焊管表面划伤的消除

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摘 要 随着用户对焊管表面质量要求的不断提高,消除焊管表面划伤越来越受到人们的重视。分析认为,轧辊各点线速度差异使带材和成型辊之间产生的滑动摩擦是焊管表面划伤产生的根本原因,合理地设计轧辊结构,准确地轧辊安装和调整,适当地使用润滑液等能有效防止焊管表面划伤的产生。

关键词 焊管 焊管表面 划伤 轧辊

1 焊管表面划伤产生的原因

使用轧辊成型的焊管要求将带材横向弯曲成圆,这是使带材通过一系列不同孔型的轧辊变形来实现的。每对轧辊以一定转速转动。但轧辊表面的线速度因旋转半径不同而不同,线速度的差异使带材和成型辊之间产生的滑动摩擦是焊管表面划伤产生的根本原因。

大部分焊管机组使用水平成型法成型。对于这种机组,粗轧辊、导向环辊和定径辊的主动辊底径被认为是驱动直径,这些轧辊底径位置的线速度基本等于带材的递送速度。由于旋转半径不同,每个轧辊的辊缘,使带材和轧辊表面产生最大的相对滑动摩擦,从而产生表面划伤。

摩擦力的大小影响表面质量,大的摩擦力会产生划伤。摩擦力公式为: $F = \lambda \cdot P$ (1)

式中 λ —摩擦系数;

P —正压力。

当摩擦力增加时,带材所受正压力 P 增大,带材变形量增加,导致轧辊拉伤带材,最终产生表面划伤。

2 合理的轧辊设计和加工

2.1 使用游动翼缘辊

为了减少带材和轧辊表面的相对滑动,主动辊使用游动翼缘辊。一种典型的游动翼缘辊结构如图1所示,其特有的设计是游动翼缘由轴承支撑,它的转速取决于带材的递送速度而不同于轧辊的转速。使用这种轧辊使带材和轧辊表面之间的相对滑动减少,从而使焊管表面划伤减少甚至消除。此设计对大管径焊管生产非常有益,因为假定底径不变,当管径增大时,轧辊辊缘直径增加,增加了相对滑动从而增加了滑动摩擦。

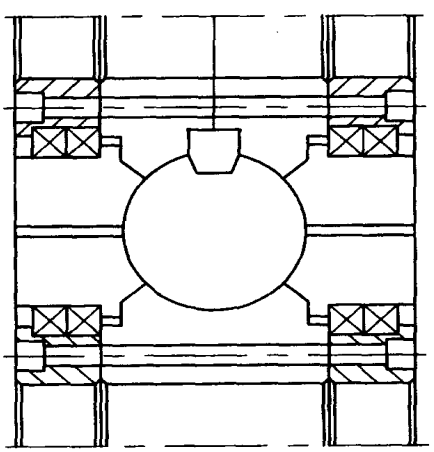


图1 带游动翼缘的导向环辊示意图

游动翼缘辊多用于粗轧辊和导向环辊,因为成型和横向弯曲主要在这两部分完成。

2.2 四辊成型

除了使用游动翼缘辊成型,有些焊管机组使用四辊成型。四辊成型用于导向环辊和定径辊,这时水平辊使用主动辊,立辊使用被动辊。立辊的转速取决于带材递送速度,这有利于减少带材与立辊表面的相对滑动和滑动摩擦。

2.3 逸出角和余隙

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除了改变轧辊设计,对轧辊修正也可以减少焊管表面划伤。常用方法是在轧辊辊缘加工一个适量的逸出角或余隙。这个余隙可以减少带材在该部位的表面压力从而减少表面划伤。加工余隙的大小不仅取决于焊管材质、管径大小和机组特点,还取决于成型过程中每架轧辊的辊花。逸出角角度或余隙要求以带材能够从轧辊的表面逸出为宜。图 2 为连续三辊成型的成型辊花(两架驱动辊和一架侧辊)和立辊孔型,进入的带材首先接触立辊的底部辊缘,这是滑动摩擦集中和容易产生划伤的部位。为减少带材在此部位的接触和压力,加工一个逸出角和余隙以增加带材和轧辊之间的间隙。大多数逸出角非常小,不影响焊管的成型。

