

Entering into Space and New Energy and Propulsion Technology (7)

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RESEARCH ON ANODE POWER SUPPLY TECHNOLOGY WITH HIGH - GAIN AND WIDE - RANGE OUTPUT VOLTAGE FOR HALL ELECTRIC PROPULSION SYSTEM

Abstract

In order to meet the power supply needs of the thruster, the anode power supply of PPU requires an isolation converter capable of accommodating a wide range of high-voltage outputs and achieving efficient high-power output over the entire range. In this thesis a high-gain and wide-range voltage output anode power supply technology is proposed which is improved on the basis of the full-bridge converter. The boosting unit is embedded in the secondary full-wave rectifier circuit. And through the front-end full-bridge circuit and the boost circuit after the match duty cycle to achieve the wide-voltage converter output. The converter has secondary boost capability to meet the requirements of high gain and wide range output of the converter while reducing the voltage and current stress of the switches. It can be sure that the converter outputs high power in a variety of voltage levels even if the transformer ratio isn't be too big. The primary circuit of the converter is adopted to realize the soft switch in the wide voltage range by using the phase shift control. The secondary side of the transformer is full-wave rectified so that the leakage inductance can be used as a part of the energy transfer inductor to improve the efficiency of the converter. The output boost unit is controlled by ZVT-PWM and also implements soft switching. The output booster circuit of the converter adopts the form of alternating parallel circuit. The input and output current ripple is small, the dynamic response of the converter is faster, and the processing power is stronger. The key technology of this converter is its control strategy. This thesis puts forward a strategy. The output voltage of the converter is divided into low voltage and high voltage. The control strategy of the converter is that in the low voltage part the full bridge circuit module works normally and the output boost circuit module does not boost in the high voltage part the full bridge circuit module operates at the maximum duty cycle and the output boost circuit works normally. The high-gain and wide-range output voltage anode power supply technology put forward in this thesis has been experimentally verified to meet the power supply requirements for a wide range of high-voltage output of space propulsion power systems.