

焊管轧辊的共用性和轧辊管理

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摘 要 简要介绍了轧辊孔型设计的基本原理及要求。提出了相邻轧辊共用性的设计思路,并举例说明了共用性轧辊的设计方法。给出了对在役轧辊和样板轧辊的行之有效的管理方法,从而提高了轧辊的利用率,降低了轧辊的消耗。

关键词 焊管 轧辊 共用性 管理

1 轧辊孔型设计的基本原理及要求

轧辊是焊管成型的基本模具,孔型设计以后通过轧辊来实现管坯的连续成型。轧辊孔型设计的基本方法有管坯中心弯曲法、管坯边缘弯曲法、管坯边缘与圆周综合弯曲法三种基本形式,并在此基础上发展了各种综合弯曲法。

轧辊孔型设计的基本要求是,正确地选择变形区长度和机架变形分配,以减少或消除边缘产生的残余变形,使管坯在孔型中成型稳定,轧辊磨损小而且均匀,保证焊管表面质量和几何尺寸符合要求。

2 相邻轧辊共用性的设计

生产不同规格的焊管需要不同的轧辊,但其形态大同小异,对于相邻规格的轧辊,尽可能地采用共用轧辊,以减少轧辊数量、降低轧辊消耗。下面通过 $\phi 165$ mm 高频焊管机组的 $\phi 165$ mm 轧辊与 $\phi 158$ mm 轧辊共用,概述成型开口孔部分的轧辊及封闭孔型的设计方法。

$\phi 165$ mm 规格的轧辊原有一套完整的轧辊,如需要生产 $\phi 158$ mm 规格的钢管,可以将 $\phi 165$ mm 轧辊的成型开口孔轧辊、成型立辊及磨光辊

与 $\phi 158$ mm 轧辊共用,而只需设计 $\phi 158$ mm 轧辊成型辊中的封闭孔型、导向辊、挤压辊、定径辊及土耳其头轧辊即可。 $\phi 158$ mm 轧辊封闭孔型的设计采用双半径设计方法,具体设计如下。

2.1 $\phi 158$ mm 轧辊钢带宽度的计算

已知焊管直径 $D = 158$ mm,厚度 $t = 3.5$ mm,带宽可根据企业焊管机组的特点,采用带宽经验公式(1)来计算。

$$B = (D - t) + (4 \sim 6) \\ = (158 - 3.5) + 6 = 491.38 \text{ mm} \quad (1)$$

取钢带宽度 $B = 492$ mm。

2.2 $\phi 158$ mm 轧辊导向环刀片厚度的计算

$$b_{fi} = K_{fi} \cdot D \quad (2)$$

式中 b_{fi} —刀片厚度; K_{fi} —经验系数。

为了保证孔型设计合理,变形分配均匀,在每一道次上钢带都能和整个孔型均匀接触,五平上辊的刀片 K_{fi} 的经验系数应略取大一些,以便使 $\phi 158$ mm 的孔型与 $\phi 165$ mm 轧辊开口孔部分的孔型顺利过渡。导向刀片的厚度见表 1。

2.3 $\phi 158$ mm 轧辊封闭孔型半径的计算

$$R_{fi} = \frac{B + b_{fi}}{2} + C, \quad (3)$$

式中 R_{fi} —所计算的第 i 架封闭孔的半径;
 C —修正值,一般取 3~5 mm。

表 1 $\phi 158$ mm 轧辊与 $\phi 165$ mm 轧辊闭口孔型导向刀片参数

| 规格/mm | 五平刀片 | | 六平刀片 | | 七平刀片 | |
|------------|------------------|-----------------------------|------------------|----------------------------|------------------|-----------------------------|
| | K_{f5} | b_{f5} | K_{f6} | b_{f6} | K_{f7} | b_{f7} |
| $\phi 158$ | $K_{f5} = 0.800$ | $b_{f5} = 126.4 \text{ mm}$ | $K_{f6} = 0.324$ | $b_{f6} = 51.2 \text{ mm}$ | $K_{f7} = 0.204$ | $b_{f7} = 32.23 \text{ mm}$ |
| $\phi 165$ | $K_{f5} = 0.576$ | $b_{f5} = 95.0 \text{ mm}$ | $K_{f6} = 0.310$ | $b_{f6} = 51.1 \text{ mm}$ | $K_{f7} = 0.087$ | $b_{f7} = 14.4 \text{ mm}$ |

