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Spinning process specification for large curved box bottoms

大型曲面箱底旋压成形 工艺规范

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1.Structure and drafting rules for standardization documents" Drafting is required. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document is proposed and coordinated by the National Forging Standardization Technical Committee (SAC/TC 74). This document was drafted by: Northwestern Polytechnical University, Sichuan Aerospace Long March Equipment Manufacturing Co., Ltd., China Machinery Engineering Academy Group Beijing Electromechanical Research Institute Institute Co., Ltd., Beijing Institute of Aerospace Systems Engineering, Shanghai Institute of Aerospace Precision Machinery, Xi'an Aerospace Power Machinery Co., Ltd., Chengdu Aerospace Changzheng Machinery Co., Ltd., Xi'an Bosai Spinning Technology Co., Ltd., Sichuan Air Separation Equipment (Group) Co., Ltd., Guangdong Bosai CNC Machine Tool Co., Ltd. and Lanzhou Lanshi Heavy Equipment Co., Ltd. The main drafters of this document are. Zhan Mei, Gao Pengfei, Ma Fei, Wang Zili, Ma Qianqian, Wang Jinglin, Liu Debo, Zhao Tao, Yang Yantao, Liu Xi, Zhou Lu, Xiao Duohai, Fan Zuojun, Luo Yongzhi, Fan Xiaoguang, Lv Jianmin, Li Jiaying, Yang Zihan, Wu Kaiqi, Cao Xuewen, Wu Jinchen, Han Bingchao, Su Weijie, Ma Yumei, and Zhu Xiaokun. Specification for Spinning Process of Large Curved Box Bottom

1 Scope

China's national process specification for spinning large curved box bottoms. These are the domed ends of pressure vessels and, most visibly, of launch vehicle propellant tanks - aluminium alloy domes between 1.5 and 5 metres across with walls from 3 to 60

millimetres. Spinning forms them by pressing a rotating blank progressively over a mandrel with a roller, and it is used instead of pressing because the tooling for a press die of that diameter is prohibitive and because spinning works the metal in a way that suits thin domes. The difficulty is that spinning a large dome is a long sequence of passes in which the material thins unevenly, work-hardens, and can wrinkle or split if the roller path is wrong, and a dome scrapped at the last pass has consumed weeks. So the specification covers equipment, blank design, tooling, the process itself, and the inspection and records - the last of which matter because these parts are traceable.

This document specifies the spinning process specifications for large curved box bottoms, including equipment requirements, blank design, tooling design, process, Inspection and record keeping. This document is applicable to the rotation of aluminum alloy curved bottom parts with a diameter of phi1 500 mm~phi5 000 mm and a wall thickness of 3 mm~60 mm. Press forming and spinning forming of conical parts (with zero generatrix curvature) shall be carried out in accordance with this document.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies. in this document.

GB/T 8541 Forging Terminology

GB/T 11345 Ultrasonic testing technology, testing levels and assessment for non-destructive testing of welds

3 Terms and definitions

The terms and definitions defined in GB/T 8541 and the following apply to this document.

3.1 Half cone angle The angle (alpha) between the tangent line of the generatrix of the spun part and the axis.

Note. The half cone angle is a variable value, see Figure 1.