

R 型循环泵密封结构改造

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摘要: 阐述了 R- 型循环泵的密封泄漏原因, 介绍了密封结构的改造方法和优点以及使用中相关注意事项。

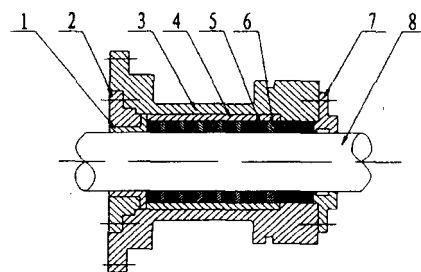
关键词: R 型循环泵 密封结构 改造

我公司建厂之初是生产合成氨的小氮肥企业。随着生产的发展, 公司不断调整产品结构, 双氧水、香料、有机胺等系列产品相继投放市场。根据生产工艺需要, 我厂合成氨变换 2 段和异丙胺分厂分别选用了 5 台台州工业泵厂的产品, 其中合成氨变换工段选用了 2 台 100R-37 型热水循环泵, 工作压力 1.2MPa, 工作温度 150℃ 左右; 异丙胺分厂选用了 3 台 80R-60 型导热油循环泵, 工作压力 0.8MPa, 工作温度 200℃ 左右。在运行过程中, 填料泄漏严重, 在高温高压下泄漏蒸汽易烧伤人。导热油需经常补充, 检修不方便, 给生产造成不应有的损失。整个密封部件使用寿命短: 密封体一年; 浮动环三个月; 浮动套一年; 弹簧五个月; 轴套三个月; 泄压环一年。

为了解决泄漏和使用周期短的问题, 我们对工艺条件和设备结构进行了分析和研究。认为, 浮动密封环加泄压环结构和石棉盘根密封结构在变换系统中不适用, 原因是: (1) 循环水在系统中与气体直接接触, 气体中的 H_2S 、 CO_2 在高温高压下溶解度增加, 酸性物质对设备机件的腐蚀加剧。(2) 浮动密封环结构的密封是靠泄荷起作用的。设备在工作时, 高温、高压液体经浮动套与浮动环、轴套之间的节流间隙逐渐泄压后汇集到泄荷孔, 经泄荷孔流向泵的进口。高速高温液体产生大的冲刷力, 致使浮动套、浮动环、轴套被冲刷磨损而损坏。(3) 石棉盘根较硬, 在高温高压下, 加剧了轴套的磨损。

我们对 R 型循环泵进行了改造, 以 100R-37 泵为例。

图 1 为经改造的 100R-37 热水循环泵密封结构图。密封结构由密封本体(原结构不变)、衬套(铸铁)、端盖(铸铁)、衬套(铸铁)、压盖(0Cr18Ni9, 如图 2 所示)、轴套(3Cr13, 所图 3 所示)、膨胀石墨环($\phi 65 \times \phi 45 \times 10\text{mm}$)、隔环(铸铁, $\phi 65 \times \phi 45 \times 5\text{mm}$)组成。



1 衬套 2 端盖 3 密封体 4 衬套
5 石墨环 6 隔环 7 压盖 8 轴、轴套

图 1

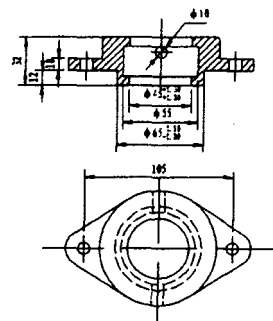


图 2 压盖

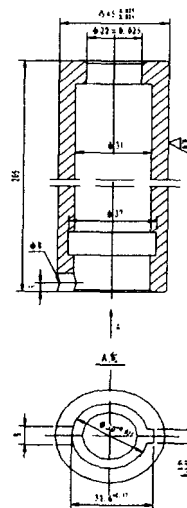


图 3 轴套

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运转,所以注意一定要正确启动。

完全打开入口管路的阀门;

关闭出口管路的阀门;

启动电机;

缓慢打开出口管路中的阀门;

调节出口阀直至达到正常工作压力;

