RESEARCH ARTICLE | AUGUST 02 2024

Optimization of the micro plasma arc welding and tipping process of exhaust valve

M. Maruthapandian; R. Pugazhenthi

+ Author & Article Information

AIP Conf. Proc. 2937, 020016 (2024)

https://doi.org/10.1063/5.0218128

The automobile manufacturing sector gets advanced day by day; a greater number of sophisticated vehicles with high speed and fuel efficiency are being made around the world. Thus, every component of an automobile must be of high quality with standards; one of the most vital parts of a spark-ignition engine is the engine valve. It is a very fragile component subject to repetitive mechanical loads at high temperatures. The valve tappet end tipping is a process to increasing the wear resistance of the tappet end by Micro Plasma Arc Welding using STELLITE Grade 1 as the filler material. This work aims to optimize the Tipping process undergoing trials in the ABC Engineering Works in a PLC controlled machine; a specially developed for the tipping purpose. After the tipping process, the weld portion of the valve shows occurrence of blow hole and non-uniform bonding at the interface of the metals. Thereby, this work is concerned to eradicate the above-mentioned problems struck with the tipping process. The investigational study suggested Standard Operation Procedure (SOP) based on the experiments and literature. The conducted trial runs are conducted by SOP in the machine after analyzing the problems and other factors. The results of the trial runs evidenced that the workpieces were reduced to less than 18% from the previous rate of rejection from 30 %.

Topics

Energy efficiency, **Alloys**, **Welding**, **Plasmas**, **Engineers**

REFERENCES

1. Lewis, R.,; Dwyer-Joyce, R.S. Automotive Engine Valve Recession; Professional Engineering Publishing Limited: London, UK, 2002; pp. 1–19. 2.

2. Wang, Y. Introduction to Engine Valvetrains; SAE International: Warrendale, PA, USA, 2007; pp. 121–324. 3.

3. Starr, F. Design and development of exhaust valves from the perspective of modern thinking: Part 3: Reverse Engineering of American and British Sodium-cooled valves. *Int. J. Hist. Eng. Technol.* 2016, 86, 70–92
https://doi.org/10.1080/17581206.2015.1119482
Google Scholar Crossref

4. J.A. Williams, A.M. Hyncica, Mechanisms of abrasive wear in lubricated contacts, *Wear* 152 (1992) 57–74.
https://doi.org/10.1016/0043-1648(92)90204-L
Google Scholar Crossref

5. R.S. Dwyer-Joyce, R.S. Sayles, E. Ionnides, An investigation into the mechanisms of three-body abrasive wear, *Wear* 175 (1994) 133–142
https://doi.org/10.1016/0043-1648(94)90176-7
Google Scholar Crossref

6. Daniel, A. A., Murugesan, S., & Sukkasamy, S. (2017). Dry sliding wear behaviour of aluminium 5059/SiC/MoS2 hybrid metal matrix composites. *Materials Research*, 20(6), 1697–1706. https://doi.org/10.1590/1980-5373-mr-2017-0009
Google Scholar Crossref

7. Cai, Xiaoyu, Bolun Dong, Sanbao Lin, Chenglei Fan, and Chunli Yang. "Numerical analysis of arc physical properties in narrow gap TIG welding." *The International Journal of Advanced Manufacturing Technology* 106, no. 11 (2020): 5509–5517. https://doi.org/10.1007/s00170-020-05024-3
Google Scholar Crossref

8. Wu, C. S., L. Wang, W. J. Ren, and X. Y. Zhang. "Plasma arc welding: Process, sensing, control and modeling." *Journal of manufacturing processes* 16, no. 1 (2014): 74–85.
https://doi.org/10.1016/j.jmapro.2013.06.004
Google Scholar Crossref

This content is only available via PDF.