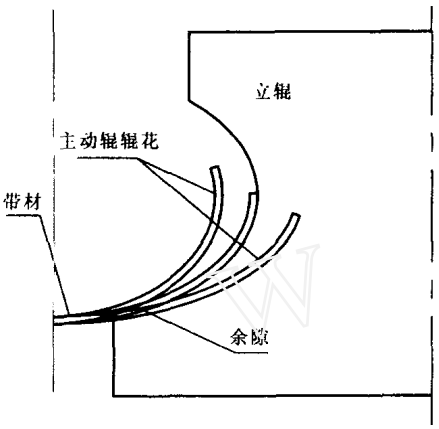


图 2　立辊孔型余隙示意图

2.4　轧辊表面粗糙度

轧辊表面粗糙度影响轧辊和带材之间的摩擦系数。轧辊表面粗糙度值越小,轧辊和带材的摩擦系数越小。为了减小轧辊和带材之间的摩擦系数,一般要对轧辊表面进行研磨加工,使轧辊表面粗糙度小于 Ra 0.2 μm。

3　轧辊正确安装和调整

3.1　轧辊中心和机组轧制中心一致

轧辊中心偏离机组轧制中心,使轧辊单侧受力太大,容易产生管体表面划伤,如图 3 所示。为了保证轧辊中心和机组轧制中心一致,以第一架粗轧辊牌坊架和最后一架定径(矫直)水平辊牌坊架为基准测量、调整,使粗轧辊第一架水平辊下辊中心和最后一架定径(矫直)水平辊下辊中心位于机组轧制中心,然后以这两辊中心拉一条钢丝线,该钢丝线就是机组轧制中心线,使各架水平辊下辊中心调整达到位于该中心线上,水平辊上辊依下辊为基准进行调整。对于立辊,可调整使立辊两辊缘相贴合。轧辊中心线应位于立辊贴合部位,否则调整立辊中心。

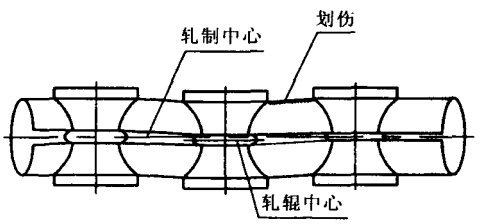


图 3　轧辊中心偏离轧制中心产生划伤

3.2　轧辊安装

轧辊安装不合适,例如水平辊安装不水平或水平辊安装错位,如图 4 所示;立辊安装不垂直或立辊安装错位,如图 5 所示,都会造成轧辊辊缘受力太大,产生表面划伤。为了保证轧辊安装准确,每次换完道后,使用水平仪对水平辊水平性检查,对立辊端面水平性检查确定立辊的垂直性。若生产过程中出现划伤,也要及时对轧辊的安装情况

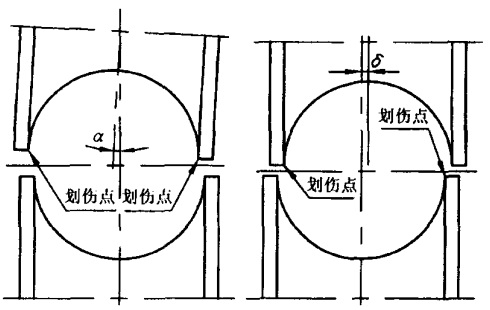


图 4　水平辊安装不合适产生划伤

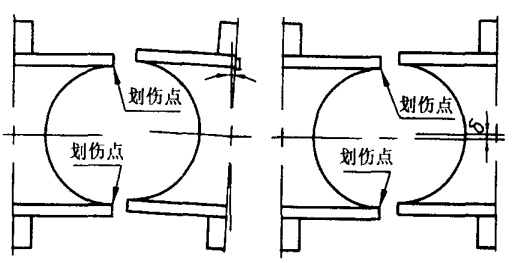


图 5　立辊安装不合适产生划伤

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进行检查。

3.3 轧辊转速

轧辊各点线速度差异导致轧辊和带材产生滑动摩擦是焊管表面划伤产生的根本原因。为了使轧辊各点线速度和带材线速度差异最小,各主动辊底径相同时,各轧辊转速应该相同。实际生产中带材会产生延伸,为了保证不在轧辊之间产生堆钢现象,主动辊底径随架次增加轧辊底径略有增加,这种情况下应该认为轧辊底径是相同的。