同理, $\phi 158$ mm 五平上辊、下辊的半径与 $\phi 165$ mm 五平上辊、下辊的半径接近,使得钢带

变形均匀过渡,具体孔型尺寸见表 2,轧辊示意图如图 1 所示。

表 2 $\phi 158$ mm 轧辊与 $\phi 165$ mm 轧辊闭口孔型尺寸 mm

| 规格 | 五平上、下辊 | | | | | 六平上、下辊 | | | | | 七平上、下辊 | | | | |
|------------|---------------|-------------|-------------|-------------|-------------|----------------|-------------|-------------|-------------|-------------|----------------|-------------|-------------|-------------|-------------|
| | $D_o = 232.5$ | | | | | $D_o = 233.12$ | | | | | $D_o = 233.48$ | | | | |
| | R_{f5} | D_5 上辊 | H_5 上辊 | D_5 下辊 | H_5 下辊 | R_{f6} | D_6 上辊 | H_6 上辊 | D_6 下辊 | H_6 下辊 | R_{f7} | D_7 上辊 | H_7 上辊 | D_7 下辊 | H_7 下辊 |
| $\phi 158$ | 102.42 | 384.22 | 66.80 | 427.92 | 260.00 | 88.15 | 397.82 | 99.40 | 405.40 | 250.00 | 85.07 | 396.54 | 108.89 | 399.62 | 250.00 |
| $\phi 165$ | 101.20 | 405.00 | 77.50 | 423.00 | 250.00 | 92.60 | 403.00 | 91.40 | 406.00 | 234.00 | 85.80 | 398.00 | 109.80 | 400.00 | 234.00 |

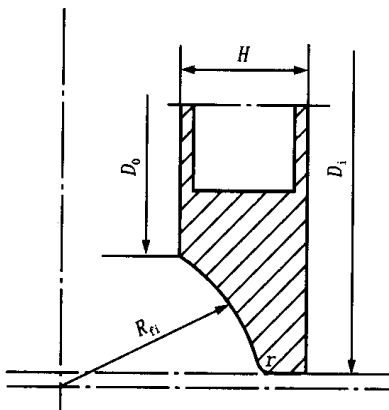


图 1 轧辊示意图

由此可见,轧辊具有共用性设计的可能性,可以根据轧辊使用的具体情况而设计。

3 轧辊的管理和验收

建立科学而完善的轧辊管理制度,是降低轧辊消耗的有效途径。轧辊管理首先应建立轧辊档案,对轧辊进行检查和验收,并加强对轧辊样板和轧辊规格的管理。

3.1 建立轧辊档案

由于焊管的轧辊数量和品种繁多,所以应建立轧辊档案的管理制度,对轧辊情况进行原始的记录。记录的内容应包括轧辊规格、数量、架次编号、材质和轧辊样板的情况以及在生产中轧辊的使用情况。根据轧辊档案的记录,以确定轧辊的返修、重加工的次数,并使轧辊能够交替使用进行合理的配辊,为轧辊消耗的情况提供依据,及时做好轧辊备件的计划,减少轧辊的储备量,降低轧辊的消耗量。

3.2 轧辊的检查和验收

轧辊的检查和验收是轧辊管理工作的一项重要内容。可以根据企业自身的特点,建立轧辊检查和验收制度,应包括以下 4 个方面内容:

(1) 首先根据轧辊图纸的编号,对轧辊的数量和轧辊的样板进行清点,检查轧辊数量是否齐全;然后检查轧辊的标志是否对应图纸要求的该印内容,标记是否清楚。

(2) 用卡钳、直尺或游标卡尺抽查、测量轧辊底径、外径、孔径和宽度等尺寸,是否符合图纸要求,并用样板测量孔型尺寸是否符合图纸的要求。

(3) 检查轧辊的加工精度和表面粗糙度是否达到图纸要求,因为轧辊的加工精度和表面粗糙度对轧辊的消耗有显著的影响;表面粗糙度越低的轧辊,磨损就越小,轧辊使用寿命就越长,轧辊消耗就越低。

