooling 冷却水 water l/h	drain to 排除水 sws l/h	instrument 仪表用气 air l/h	TOTAL 合计
K1	8400	180	50	30	50	2	
K2	4000	180	50	30	50	2	
K3	0	0	0	0	0	0	
cost in \$ per unit / h		0.05	0.001	0.005	0.1	0.01	
total cost per year 每年总费用		111,600	620	1,860	62,000	248	176,328

SAVINGS DUE TO FGR UNIT INSTALLATION FGR 装置安装后节省费用

compressor 压缩机	working h/y 工作时数h/y	recovered gas T/h 回收气体T/h	recovered condens. l/h 回收冷凝油l/h	CO2 equiv. saved T/h	saved steam T/h 节省蒸汽T/h	TOTAL 合计
K1	8400	1	50	0.5	1	
K2	4000	1	50	0.5	1	
K3	0	0	0	0	0	
cost in \$ per unit / h		120	0.2	10	7	
total cost per year 每年费用		1,488,000	124,000	62,000	86,800	1,760,800

pay back calculation 投资回收统计



如上分析：单位（美元）

初期投资：1,119,000

每年运行费用：176,328（电力+补充水+冷却水+仪表用气等）

每年运行节省费用：1,760,800（可燃气回收+油回收+减少
废气处理等）

故： $(1,119,000 + 176,328) \div 1,760,800 = 0.74$

实践运用已经证明，NASH液环压缩机，由于极低的维护费用，安全可靠的长久运行，大量高价值油气的回收利用以及环保价值，通常可在9个月左右就能让您收回全部投资成本。（基于欧洲实例）

Currency USD

Initial investment: 1,119,000

Operation cost per year: 176,328 (power + make up water + cool water + instrument gas)

Saving per year 1,760,800 (recovery gas + oil recovery + cost of waste gas treatment)

Summary: $(1,119,000 + 176,328) / 1,760,800 = 0.74$

According to the widely operation experience, NASH liquid ring compressor can reback the whole investment within 9 months after starting operating due to its lower maintenance cost, reliable operation, high value oil and gas recovery and the environmental protection value. (based an example from Europe)

服务在您身边 Service Around You



我们一贯秉承“决不因短期利益出卖未来”的经营理念，急客户所急，想客户所想；为客户提供更专业、及时及客户化的物超所值的服务。我们在北京、上海、成都、广州设有办事处以及遍及全国32个省份(除西藏外)的服务网络。能够更迅速的贴近客户。了解客户的需求。在追求产品完美品质的同时，不断完善服务体系，您的每个需求和期望将是我们不懈的追求。

如果您想了解更多内容，请随时拨打我们的服务专线：0533-4652266，享受我们全面的支持与服务。

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If you want to know more about us please call our service line: 0533 4652555 and enjoy our support and service.

NASH

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