3.4 轧辊参数设定合理

实际生产时要合理设定轧辊参数。减径量太小影响产品质量,减径量太大使轧辊受力太大,容易产生划伤。对给定的减径量,应尽量使各架减径量均匀分配,避免局部架次减径量过大,使管体表面产生划伤。

3.5 轧辊维护

正常生产时,轧辊自身会产生划伤,毛刺、铁屑等异物粘在轧辊表面,也会对管体表面产生划伤。轧辊表面有划伤或粘有异物时,要及时对轧辊表面清理、修磨。

4 润滑液的合理使用

如果可能,焊管在成型过程时应该使用润滑液。使用润滑液的优点:①提高轧辊寿命;②管体表面不易产生划伤。润滑液降低了轧辊和被成型材料之间的摩擦系数,从而使焊管表面产生划伤的可能性降到最低。选择专用润滑液可以防止焊管表面粘污,同时保证润滑液循环系统正常运转。

各种材料和各种加工方法用于焊管的生产,同时有许多不同基体的润滑液用于焊管机组。必须根据被成型材料选择合适的润滑液,以提高生产率,同时满足环保的要求。

但使用润滑液也有缺点,最常见的是固态聚集和金属固溶。固态聚集是以下两种现象的结果:一是外来颗粒,例如在成型过程中带材表面产生的铁屑和氧化物的沉积;二是润滑液中溶解的固态物的沉淀。这会对焊管和轧辊产生影响,引起表面划伤。

大部分带材成型时,小的金属颗粒会从带材表面脱离,这些颗粒被润滑液冲走,这就是“金属固溶”,另一个金属颗粒的来源是纵剪时带材边缘产生的毛刺,这些毛刺非常小,不容易看到,成型时被润滑液冲走。这些颗粒和润滑液混合,同时拌有其他污染杂质,如齿轮润滑油、轧辊轴承润滑脂,夹在轧辊和焊管之间,引起细金属颗粒在轧辊上的堆积,引起表面划伤。润滑液循环系统的合理维护会防止这些问题的发生。

5 结 语

对不同用途的焊管,例如高强度低合金钢结构管,表面质量不像需要再精加工的焊管要求高,为了降低生产成本,(如果轧辊划伤在标准要求范围以内)就没有必要在消除表面划伤方面做出太多的努力。

表面处理工艺可以在轧辊表面形成硬的耐磨层。耐磨层有物理涂层,化学涂层和热扩散层。涂层材料一般含氮化钛和碳化钛。涂层可以增加轧辊的耐磨性,减小摩擦系数,但是使用时轧辊变形和修复困难限制了轧辊在这方面的应用。当钢管表面粗糙度非常严格时,可以考虑对轧辊进行表面处理。

焊管表面划伤产生的原因可能很简单,例如表面摩擦大或由于轧辊表面线速度的差异。但是要分析并消除表面划伤的过程却比较麻烦,应对整个成型过程包括轧辊的设计、轧辊安装和调整,润滑系统的合理使用等进行分析处理,这样才可以生产出高质量的产品。

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control of welding parameter. The original Control system adopt time relay to control welding parameter and the performance target of control accuracy ,stability and reliability ,etc. can not meet the requirement. To adopt FPI1 - CI4 PLC of Japan National Co greatly increase the performance of welder with pre - tune and display function through write protection function program ,time data input program and control the weld process program.

Key words : PLC Cu - Al pipe butt resistance welder welding current welding voltage

Discuss on Inside Welding Monitoring Scheme

Zhang Mengjun , Xie Shuxia , Liu Huanjun (55)

Abstract : The article put forward that to build a inside welding monitoring unit carry out inside welding monitoring scheme by using a PLC ,step by step motor ,shift sensor ,and man-machine interface ,etc. according to present actuality of inside weld monitoring for high quality ,heavy wall thickness spiral submerged arc welded pipe. The inside welding monitoring unit adopt non-contact type measurement ,and can obtain the correct alignment of strip and inside weld movement unit through calculating the rotation angle of step by step motor to meet the purpose of inside weld control and the system can obtain 0. 3 mm inspection accuracy for strip misalignment.

