

高频螺旋焊管机组的改造

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摘 要 简要分析了国内焊管市场的生产和需求情况。制定了太钢集团临汾钢铁有限公司高频螺旋焊管机组的改造方案,即:保留现有机组核心部分,并进行适当改造,保存一定的高频焊管生产能力,在高频生产线的活套位置建一套螺旋缝双面埋弧焊管机组;同时配套平头倒棱机、X 射线探伤装置、水压试验机等设备。这样便实现了既能生产高频螺旋焊管又能生产埋弧螺旋焊管的双重生产能力。

关键词 螺旋焊管机组 改造方案 分析 选择

0 引 言

1965 年,我国第一台高频螺旋缝焊管机组在临汾钢铁有限公司(以下简称临钢)诞生,临钢高频螺旋焊管产品曾出口到朝鲜、越南等亚、非、欧国家,为临钢争生存求发展做出过较大贡献。随着螺旋缝埋弧焊管技术和工艺不断发展,埋弧焊管质量和生产率稳步提高,生产成本显著下降,质量保证手段更加可靠,这样以来,国内原有的高频螺旋缝焊管机组就不能满足生产需要纷纷淘汰或停产。为适应市场变化,临钢公司决定对原有高频螺旋缝焊管机组进行改造,本文对临钢高频螺旋缝焊管机组改造方案进行了分析探讨。

1 焊管生产和消费的分析

2001 年我国焊管产量为 $602.45 \times 10^4 \text{ t}$, 比 2000 年增长 18.36%, 其中进口 $35.7 \times 10^4 \text{ t}$, 出口 $26.65 \times 10^4 \text{ t}$, 国内表观消费量为 $612 \times 10^4 \text{ t}$, 表观消费增长 19.63%, 进口增长 19.84%, 出口减少 3.76%。

目前,我国中小直缝焊管机组约有 1 600~1 800 套,年生产能力在 $1.3 \times 10^4 \text{ t}$ 以上,大口径直缝埋弧焊管机组只有 3~4 套,年生产能力约 $150 \times 10^4 \text{ t}$,螺旋焊管机组约 90 多套,年生产能力 $200 \times 10^4 \text{ t}$,以上总计,我国钢管行业的年生产能力在 $1.6 \times 10^4 \text{ t}$ 以上,但 2001 年实际产量只有

$602.45 \times 10^4 \text{ t}$, 可见其开工率不足 40%。

在焊管生产方面存在的主要问题是产品结构不甚合理,普通管供过于求,市场空间极小。高等级的石油、天然气输送用管紧缺,部分还依赖于进口。随着我国石油、天然气“两纵两横”输送格局和“南水北调”等重大项目的实施和城市建设的实施,高等级管线钢管具有广阔市场前景,如:“西气东输”一期工程干线一类地区用螺旋埋弧焊管 $98 \times 10^4 \text{ t}$, 二三类地区用直缝埋弧管 $62 \times 10^4 \text{ t}$ 。

随着生产工艺技术和装备的不断进步,焊管正逐步向无缝钢管的使用领域扩展,将部分取代无缝钢管。从这一发展趋势看,今后那些高技术含量、高质量的焊管将占市场的主导地位,其前景广阔;而小直径的电焊钢管将退出市场,这是我国焊管行业产品结构调整的必然发展趋势。

2 临钢螺旋焊管机组改造方案的选择

根据市场情况,并结合焊管行业发展趋势和临钢实际情况,初步确定进行临钢螺旋焊管机组改造的基本思想是充分发挥临钢焊管的区域优势,极大地占有本地市场,努力开拓外地市场,抓住“西气东输”管道横穿山西机遇,提高企业经济效益。

2.1 主要性能参数的确定

2.1.1 关于钢管钢级的选择

根据有关文献介绍,国外天然气高压输送采用高钢级钢管呈强劲的发展趋势,由于高压输送

和采用高钢级钢管可使管道建设的成本大大降低,且管道建成后的运营经济效益更加良好。输气压力在 20 世纪 50~60 年代最高输气压力为 6.3 MPa, 70~80 年代最高输气压力为 10 MPa, 90 年代最高输气压力已达到了 14 MPa。随着输气管道输送压力的不断提高,输送钢管也相应地向高钢级发展,专家论证,“西气东输”确定采用钢级为 X70。经过考虑,临钢螺管机组改造生产钢管的最高等级按 X70 考虑。

2.1.2 关于钢管最大外径的选择

由于受原厂房跨度的限制,经过测算,初步确定本次改造最大钢管外径按 $\Phi 720$ mm 考虑,并留有 $\Phi 820$ mm 可能。

2.1.3 关于钢管最大壁厚的选择

由于输气管道输送压力的不断提高,对输送钢管的壁厚也提出了新的要求,参考了“西气东输”主管道确定采用钢级为 X70,壁厚为 14.6~26.2 mm,输气压力为 10 MPa 的要求,并考虑了临钢的螺旋焊管只能作为“西气东输”支管道使用和其他实际条件的限制,确定最大壁厚为 12.7 mm。

