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# WAVELET PACKET ANALYSIS OF TIME-FREQUENCY CHARACTERISTIC OF THE LOX/KEROSENE ROCKET ENGINE DUE TO HEAVY IMPACT

**Abstract**

The LOX/Kerosene rocket engine will greatly improve the launching capability of China, and will ultimately meet the requirements of future space activities such as manned lunar project and deep space explorations. The LOX/Kerosene rocket engine has succeeded in hundreds of ground hot-firing tests. But once the engine suddenly exploded without any fault symptom during stationary process. According to the vibration data gathered from the test, it is found that the amplitude increased significantly. Firstly this paper systematically reviewed and summed up the development and process of the wavelet pocket technology in detecting vibration signals. Then the wavelet packet decomposition was carried out by db4 wavelet base function. The analysis of energy feature for each frequency band and property for reconstruction vibration signal of each frequency band were carried out. Through wavelet packet analysis, the time-frequency distribution of vibration in the explosion was studied, and the engine's shock response was derived. The main frequency components of the vibration were between 10 Hz and 1 kHz which was the important energy source of the impact of the engine. So the impact feature of the LOX/Kerosene rocket engine was obtained, while noise was removed reasonably. Finally, the feasibility and the reliability of this wavelet pocket technology for dynamic of the LOX/Kerosene rocket engine were proved. Analysis in real vibration signals indicates that the proposed method is better than the conventional filtering method and basic wavelet analyzing method for the heavy impact detection of the LOX/Kerosene rocket engine.