Key words : spiral welded pipe inside welding monitoring weld misalignment monitoring

Discussion on Forming Components of Longitudinal Edge Forming Unit

Yang Xian , Wang Junwei , Gao Jinyan (57)

Abstract : The article introduces the composition and working principle of forming components of longitudinal edge forming unit and use of each component. It put forward 5 kinds improved forming components of longitudinal edge forming unit ,i. e. a pair of bottom crossbeam of row rollers shall be lonrgitudinally moved along rolling line direction. The angle of rollers can be adjusted and realize adjustment by computer aid. To add support rollers under row rollers; To adopt four roller universal stands in finishing forming segment. After adopting the above mentioned improvement ,the forming procedure of row rollers has better flexibility and adaptability.

Key words : longitudinal forming natural flexible forming pre-bending row roller

A New Type Bending Pipe Unit

Duan Jinhu (60)

Abstract : A new type bending pipe unit is designed faced to the problem of poor bending quality , heavy labour and low working efficiency etc. of original serpent pipe bending unit. The article introduces the technical parameter ,working principle and operation procedure of this bending unit as well as the hold down roll structure ——the oval degree of key parts of controlling bending pipe. The new type bending pipe unit improves the quality of pipe bending and increases work efficiency.

Key words : bending pipe unit working principle bending pipe oval degree labor strength working efficiency

Discuss on Setup of Inside Welding Multiple Wire Welding Specification in Longitudinal Submerged Arc Welded Pipe

Ma Jun , Li Junzuo (63)

Abstract : It takes a great deal of experiments for the setup of inside welding multiple wire welding specification in longitudinal submerged. It is found there is certain rule in setup of inside welding multiple wire welding specification in submerged arc automatic welding through the analysis of experiment welding specification. It can effectively reduce weld defect produced such as weld gas pore ,slag inclusion and burn through ,etc. by use this rule.

Key words : submerged arc automatic welding multiple wire welding specification setup weld defect

Polyethylene Wrap Coating Procedure of Pipe Outside Coating

Wen Hongwei (65)

Abstract : The article analyses and discusses wrap coating procedure of 3PE outside coating pipe production aim at the real problem existed in production and production procedure. And puts forward it can improve the quality of polyethylene wrap coating to pipe through the method of control the temperature of polyethylene and adhesive ,keep suitable melting viscidity and pressure ,different diameter pipes adopting different coating rate and mend vertically and horizontally mechanical performance differential of polyethylene film layer as well as adopt reasonable hold down roller and water cooling ,etc. . with great ease.

Key words : pipe coating wrap coating polyethylene adhesive fusion bond epoxy powder

Betterment to Press Stand Structure of Strip Shearing Unit of Spiral Welded Pipe Unit

Chen Qiwei , Zhang Yabin , Zhang Zhongxiu (67)

Removing of Surface Scratch on Welded Pipe

Jie Shengqi (68)

Abstract : People more and more pay much attention to removing of surface scratch on welded pipe through the increasing surface quality requirement to welded pipe by end users. The article analyses and considers that slide friction produced between strip and forming rollers due to the differential of each point linear speed of rollers is the root reason that produce surface scratch on welded pipe. It can effectively prevent the produce of surface scratch on welded pipe by reasonable design the structure of roller ,exactly installation and adjustment of rollers and suitable adopt lubricate ,etc. .

Key words : welded pipe surface of welded pipe scratch roller

Develop Status of Pipe for Generate Electricity Boiler in Japan

Translated and edited by Zhang Chaosheng (71)

Abstract : The article introduces develop status of pipe for generate electricity boiler. At present , the development of generate electricity technology is to increase its generate electricity efficiency as emphasis. The direction of steamer conditions of boiler develops from ultra critical pressure to VSC ,i. e. to increase the steam temperature and steam pressure of boiler. In order to meet the demand of generate electricity , Japan Steel Co had developed out low alloy ,ferrite ,Austenitic thermal resistance pipe and is under developing to exploit Ni base alloy tubular ,etc. .

Key words : Japan coal generate electricity boiler thermal resistance pipe material performance

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