为使泵正常运转,应使泵在其允许的范围內工作。

5 运行及维护注意事项

(1) 海密梯克磁力泵绝对不允许在干摩擦状态下以及在出口管路阀门关闭时工作,否则将导致滑动轴承损坏。

(2) 必须与电动机同步工作,如果泵失效(扬程很小),则表明已超过了磁力联轴器的最大扭矩,应避免在不良工况下长时间工作。

(3) 正常工作情况下发生振动、较大的噪音及功率增长,说明轴承发生磨损(润滑不足)应立即检查。

(4) 磁力泵滚动轴承为深沟球轴承,靠其自身

的润滑脂进行永久性润滑,但亦应定期检查,定期更换。

(5) 磁力联轴器的失效并不意味着永久磁铁的损坏。但如果在失效状态下长时间地工作,因其转速较低,滑动轴承润滑不良,会导致滑动轴承的损坏。

(6) 转子组件及驱动组件有较高的磁性,在组装和拆卸磁力泵时,应当考虑磁力范围,它可能对电力及电子装置产生一定的影响,注意保持一定的距离。

(7) 长时间放置时,若所输送的液体会产生结晶或凝固,应用合适的液体来冲洗泵。

6 结束语

综上所述,可知合理的工艺设计安装和监控保护是保证海密梯克磁力泵长周期无故障运行的必要条件,而正确的操作维护可延长泵的使用寿命;必须加强对磁力泵科学严密的精确操作与精心呵护,为确保新装置的安全、平稳、可靠运行提供保证。

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此密封体结构使用效果理想。其优点如下:

(1) 结构简单,改造容易。原密封体不变,只加工一个 $\phi 75 \times \phi 65 \times 105\text{mm}$ 的铸铁套压进即可。膨胀石墨环可以定点加工,隔环在车床上加工即可完成。

(2) 安装、检修方便。如图 1 所示,100R-37 热水循环泵共用 $\phi 65 \times \phi 45 \times 10\text{mm}$ 膨胀石墨环 10 个, $\phi 65 \times \phi 45 \times 5\text{mm}$ 隔环 6 个,从泵的两端都可安装和拆卸。石墨密封环和隔环间隔安装,口端三根不要隔环。正常情况下,一组填料运行一年,口端三根视情况,一般四个月左右更换一次(因压力,温度不稳造成)。整体组装时,膨胀石墨密封环不切口。第二次更换口端三根时,要把口端内部清理干净,把备好更换的三根切成一个或对称切开二个 45° 切口,三根缺口错开安装。

(3) 密封效果好,无泄漏。

(4) 使用寿命长。整组填料一年更换一次。口端三根一般六个月更换一次。密封体可使用三年,填料套从原来三个月提高到二年左右。

(5) 经济效益好。原浮动环结构,100R-37 热水

循环泵需三组浮动环和一个泄压环,一套价值 700 元,改用膨胀石墨环后,每年只需 60 元。改装后,没有再发生事故停车现象。因去掉了泄压环,泄压孔被堵死,每小时可节约热水 1~2 吨。

使用中应注意的事项:

(1) 膨胀石墨温胀系数较大,新装填料必须空负荷试车。试车前不可预压过紧。每次预紧时,不仅要用力均匀,而且需要停车预紧。最后预紧,必须在工作温度下进行,不然会因高温膨胀将轴抱死。

(2) 操作压力,温度必须稳定。压力不稳,影响填料使用。温度突然升高,石墨填料温升膨胀把轴抱死,轴向膨胀会把填料压盖崩坏,高压蒸汽向外冲出而发生事故。

(3) 发现泄漏时将口边三根填料进行更换,不然,内部填料会因泄漏而被冲坏,轴套也会被高速旋转的涡流冲刷坏。

(4) 80R-60 导热油循环泵的改造同 100R-37 热水循环泵。

Abstract: It was mainly introduced in this paper that the feasibility, implementation and good results of the technical modification through diameter expanding of the cylinders in the 190 m³ / min nitrogen / hydrogen gas compressors used in the ammonia synthesis plant. In this modification, the discharge pressures of some stages in the compressors were changed in order to meet the requirements of the changed operation conditions in the production through the diameter expanding of the corresponding cylinders in the compressors.

Key words: nitrogen / hydrogen gas compressor, expanding diameter of cylinder, good results

Analysis on Causes about Leakage of Mechanical Seals in Ammonia Compressor and Modification

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Abstract: The causes of the abrasion, leakage and short service life of the original mechanical seals were analyzed in this paper. Modified by using the non-contact type of spiral chute end-face seals with fluid dynamic pressure, the seals were basically in a good state of minor abrasion, non leakage, high reliability and long service life. This modification ensured the normal operation of the ammonia compressor unit with remarkable economic results.