(4) 检查轧辊有无损伤、裂纹、锈蚀等外观质量缺陷。

3.3 轧辊样板的管理

每一套轧辊都应配备相对应的轧辊样板,样板的数量几乎与轧辊的数量差不多,且每件样板上的架次标记,应与轧辊的架次逐一对应。

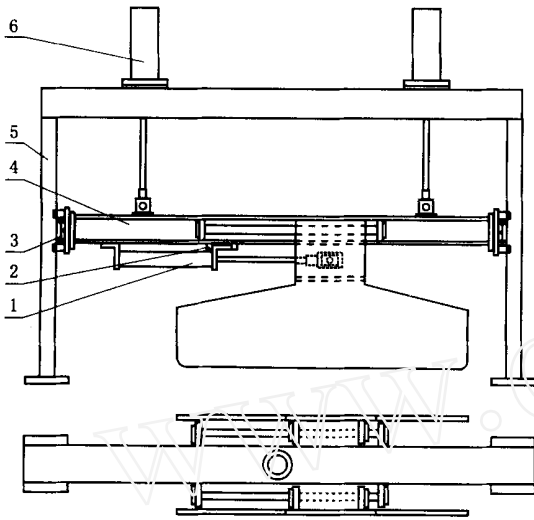
在使用过程中要防止样板丢失和损坏,使用后的样板要及时归放原处,不合格的样板应及时报废。对于在使用中确实丢失的样板,可以临时用硬纸皮剪纸样来制作样板。

3.4 加强轧辊的管理

除了建立轧辊档案对轧辊进行科学的管理外,在生产中还应对轧辊进行有效的管理。每次更换轧辊的品种规格,一般都是整套轧辊进行更换。对于更换下来的轧辊,首先应及时清洗

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造。改进后的全液压驱动板探装置如图 2 所示。



1—探头横向移动装置 2—挡块 3—导向装置
4—探头垂直移动装置 5—立柱 6—油缸

图 2 改进后板探装置示意图

改造方案如下:

(1) 改电机—丝杠—丝母探头横向移动装置为液压缸驱动探头横向移动,探头悬挂在两根导向柱上,加长有效导向距离,保证探头移动灵活可靠。而且消除了探头横向调整时的转动。

(2) 改进后的探头横向移动装置重量大大减轻,油缸仅重 15 kg,有效地减小了偏重的产生,保证了所有探头均匀地与钢板接触。

(3) 导向部件改为由偏心轴调整 8 个密封深沟球轴承的新型导向部件,如图 3 所示。改进后的导向部件有效地保证了探头垂直移动平稳灵

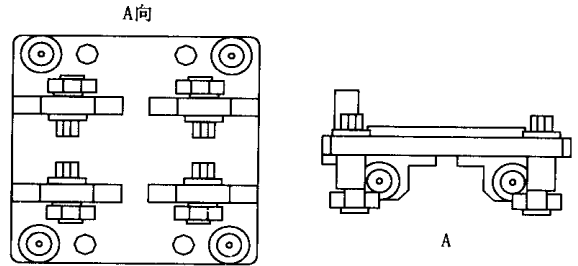


图 3 新型导向部件图

活,而且改进后的导向部件靠 4 个 M20 螺栓与探头垂直移动部分连接在一起,检修时可直接拆卸修好后直接安装,操作简单。

(4) 探头垂直移动选用双油缸驱动,保证了探头垂直调整灵活无卡滞。双油缸采用液压同步回路,保证两个油缸同步运动。

(5) 整体立柱改为由型钢组成的焊接件,提高了各部分的强度和刚性。

3 结 论

通过现场使用和比较,改进后的全液压驱动板探装置结构简单、重量轻、探头调整灵活可靠、整体强度、刚度高。它的成功应用,有效地保证了母材分层探伤的准确率和探伤精度。

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干净,加强日常维护,防止轧辊生锈、混乱堆放和丢失。其次,根据轧辊实际使用的情况,确定返修重车轧辊的架次,然后确定这一架次或者这一规格经过重车多次后的轧辊;已不能再使用的轧辊的数量,经过返修后,是否可以互换,在另一架次或另一规格的轧辊上继续使用。