2.2 改造方案的探讨

根据国内同类螺旋焊管机组改造的生产与实践,对原高频螺旋焊管机组改造因受厂房高度、跨度和众多工厂条件的限制,最大只能建设 $\Phi 720$ mm 左右的双面埋弧焊机组,其改造方案有两个,参见表 1。

2.2.1 方案一

拆除原所有高频螺旋缝焊管机组,充分利用原厂房、天车和动力设施,建设一套螺旋缝双面埋弧焊管机组,形成螺旋缝双面埋弧焊钢管的能力。

2.2.2 方案二

保留现有高频螺旋缝焊管机组的核心部分,并进行适当改造,保存一定的高频焊管生产能力;尽可能地利用现有机组的设施和设备,在现有高频生产线原料准备部分的活套位置,建设一套螺旋缝双面埋弧焊管机组;并配套建设平头倒棱机、X 射线探伤装置、水压试验机等设备,供原高频焊管机组和新的双面埋弧焊管机组共用。改造实施后,不但形成螺旋缝双面埋弧焊钢管的生产能力,而且仍可以实现高频螺旋缝焊管的生产。

3 临钢螺管机组改造方案的分析

3.1 从适应市场分析

若采用方案一,生产的双面埋弧螺旋缝焊管规格范围为 $\Phi 219$ mm~ $\Phi 720$ mm,对于原来规格在 $\Phi 159$ mm~ $\Phi 219$ mm 范围,无论是高频螺旋焊管,还是双面埋弧螺旋缝焊管都不能满足市场需要。若采用方案二,产品的规格范围为 $\Phi 219$ mm~ $\Phi 720$ mm 的双面埋弧螺旋缝焊管和 $\Phi 159$ mm~ $\Phi 529$ mm 的高频螺旋焊管,可以根据不同的用户需要组织生产,方案二比方案一适应市场能力要强一些,特别是改造实施后,新产品还未打开市场之前。但需要说明,随着社会的进步和发展,高频螺旋焊管最终要被淘汰。

3.2 从工艺流程分析

若采用方案一,一个厂房内一套焊管机组配套一条精整生产线,工艺流程比较宽松;若采用方案二,一个厂房内两套成型机组配套一条共用精整生产线,工艺流程比较紧凑,原料堆放场地变小,并且每次只能启用一套成型机组和精整线。

3.3 从生产组织分析

若采用方案一,要全部报废原来高频螺管机组的所有设备和备件,比采用方案二占用的备件数量要少、备件占用资金也少;若采用方案二,既要保存原来高频螺管机组主要岗位的生产骨干,还要培养双面埋弧焊机组的岗位生产骨干,对生产组织带来一定困难,还需采取强化生产组织等措施,来提高整个生产线的可靠性。

3.4 从投资组成分析

无论采用方案一,还是采用方案二,其建设投资相差不大。若采用方案一,要报废原来高频螺管机组的所有设备和备件;即使采用方案二,也要根据市场的变化和发展趋势,严格控制原高频焊管机组备件的库存,以免因淘汰高频焊管造成备件积压和经济损失。

3.5 从生产能力分析

若采用方案一或者采用方案二,生产线的生产能力差别不大,与生产的品种和规格的批量有关。

3.6 综合分析

考虑采用方案二为宜。

表 1 临钢螺旋机组改造方案的技术参数对照

序号		方 案 一	方 案 二	
1	产品执行标准	SY/T5037- 92、 GB/T9711 1- 1997、 ANSI/API Spec 5L (第 42 版) 及附加要求	LGB1- 90	SY/T5037- 92、 GB/T9711 1- 1997、 ANSI/API Spec 5L (第 42 版) 及附加要求
2	管	外径/mm	Φ159~ Φ529	Φ219~ Φ720
		壁厚/mm	4~ 8	5~ 12 7
		长度/mm	8~ 10	8~ 12 5
		成型角/(°)	48~ 65	38~ 65
3	钢 卷	宽度/mm	300~ 800	1 300
		厚度/mm	5~ 8	5~ 12 7
		外径/mm	Φ1 000~ Φ1 5000	Φ1 000~ Φ1 7000
		内径/mm	Φ500~ Φ700	Φ500~ Φ700
		最大卷重/t	10	20
		钢带镰刀弯	≤1 5/1 000	≤1 5/1 000
3	材质	Q 195- Q 235 X42~ X70 L 175- L 485	Q 195- Q 235	Q 195- Q 235 X42~ X70 L 175- L 485
4	焊接速度/(m·m in ⁻¹)	0 8~ 2 0	5~ 10	0 8~ 2 0
5	递送速度/(m·m in ⁻¹)	0 6~ 2 5		0 6~ 2 5
6	机组形成	前摆式 右螺旋	后摆式套筒成型左螺旋	前摆式 右螺旋
7	焊接方式	焊剂埋弧自动焊	高频 搭接焊	焊剂埋弧自动焊
8	年产量/(×10 ⁴ t)	1 5~ 2 0	1 5	1 5~ 2 0

4 结 语

临钢螺旋焊管机组进行双面埋弧焊改造工程于 2001 年 4 月建成投产, 并使用宝钢生产的 X70 管线钢进行了试生产和考核验收, 经过一年多的生产和完善, 不但可以生产普通钢质的双面埋弧焊管, 而且可以生产 X70 管线钢双面埋弧焊管, 可生产焊管的最大壁厚为 12 7mm, 最大管径为 Φ820mm, 各项技术指标达到了预期目标。

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Application of Artificial Intelligence Technology on Roller Design

L i Guochang, Yangx ian (30)

Abstract The problem existed in the current specialist system is discussed and raised the thinking and method of adding Agent technology in reasoning unit as well as the conception of macro Agent and micro Agent. And applied all these thinking, method and conception on pass design specialist system.

