国内螺旋焊管不剪边生产工艺发展状况

常 铁 锤
(西安鑫麒科工贸有限责任公司, 西安 710065)

摘 要: 随着冶金技术的不断发展,焊管生产用铣边机的制造以及铣刀盘、刀片制造工艺的研究都达到了新的水平,从而使焊管的生产工艺水平更加成熟。通过对近十年国内螺旋焊管生产线上采用的不剪边生产工艺的统计和分析认为,螺旋焊管采用不剪边生产工艺是螺旋焊管生产技术发展的新趋势。

关键词: 螺旋焊管; 不剪边生产工艺; 铣边机; 刀片
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1 螺旋焊管不剪边生产工艺发展状况

(1)宁波三鼎钢管厂 1994年引进英国前摆式断续生产机组,采用 1台铣边机,单边铣削量 2～4mm。

(2)上海三航——亚新太钢管公司 1994年引进德国前摆式断续生产机组,采用 1台铣边机,单边铣削量 2～4mm。

(3)鞍山德龙钢管有限公司(鞍钢三冶)1996年引进德国前摆式断续生产机组,采用 1台铣边机,单边铣削量 5～8mm。

(4)沙市钢管厂 1997年自制铣边机。采用 1台铣边机,1999年在国内首次采用不剪边工艺生产徐州管线钢管(φ323.9mm×6.4mm、钢级 X46)6 800 t,单边铣削量 15mm。

(5)宝鸡石油钢管有限责任公司 2002年在国内首次采用 2台铣边机(1台粗铣,1台精铣,X型坡口),单边粗铣削量为 8～10mm,精铣销量为 2～3mm,最大粗铣销量 30mm,生产西气东输管线用管(钢级 X70、板厚 17.5mm)30×10^4 t。

(6)上海佳方钢管有限公司 2003年投产的前摆式连续生产机组,采用 1台铣边机,单边铣削量为 3～5mm。

(7)哈尔滨三冶钢管有限公司前摆式断续生产机组 2003年投产,采用 1台铣边机,单边铣削量 5～10mm。

(8)上海宝世威石油钢管制造有限公司后摆式连续生产机组 2004年投产,采用 2台铣边机,单边粗铣量为 3～5mm,精铣量为 2～3mm。

(9)上海港口美亚钢管厂引进的国外前摆式连续生产机组 2004年投产,采用 1台铣边机,单边铣削量 3～5mm。

(10)上海埃力生钢管有限公司引进的国外前摆式断续生产机组 2004年投产,采用 1台铣边机,单边铣削量 3～5mm。随后又上了 2条前摆式连续生产机组,各采用 2台铣边机(粗、精铣工艺)。

(11)浙江双羊集团有限公司前摆式断续生产机组 2004年投产,采用 1台铣边机,单边铣削量 3～5mm。

(12)沧州鑫源泰钢管有限公司前摆式断续生产机组 2004年投产,采用 1台铣边机,单边铣削量 3～5mm。

(13)四川资阳石油钢管厂 2004年将后摆式连续机组进行改造,增加了 2台铣边机,单边粗铣量为 2～5mm,精铣量为 2～3mm。

(14)中美合资上海太平洋钢管公司前摆式断续生产机组 2004年投产,采用 1台铣边机,单边铣削量 5～10mm。

2 螺旋焊管不剪边工艺的优越性

螺旋焊管不剪边生产工艺是螺旋焊管生产技术发展的新趋势,据不完全统计,上海市的 17条

螺旋焊管生产线中,只有宝冶钢管厂引进德国博隆公司的 1条生产线和国产的 1条生产线还采用剪边工艺,其他生产线均采用不剪边生产工艺。

过去绝大多数钢管厂都采用剪边工艺生产螺旋钢管,原因之一是钢管生产用板卷标准规定,板头、板尾 1.5m内不保证质量,俗称"大舌头"。随着我国轧钢水平的不断提高,"大舌头"现象基本消除。另外,通常认为钢板边缘 20mm范围内的质量得不到保证,但是,笔者查阅国家标准这方面却无明确规定。再者钢板宽度公差虽然钢厂规定为 0～20mm,但是大钢厂如宝钢、武钢、鞍钢均在 0～10mm范围内,这些都给螺旋焊管不剪边生产工艺提供了有利条件。

