An optimized control strategy applied to high-power high-frequency series-parallel resonant convertor operating under CCM

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Because of the large turns ratio of the step-up transformer, high-voltage high-frequency electrostatic precipitator power supply is often constructed in series parallel resonant (SPR) topology (figure 1) [1]. LCC-type resonant converter operating at continuous conduction mode (CCM) have the merits of soft switching and low peak conduction current, it attracts people's more attention. To utilize this topology more efficiently, studies has been done to search a better control method of the converter which is operating under CCM [2-6].

In this paper, an optimized control strategy of SPR converter is presented. Main objective of this control strategy is to realize soft switching, and minimize the switching losses in the main switching valves. Under the light-load condition, revised dual control strategy is applied. With the scheme of altering the sequence of gate driving pulses on physical leading leg and lagging leg of full-bridge inverter, the drawback of uneven loss distribution between both legs is avoided.

Under the heavy-load condition, frequency modulation control, which naturally even the switching loss, make converter produce less loss when converter working point is beyond a certain operating one. In order to analyze the optimized strategy, digital simulations and lab experiments were carried out, comparison results with traditional controls are analyzed, it is validated that the proposed control has less switch losses in the condition of wide variation of output voltage. At the same time, the strategy evens power loss of legs of inverter bridge, which eases the design of cooling system.

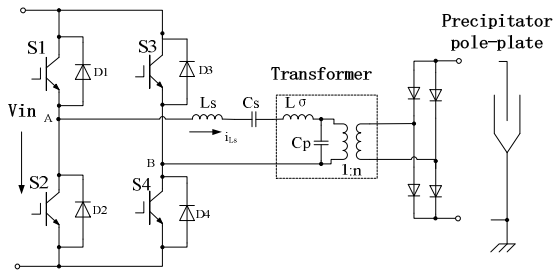

Figure 1. Main topology of ESP power supply

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