Key words: ammonia compressor, mechanical seal, spring specific pressure, leakage, spiral chute

Improvement of Sealing Structure in R-Model Circulating Pumps

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Abstract: In this paper the causes of leakage from the original sealing in R-model circulating pumps were described. The improvement of the sealing structure and the advantages of the modified seal as well as the corresponding points for attention in service were introduced.

Key words: R-model circulating pump, sealing leakage, sealing structure, improvement

Measures and Approach to Raise Operational Reliability of Hermetic Magnetic Pumps

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Abstract: In this paper, the characteristics of the Hermitic pumps were briefly introduced and the causes of common troubles during the routine operation were analyzed. The relevant measures and approach to ensure and promote the reliability in smooth operation of the pumps were presented.

Key words: magnetic pump, trouble, reliable operation, measure, approach

Properties and Selection of Non-Asbestos Gaskets in Engineering Design

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Abstract: In this paper, the varieties and technical parameters of non-asbestos gaskets were more comprehensively introduced. Meanwhile, how to select the non-asbestos gaskets in engineering design was described.

Key words: non-asbestos gasket, variety, technical parameter, selection

Characteristics of Polypropylene Material and its application in Conversion System of Potassium Chloride

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Abstract: The characteristics and properties of polypropylene material were shown in this paper. Its application in the conversion system that is used in the production of S-based NPK compound fertilizer by the method of conversion of potassium chloride under low temperature was introduced.

Key words: polypropylene, characteristics, compound fertilizer, conversion system, application.

Analysis on Causes of Corrosion in Ammonia Stripper and Countermeasures

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Abstract: In this paper, the state of corrosion in the ammonia stripper was introduced, the causes of corrosion were analyzed and the countermeasures to solve the problem of corrosion were put forward.

Key Words: ammonia stripper, cause of corrosion, countermeasures

Analysis on Causes of Cracks in Polymerizing Vessels and Treatment Measures

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Abstract: In this paper it was described that the analysis on the causes of the cracks located in the region of the thermal couple nozzles in the polymerizing vessels was carried out via testing and examination, and effective treatment measures to prevent the corrosion cracks were taken.

Key words: polymerizing vessel, corrosion, crack

Analysis on Causes of Failure for Partial Condenser of Ammonia Stripper

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Abstract: The causes of failure of the partial condenser of the ammonia stripper were analyzed in this paper. Through the macroscopic examination, the analysis of chemical composition of the tubes and the testing for quality of the water, it was shown that the main causes of failure of the equipment were the eroding corrosion, but the corrosion could be under the influence of the heat exchanging way and accelerated with the raise of the PH value of the media. However, the local corrosion in the outside wall of the tubes resulted from the unacceptable content of the chloride ion and the impurities in the circulating water.

Key words: partial condenser, failure, corrosion

A Study on Connection of Pro/E with ANSYS

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Abstract: The modeling of a complex structure in the finite element analysis software ANSYS is a time-consuming work. By comparing many kinds of methods to import CAD files to ANSYS, the method for ANSYS modeling has been put forward in this paper. In the ANSYS modeling, CAD software is used to build the CAD model and then the model can be accurately imported to ANSYS by utilizing the connection of Pro/E with ANSYS.

Key words: ANSYS, Pro/E, Modeling

Method of Finding out Friction Factor of Pipe Based on CAGD

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Abstract: By adopting the method of Computer Aided Geometrical Design (CAGD), the curves of friction factors for pipes are converted and precisely plotted in computer. The program, which is worked out with Visual Basic calculating foreground and AutoCAD dealing with curves background, can imitate a man to search for the curves and then the friction factor of the pipe under the given conditions will be determined accurately.

Key words: CAGD, pipe, friction factor,

Mechanics Analysis on Swaging Process of Hose Assembly

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Abstract: The swaging quantum influences the connecting performance of the hose assembly directly. A hydraulic high-pressure hose is composed of the steel wire reinforced layer, inner and outer rubber layer, and presents orthogonal anisotropy. By adopting the theory of rubbery composite materials, regarding the hose as an anisotropic cylindrical shell, considering the swaging force and studying the method of analysis of stress-strain for the lamination cylinder composed by multi-materials, the mechanics model of the compounded tube was established. The deformation regularity of the hose was obtained and the relationship between swaging force and swaging quantum was derived theoretically. Meanwhile, simulated analysis was carried out by using the ANSYS finite element method and the results were finally proved with the experiments.

Key words: swaging quantum, hose assembly, mechanics model, ANSYS finite element method