一般来说,轧辊可以重车多次,并具有互换性。对某一规格已经不能再使用的轧辊,经过返修后,有可能再用于另一规格,根据具体情况,尽可能地对轧辊加以利用,不要轻易报废。

参考文献

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Key words :space pipeline parameter calculation program

The Exploitation of Anti-Corrosion Connecting Pipe Fitting for Outside Galvanized and Inside Applied with Plastic Pipe

Bai Yongqing, Sun Bingxin, Pang Yongjun et al(28)

Abstract :Outside galvanized and inside applied with plastic pipe has entered the application in water supply pipeline of building trade ,however ,its matching pipe fitting is used with liner plastic fitting. And the useful life of liner plastic fitting is only one third of the plastic pipe ;this greatly reduces the useful life of the pipeline of plastic pipe. Penman recommends that a thread joint plastic applied pipefitting has reliable quality and makes the thread joint of plastic pipe with convenience and utility. Therefore ,Pipeline has good anti-corrosion and reach to 60 ~ 100 years useful life.

Key words :outside galvanized and inside applied with plastic pipe liner plastic fitting plastic applied pipe fitting thread joint anti-corrosion technology

Application of Cold Bending Section Bar in Conservatory Big Shed

Li Dingyi(31)

Abstract :It introduces the research and development of special cold bend section bar for framework of several conservatory big shed in recent years and analyses strength and stiffness if this kind of section bar as well as the design thinking and usage performance of section bar with solid film channel. The usage approves that the anti-wind capability and economy of new section bar is superior to that of pipe big shed and the section bar has large potential market and social economy benefit.

Key words :cold bend section bar conservatory big shed strength stiffness solid film function anti-wind capability economic rationality

New Method of Early NDT Diagnosis for Welding Defects

Di Xinjie, Li Wushen, Liang Zhifang(34)

Abstract :Early NDT diagnosis for metal component has become a new study hotspot in NDT field along with the continuous development of NDT technology. Metal magnetic memory inspection method is a NDT mean that using the magnetic mechanical effect of ferromagnetic to determine stress concentrated position through inspection the leakage magnetic field strength of metal component and further determine welding defects in accordance with the stress concentration. Compared with other NDT inspection method, the most strongpoint is early NDT diagnosis method could early "forecast" the position that easily produce defects and directly use geomagnetism field to inspect and no need to carry out additional magnetization to the component. It briefly introduced that study actuality ,principle ,equipment as well as its developing prospect of metal magnetic memory inspection method.

Key words :welding defects inspection metal magnetic memory magnetism caused flex

The Property and Characteristic of Steel-Plastic Composite Pipe and Its Application in Water Supply Field

Liu Huiyi(36)

Abstract :Steel-plastic composite pipe shortened from steel-plastic pipe. It 's based on steel pipe and applied plastic material ,thus it not only keeps the high and strong toughness of steel pipes but also has the Characteristic of higher pressure resistance ,impact resistance and fracture resistance , etc. Compared with the traditional galvanized pipe and cast iron pipe ,the steel-plastic pipe is more safety and reliable ,economy and environmental protection and can fully replace the galvanized pipe and cast iron pipe in water supply field. The installation of steel-plastic pipe is similar to that of galvanized pipe with simple operation. The steel-plastic pipe is widely

applied to China developed cities in recent years. Along with China continuous change to cities direct drinkable water supply ,it will surely obtain larger market scope.

Key words :steel-plastic pipe characteristic water supply application standard installation

Study on 1200 kW Radio Tube High Frequency Welding Unit

Peng Yonglong, Xia Yueliang, Xuan weike(39)

Abstract :It introduces the composition of 200 kW radio tube high frequency welding unit and describes its main design parameter and automatic control system. It highlights the application of ultra evaporation cooling technology on radio tube high frequency welding unit and discusses several measures to improve welding efficiency.

