

Research and Application for Thermal Fatigue Analysis of V-Shape Specimen[⊖]

Yang Xiaodong¹, Chen Zhengguo¹, Zhang Yunhua², Qi Dongliang¹

1. *Wuxi Weifu Lida Catalytic Converter Co., Ltd.*

2. *Tongji University*

Abstract: A thermal fatigue (TF) test bench for V-shape specimen was established successfully. Based on different test schemes, it was observed that the fatigue life of V-shape specimen decreased within creasing cooling time. Then, the finite element analysis (FEA) model was developed, the max value of equivalent plastic strain amplitude ($\Delta PEEQ$) is 0.17%, observed on the inner surface of V-shape area, which corresponded to the area with cracks on the real specimen. Moreover, the program was written by python to predicate the crack locations and TF life. The calculated life of critical point of V-shape specimen was 4071 cycles, corresponding to the test value of 3963 cycles. Finally, the research achievements were applied successfully in a product of catalytic converter. The minimum value of the TF life occurred at the inner edge of the intake clamshell, with a life value of 2775 cycles, meeting the reliability requirement.

Key words: thermal fatigue analysis, V-shape specimen, exhaust catalytic, finite element analysis

⊖ 本书仅收录摘要，全文刊载在《2023 中国汽车工程学会年会论文集精选 (Proceedings of China SAE Congress 2023: Selected Papers)》(电子出版物，由德国施普林格出版社出版)。