Key words: Agent pass design reasoning unit specialist system thesaurus

Development of New Type Fast Installation Pipe Fitting for Low Pressure Pipeline

D u X ianZeng (32)

Abstract It is usually adopted the pipe thread connection of English system for connection pipe fitting to low pressure common welded pipe with complex operation of installation and disassembly and low efficiency. The rationalization of pipe fitting limited due to the restriction of English System pipe thread specification. In order to meet the development requirement of fast, reliable and good adaptability of pipeline connection, it is developed and designed a new type fast installation pipe fitting. This paper described design thinking and structural dimension of steel ball stop pull thread free type fast installation pipe fitting and seal stop pull thread free type fast installation pipe fitting in detail and raised each design features and application field.

Key words: welded steel pipe coupling pipe fitting design

The Study on the Seam Tracking Fuzzy Control System for Submerged Arc Welding

Zhang H ua, D ing X uelei et al (38)

Abstract The structure and the principle of seam tracking for submerged arc welding are introduced in this paper. The method of seam recognition with computer vision is mainly researched when the environmental light is changed. Intelligence control system for seam tracking has been reached by using a selfmodulated fuzzy control set. The system is tested on the producing of spiral submerged arc welded pipe for outside welding and the primary results are obtained.

Key words: submerged arc welding seam recognition intelligence control seam tracking

Application of Solid State High Frequency Power Supply in the Industry of Pipe Welding

Peng Yonglong, X u H aiw en, X ia Yueliang et al (42)

Abstract Working principle of solid state high frequency power supply, together with its application in the industry of pipe welding are introduced in this paper. Several important issues of this new kind of power supply are discussed. Then, respective merits and demerits are compared and analyzed between solid state high frequency power supply and those using radio tubes. Finally, the developing direction of this new technology in our country is pointed out through comparison between domestic and oversea manufactured power supply.

Key words: solid state high frequency high frequency pipe welding induction pipe welding

Reconstruct of High Frequency Spiral Welded Pipe Unit

Guo Zhenjiang (46)

Abstract It is briefly analyzed the production and demand situation of China welded pipe market. It is established a reconstruct scheme of H. F. spiral welded pipe unit for Linfen Steel & Iron Co. Ltd. of Taisteel Group — i.e. keep key parts of existed unit and carry out adequately reconstruct, save to certainty production capacity of H. F. welded pipe and install a set of spiral submerged arc welded pipe unit on the location of loop in the H. F. production line, and meantime equipped with facing and chamfering machine, X ray inspection unit, hydrostatic tester, etc. In this way, it is realized dual production capacity of producing H. F. spiral welded pipe as well as submerged arc welded pipe.

Key words: spiral welded pipe unit reconstruct scheme analyze selection

Fracture Reason Analysis and Resolving Method of Locking Cylinder Lever of Casing Threading Machine

Zhang Yong (49)

Technology Research of Thick Wall Thickness Longitudinal Welded Pipe with Force-Forming

Q in J ianping (50)

Abstract It is written in a new technology of roller bending force-forming after forming theory analysis and experiential study and aiming to the character of more difficulty, more stands, heavier equipment and high manufacturing cost of equipment of longitudinal welded pipe with large diameter and thick wall thickness during the production. It is described the principle of forming, production process and equipment features of this technology.

Key words: longitudinal welded Pipe thick wall thickness large diameter forming

Temperature Affects Sensitivity and Defects Quantitative and Orientation of Ultrasonic Inspection

Cao Guangquan (52)

Abstract It is analyzed the variation rule on K value, diffuse angle of reclined probe along with temperature, separately deduced their each mathematic expressions and discussed the affection of temperature to inspection sensitivity and defects quantitative and orientation and solution in accordance with sound speed of ultrasound longitudinal wave change along with the temperature among a certain organic glass.

Key words: ultrasonic inspection working temperature K value diffused angle longitudinal wave horizontal wave sensitivity defect

Highly Efficient Automatic Ultrasonic Inspection System for Weld Seam of UOE Pipe

Translated by L u Chengxiu (56)

Abstract NKK has developed a new automatic ultrasonic inspection system for weld seam of UOE pipe. The features of the system are two manipulators that can be used max. 20ch probes, a high sensitivity detection technique for center minute defect and a high accurate seam-tracking sensor. We believe the specification of the system with perfectly meet various and strict customer's inspection needs.

Key words: welded steel tube UOE ultrasonic inspection high accurate