Key words :high frequency welding unit welding efficiency ultra evaporation cooling

Analysis on Pressure Regulating Loop of Pipe Hydrostatic Tester

Mao Zhoutuan, Liu Yaomin(42)

Abstract :It introduces two typical working principles of pressure regulating loop of pipe Hydrostatic tester. It compares the two pressure regulating system and combines the characteristic of different working phases of the system as well as analyzes the design principle and structure of water valves of pressure regulating system with no pressure compensation from design and maintenance angle.

Key words :pipe hydrostatic test pressure regulating system analysis

The Development of PLC Controlled Plasma Arc Welding Unit

Han Jian, Hu Shengsun, Fu Yuwen et al(45)

Abstract :It designed a PLC controlled plasma arc welding unit by himself in accordance with the characteristics of PLC. The automatic control system of this welding unit takes model FXON - 24 as the control core of PLC and can meet all control requirements of plasma arc welding. The Experiment shows the welding unit can realize plasma arc automatic welding.

Key words :plasma arc welding welding unit PLC

The Forming Technology of Spiral SAW Pipe

Bai Zhongquan(48)

Abstract :It works over the roller shape of design ,pre-bending position ,forming control and the applicability of bending plate roller of SSAW pipe , etc. . And it gives the design demonstration of forming process and has certain guidance for the forming design and site commission.

Key words :spiral submerged arc welded pipe forming technology roller shape curve prebending elasticity

Cause Analysis on GCr15 Steel Roller Fracture of Small Size Welded Pipe Unit

Han Feng(57)

Abstract :GCr15 steel Rollers of Small size longitudinal seam welded pipe Unit production line often produce brittleness fracture ,and edges and corners cracks with falling pieces and affect the production efficiency as well as increase the cost of pipe manufacturing. It analyzes the cause of the roller aging and suggests that it can avoid or reduce the fracture of roller through improving the pass design.

Key words :small size longitudinal seam welded pipe unit GCr15 steel rollers fracture analysis

The Sharing of Welded Pipe Rollers and Rollers Control

Chen Qin, Chen Yingyang(60)

Abstract :It introduces the rationale and requirements of rollers pass design. It puts forward the design thought of adjacent rollers sharing and explains the design method of sharing rollers with example. It gives out the effective control

method to servicing rollers and former rollers and increases the utilization rate of rollers and reduces the consumption of rollers accordingly.

Key words :welded pipe roller sharing control
Improvement of Coil UT Inspection Equipment of SAW Pipe Unit

Chen Qiwei, Liu Lianqi (62)

Abstract :The coil ultrasonic inspection for welded pipe is an important procedure during the production of Spiral welded pipe. Through analyzing the existed disadvantage and shortage of original coil inspection equipment during the application of lamination inspection to pipe parent metal ,it puts forward the improving scheme. The probe transverse movement adopts hydraulic driven ;The probe vertical movement adopts double oil cylinder driven ;The guidance parts adjusts by eccentricity shaft ;The whole stand is instead of section steel welded parts. The improved full hydraulic driven type coil inspection equipment has simple structure ,light weight ,flexible and reliable probe adjustment and highly whole intensify and stiffness as well as good use effect.

Key words :welding pipe unit coil Inspection unit improvement

Use Technique of Strip Splitting Production Line

Zhai Hui (64)

Blind Area Elimination of X Ray Industrial TV Inspection on SSAW Pipe

Wang Shuren, ZhuDaquan (65)

Abstract :Aim to the existed blind area problem of pipe ends during the inspection of X ray industrial TV Inspection system of SSAW pipe line ,it analyzes the cause of blind area as follows:1) X ray dispersion;2) remained magnetic particle on pipe ends;It puts forward the specific method of eliminating blind area as follows:1) pipe ends radiographing;2) image shelter unit ;3) Magnetic field rectifying unit. This makes the inspection system can meet the requirement of 100 % whole weld inspection.