螺旋焊管的焊缝质量,主要取决于成型质量和焊接质量,而这两者又取决于钢板工作宽度的精确、焊接坡口的形状和钢板边缘粗造度的精度。钢板的宽度精确、坡口的形状理想以及钢板边缘粗造度的精度高必然使成型稳定,焊接电流稳定,焊缝质量高。

铣边机一般设置在距离递送机、成型机较近的位置,可消除钢板的摆动量,有利于钢板的稳定,保证钢板递送线的精确性,焊管的一次通过率因此可提高 10%。

在剪边生产工艺中,经圆盘剪剪切后,钢板侧面可明显观察到钢板厚度的三分之一是挤压剪切,三分之二是扯裂,扯裂部分可看到微裂纹,而经铣边机铣边后的钢板侧面基本上是没有裂纹的。剪边时,若圆盘剪出现崩刃,还会造成钢板侧面出现高点,成型时就会造成局部错边。

铣边可使 X型坡口的尺寸稳定,使焊接电流也稳定。宝鸡石油钢管有限责任公司在生产西气东输用钢管时,严格要求 X型坡口形状,并作到每班检查 X型坡口尺寸,保证了焊接质量,为西气东输工程输送了 30×10^4 t优质钢管。

螺旋焊管不剪边生产工艺在不增加电力、焊剂、焊丝的前提下,增加了钢板实际工作宽度,据实际测算可提高 1%的成材率,产生较大的经济效益。国际上最大的铣边机专业生产厂家奥地利林辛格公司宣传广告上写着"铣削技术——一个用户的经验:在年产量 25000 t的条件下每年节约 375000欧元"。由此可见,不剪边技术在国际上已经得到认可。

在新机组的设计中采用铣边机,可去掉圆盘剪及拉边机,两者相比设备造价相当,铣边机刀片的消耗略高于圆盘剪刃的消耗。

3 铣削刀片的研究

焊管生产是连续生产线,而铣边机的刀片属于断续冲击切削,这就要求刀片具有很高的抗热振裂和抗塑性变形能力,红硬性高,耐磨性好。刀片的材质不同,价格不同,使用效果也不同。对于钢级为 X70、X80的制管原材料,必须要求相应铣边机刀片的抗弯强度较高。

当前,国内先进的刀片均采用镀层刀片。镀层刀片有三大优点:耐磨、隔热、润滑,从而提高了刀片的寿命,镀层硬质合金的寿命比未镀层的硬质合金高出许多倍。

镀层的种类也有多种:①碳化钛(TiC),灰色;②氮化钛(TiN),金色;③氧化铝(Al_2O_3),黑色;④碳氮化钛(TiCN),深紫色。镀层的种类不同,价格不同,寿命也不同。

4 结 语

近十几年,由于铣边机、铣刀盘、刀片等关键技术问题的研究及解决,国内螺旋焊管和直缝焊管生产线的生产工艺发生了很大的变化。不剪边、以铣代剪生产工艺日益成熟,使焊管生产的成型质量、焊接质量有了很大的提高,也必将成为焊管生产工艺发展的新趋势。

作者简介:常铁锤(1950 -),男,江汉石油管理局有突出贡献科技专家,长期从事石油钢管制管设备的技术研究工作。

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pipe diameter is smaller and final project total cost can save 5% ～15%.

Key words: gas transmission pipeline; grade X120; property research; application program

Production Process Developing Status of Non-Shearing Edges in China's Spiral Welded Pipe

CHANG Tie-chui

Abstract ID: 1001-3938(2006)03-0033-EA

Abstract: Through the continuous development of metallurgical technology, the manufacture of milling unit for production of welded pipe and study for manufacturing process of milling die head and chips both reach a new level thereby the production process level of welded pipe has grown up. It is considered that spiral welded pipes adopts non-shearing edges production process is the new trend of its production technology development through the statistics and analysis of adopting non-shearing edges production process in recent ten years. It briefly analyses each performance of chip used by milling unit

Key words: spiral submerged arc welded pipe; non-shearing edges production process

