

SUS316 异形管件内表面磁针磁力研磨的试验研究^{* 1}

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摘要: 为提高异形管件的内表面质量和使用寿命, 利用旋转磁场驱动微小磁针研磨管件内壁。运动磁针对管件内壁有碰撞、划擦和滚压的作用效果。在磁针的作用下管件内表面会发生弹性和塑性变形, 并产生微小去除量, 进而抚平加工纹理, 提高表面质量。同时, 管件型腔焊接相贯线处的残留焊渣可被完全去除。经过研磨后管件内表面粗糙度平均值 Ra 由原始的 $1.47 \mu\text{m}$ 下降到 $0.47 \mu\text{m}$ 。磁针磁力研磨可实现对异形管件型腔的光整加工, 提高异形弯管的内表面质量和使用寿命。磁针磁力研磨法为异形管件内表面的光整加工提供了一种新的途径。

关键词: 异形管件; 磁力研磨; 旋转磁场; 磁针; 焊接相贯线

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Study on the magnetic abrasive finishing of the inner surface of SUS316 irregular tubular by magnetic needles

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Abstract: In order to improve the inner surface quality and service life of the irregular tubular, the rotating magnetic field was used to drive the micro magnetic needles to grind the inner wall of the pipe. The moving magnetic needle has the effects of collision, scratch and rolling on the pipe wall. Under the action of the magnetic needle, the surface of the tube inner wall occurred elastic and plastic deformation, and produced a small amount of removal, and then smoothed the processing texture to improve the surface quality. Meanwhile, the residual welding slag at the welding intersecting line of the pipe fitting cavity was completely removed. The average roughness of the inner surface of the milled pipe decreased from the original $1.47 \mu\text{m}$ to $0.47 \mu\text{m}$. The magnetic abrasive finishing of the magnetic needles can realize the finishing of the cavity of the irregular tubular fitting and improve the inner surface quality and service life of the irregular tubular fitting. The magnetic abrasive finishing method of magnetic needles provides a new way for finishing the inner surface of irregular tubular.

Keywords: irregular tubular; magnetic abrasive finishing; rotating magnetic field; magnetic needle; welding intersecting line

0 引言

一些管件在冷拔、弯折或焊接成型时其内壁会产生褶皱、裂纹、加工纹理和焊渣等表面缺陷。特别是型腔比较复杂的管件, 在其内表面的相贯线焊缝处残留着大量焊渣和毛刺等。这些表面缺陷的存在会严重影响管件的使用效果和使用寿命。特别是在航空、

医疗器械和汽车等现代工业领域, 对输送管道耐高温、高压和耐腐蚀的能力具有一定要求, 或者对输送的液体或气体的纯度有较高的要求^[1-2]。同时, 在许多场合中对管件所输送的液体或气体的压力和流速有特殊要求。为满足这些特殊要求, 大量的异形管件被应用于现代工业领域, 如变径管件、焊接管件和不规则截面管件。由于此类管件的型腔复杂, 用传统的研磨

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