Key words :spiral welded pipe X ray inspection blind area elimination

Selection Guide and Theory Basis of Welding Material for High Pressure Transmission Steel Pipeline

Zhen Zhaodong, Gao Lei, Song Tianxu (67)

Abstract :It discusses selection guide and its related theory basis of welding material for high-pressure transmission steel pipeline combined the experience of actual project and corresponding international specification ,the distortion characteristics ,fracture mechanics and strength matching during the pipeline welding ,etc. .

Key words :pipeline welding selection of welding material theory basis strength matching fracture mechanics analysis

The Relation Between Geometrical Shape of Oil Tank Body and Welding

Chen Bin, Shang Li (70)

Abstract :It introduces the classification and its composition of vertical cylinder shape steel welding oil tank and analyses the relation between geometrical shape of oil tank body and welding construction of oil tank. It describes the welding sequence and welding method of tank parts during welding , etc. .

Key words :vertical cylinder shape steel welding oil tank geometrical shape welding relation

Welding Construction Measures Taken on Atrocious Weather

Zhao Jinhui (72)

Abstract :The bad weather is one of the key factors that affect the quality of welding during petrochemical project construction. The atrocious weather makes the electrodes affect

ed with damp ,pipe ends bevel rusting and increase the hydrogen diffusion chance in welding metal and it is easy to produce welding defects and deteriorate the mechanic property of welding metal. Therefore ,it is necessary to adopt preventive measures and strict control of electrode usage to insure the welding quality.

Key words :site welding atrocious weather effect and preventive measure

Procedure Quality Dynamic Control of Welded Pipe Production Process

Wang Gaotian (74)

Abstract :Through analysis to the characteristic of welded pipe and goods flow influenced by information flow ,it suggests to consist the procedure of welded pipe and establish the method of procedure dynamic quality information system in order to timely improve the procedure quality ,reduce the procedure badness and insure goods flow free.

Key words :welded pipe production process procedure quality dynamic control

Study of Applying ERW Pipe Technical Specification in City Natural Gas Pipeline Net

Sun Yongxi (76)

Abstract :It considers the main process parameter of ERW pipe must be standardized to avoid quality overmuch and increase the nullification investment and put forward some advice and opinion to the design of city gas pipe under the analysis of some special requirement of the composition of gas transmitted by pipeline ,environment conditions and natural gas to ERW pipe.

Key words :natural gas net ERW pipe technical specification study

Discussion on Several Ordinary Problems on Additional Technical Conditions of P. O. of SSAW Pipe for Oil and Gas Transmision

Qiao Xiaotang (81)

Abstract :It analyzes practical application requirement of pipe and quality level which can be obtained from production procedure technology of pipe and discusses the technical conditions which not only can meet application requirements of pipeline but also can all accept by each party aim to the ordinary arouse disputed problems of upper and lower limit of yield strength ,yield/ tensile ratio ,toughness ,time of X ray inspection and hydrostatic test burst test as well as pipe ends dimensions and process defects ,etc. .

Key words :spiral seam submerged arc welded pipe oil and gas transmission technical conditions addition application performance process quality level

The Strength Characteristic of High Grade Gas Transmission Pipeline Steel

Translate and edit by Li Xiaohong, Xinxixian (85)

Abstract :In recent ten years ,pipeline steel technology also made great development through the augmentation of natural gas consumption. It is very important for pipeline to safely and economic transmission of natural gas ,for example ,it requires the pipeline WT and high toughness to deep water pipeline of offing gas field ,and long distance gas transmission pipeline requires above X80 grade pipeline strength to reduce the gas transmission cost. To meet the above requirements of safety and economic ,steel making technology gains sufficient development ,therefore X100 Grade gained further study. However ,it still need to further study all characteristics of X100 grade ,such as characteristic of distortion action ,welding design ,dynamic ductibility fracture crack arrest ,the property of pipe material and X100 pipeline construction specification for the X100 grade pipe applied on the construction of pipeline.

Key words :pipeline steel X80 X100 characteristics