Pipe for City Natural Gas Transmission Project

FANG Xiao-dong, YANG Bin-fu

Abstract ID: 1001-3938(2006)03-0035-EA

Abstract: It puts forward that spiral submerged arc welded pipe is the first choice of welded pipe for main trunk gas transmission with medium and high pressure for selecting of city natural gas pipe with several comprehensive consideration of security, economy and applicability, etc through comparison of advantage and disadvantage and introduction of PE pipe, cast iron pipe and welded pipe for city natural gas

Key words: pipe for city natural gas transmission; PE pipe; cast iron pipe; welded pipe; select

Line Scanning DR Digital Imaging Technology Application on Spiral Submerged Arc Welded Pipe

TANG Yan-lin, DING Xiao-jun, WANG Hua-gong

Abstract ID: 1001-3938(2006)03-0037-EA

Abstract: To utilize new type line scanning direct radiography digital imaging technology is to carry out X ray direct imaging inspection to weld on pipe ends of spiral welded pipe. Its sensitivity and distinguished rate is superior to image intensifier and reaches and exceed the level of film and can replace the existed film inspection to improve inspection rate and quality.

Key words: X-ray; spiral submerged arc welded pipe; digital imaging; image disposal

Digitized Pulse Width Modulation Technique for Inverter Typed Arc Welding Power Supply with Pulsating Variable Polarity Output Based on DSP56F805

FU Ce-jian, ZHU Zhi-ming, ZHOU Xue-zhen, JI Sheng-ru

Abstract ID: 1001-3938(2006)03-0041-EA

Abstract: A full-digitized control system, which is used for inverter typed arc welding power supply with pulsating variable polarity output, was established based on dual DSPs, Motorola 16 - bit hybrid digital signal processor DSP56F805. By adopting the PWM modules integrated in DSP56F805 and selecting their reasonable working mode, the direct digitized control of the PWM control pulse for the primary inverter and the polarity counterchange control signal for the secondary inverter was realized. The A/D sampling is synchronized with the PWM control pulse, thus the disturbance of surge voltage and current during switching transition is avoided. All of these measures enhance the stability and reliability of digital control system. Eventually, the welding current output waveform with pulsating variable polarity, which is the combination of mid-frequency variable polarity output and low-frequency pulse output, was realized. This establishes the foundation for improving the welding quality of TIG welding

Key words: digital signal processor DSP56F805; pulse width modulation; A/D synchronous sampling; variable polarity

Application of Mixed Gas in Gas Metal Arc Welding

ZHANG Jian-chun, WANG Guo-rong, SHI Yong-hua, ZHONG Ji-guang

Abstract ID: 1001-3938(2006)03-0046-EA

Abstract: Gas metal arc welding (GMAW) is the main welding method in welding production. This paper illustrates the applications of mixed gases in GMAW and analyzes the different proportion of shielding gas impacts on the welding technics performance and quality in GMAW.

Key words: GMAW; mixed gas; gas characteristics

Computer System Development of New Type Welded Pipe Fixed Length Flying Saw

GUO Sheng-min, PAN Jian-guo, Liu Zi-zhuang

Abstract ID: 1001-3938(2006)03-0050-EA

Abstract: It recommends the computer system's flexibility control, the in-line adjustment of fixed length accuracy and reliable design of new type welded pipe fixed length flying saw. The computer system of new type fixed length flying saw adopts perfect technical scheme and reliable program calculation to make the fixed length flying saw with good movement capability, greatly reduce mechanical impact and wearing due to saw movement and realize flexibility operation of saw. Meanwhile, this system adopts perfect self-fit calculation, suit the operation status of site saw by timing adjustment control project both assure the cutting accuracy of fixed length of welded pipe and improve the reliability of control system.

Key words: fixed length flying saw; flexibility control; fixed length accuracy on line automatic adjustment; reliability

Three Points Bending Rollers Type Forming Process and Its Application for Medium and Small Diameter Longitudinal Welded Pipe

GAO Qing-jun, LU Feng-ling

Abstract ID: 1001-3938(2006)03-0053-EA

Abstract: It gropes and designs a method of three points bending roller type forming process design as per longitudinal welded