

# Predictive Control – When to use and when not?

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*Abstract* — Switching losses contribute the major portion to the total losses in medium voltage drives. Operation at extremely low switching frequency is therefore mandatory. Low harmonic current distortion can be nevertheless achieved when predictive current control is used.

The method is presently attracting the interest of many researchers. The predictive algorithm directly generates the firing pulses of the inverter as part of a closed loop current control system, thus eliminating a pulsewidth modulator. A preset magnitude of the current error is maintained, defined as the difference between the current reference and the actual current space vector. The inverter gate pulses are generated while maximizing the time differences between any two switching instants. This minimizes the switching frequency, and thus the switching losses. The algorithm predicts the current trajectories of all possible switching states and then selects the optimal switching state. The method reduces both current distortion and switching losses and thus almost doubles the utilization of a given inverter hardware. A comparison with off-line optimized pulse patterns demonstrates that the harmonic distortion is minimum. Most researchers ignore that operating at switching frequencies above a few 100 Hz and sampling frequencies around 10 kHz does not lead to better results than the much simpler space vector modulation. The presentation explains the adequate design procedures.