

Comparison of thyristor-controlled reactors and voltage-source inverters for compensation of flicker caused by arc furnaces

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Abstract-

The objective of this paper is to compare the performance of thyristor-controlled reactors (TCR) and shunt-connected PWM voltage source inverters (PWM-VSI) for compensation of flicker caused by arc furnaces. First of all, arc-furnace principles are presented in order to explain the main characteristics of the problem. Secondly, traditional TCR control are analyzed. An improved measuring procedure is suggested to enhance TCR performance showing that it achieves faster compensation than more traditional methods. Thirdly, PWM-VSI control for flicker compensation is described in detail using Park's transformation. The analysis shows how real and reactive power control can be decoupled. Finally, a TCR control and a PWM-VSI control are compared by simulation using data and measurements from a real arc-furnace installation. The analysis considers three different periods of the production cycle: (a) bore-dwn, (b) fusion and (c) refining. It is clear from the results obtained that a shunt-connected PWM-VSI is better than a TCR for flicker compensation. This can be easily justified nothing that the bandwidth of the PWM-VSI control system is far better than that of the TCR control. However, the control system for a PWM-VSI inverter is more complicated than that of a TCR. Besides, the latter uses a better-established technology than the former.

Index Terms- Arc Furnace, flicker mitigation, TCR control, voltage source inverter control, WM, arc furnace

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