

Test and Analysis of Transient Process on the Cool-Starting Diesel Engine

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Abstract: Along with the increasing strict of the emission control regulations on automobile, it is stringent and important to control the emission of the cool-starting diesel engine, simultaneity, transient performance is profoundly researched on the diesel engine for vehicles; it is more and more important that the transient data acquisition systems of the cool-starting diesel engine have high-precision and high-frequency. In order to carry out the transient parameter Acquisition of the cool-starting diesel engine and roundly understand the work characteristic of the diesel engine and its accessorial equipments on the cool-starting, so it is necessary to develop a data acquisition system for researching the cool-starting performance of diesel engine.

The portable data acquisition system which can acquire the dynamic parameters of the cool-starting diesel engine has been developed. It is used the data acquisition card, contained with voltage sensor, electric current sensor, rotate speed sensor and F/V. At first It can carry out real-time collection of starting battery voltage, starting electromotor current, the electrolyte temperature and the diesel engine rotate speed by multi-channel, then it can magnify and filter by the filter, and change analog signals into digital signals by A/D, finally it can also storage, transact and display the signals in the same time by compiling the convenient interface and demarcate program by DASyLab in the computer. Every temperature is inspected by SKE-32AD, which makes transient data acquisition systems work smoothly.

Based upon the transient data acquisition systems of the diesel engine, the instantaneous process of the diesel engine is tested and researched on the cool-starting, several instantaneous parameters of the diesel engine about temperature, starting voltage, starting electric current and starting rotate speed are measured on the cool-starting. The instantaneous characteristic on the cooling-starting of the diesel engine is researched, several variational rules of the instantaneous parameters about the maximum starting rotate speed, the average starting rotate speed, the variation rate of the starting rotate speed and the ignition time are mainly discussed on the cooling start of the diesel engine, and several influencing factors of the electromotor such as the voltage and the electric current are analyzed, the regulation of the instantaneous parameters of the diesel engine are found on the cool-starting. The test results show : (1) At 5°C A after top dead center, initial stage of the diesel engine is started ; the variation of the start rotational speed is about 25%, the whole start process time is 15°C A, about 4.1 second; the maximum temperature variation of the cooling fluid is 0.5°C during the cooling start of the diesel engine; the maximum decreasing value of storage battery instantaneous starting voltage is 1.8V and the temperature variation range of the storage battery is minimum, about 0.4°C. All of these are accorded with the facts. (2) The maximum starting electric

current is 678A, the minimum starting voltage is 9.3V, the maximal starting torque is 200 N • m, which completely satisfy the performance requirements of the cool-starting diesel engine. (3) The variation of the start voltage is 30%, and the start electric current is 25%, the reason is that the electrolyte conglutination of the battery is bigger at low temperature, so that the internal resistance of the battery is increased. The regulation and the variation of instantaneous parameters can meet the cool-starting diesel engine greatly. (4) It is reliable that the transient data acquisition systems and its signal deal circuit can carry out real-time collection, display, storage and analysis. It can be easily controlled by interface and demarcate program. It can meet the needs of the dynamic data acquisition for the cool-starting diesel engine greatly.

Key words: Transient data acquisition, Diesel, Start voltage, Start electric current, Start rotational speed