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201 ENSIGN ROAD
BELLEVUE, IOWA 52031
PHONE: 630-628-9999 (Sales)
FACSIMILE: 630-628-9922

HIGH FREQUENCY – HIGH VOLTAGE TRANSFORMERS

by Kenneth P. Blackburn, Sr. Engineer Ensign Corp. with edit assistance by Steve Ensign

The need for high frequency (HF) combined with high voltage (HV) in transformers is becoming more popular. The well known advantage of operating at high frequency is that it allows the transformer to be designed smaller. High frequency (HF) transformers are often referred to as switchers. When the requirement of higher voltage is added to the switcher the currents are reduced allowing the wire in the coils to become smaller, resulting in further opportunity to reduce the transformer's size while retaining an equivalent power rating.

One industry that takes advantage of HF/HV transformers is robotic paint sprayers. The paint sprayer utilizes a cascade capacitor bank to increase the transformer voltage and apply a charge to the paint. Wherever high voltage is needed in a small space, HF/HV transformers may be utilized. Similar "green" applications have successfully used HF/HV transformers, such as to provide secondary burning of semi-truck hot exhaust, thereby reducing pollution.

However, there are real-world limits when both high frequency and high voltage are required. Some HF/HV combinations will not work. For example, at 200kHz an input to output ratio of 1:1250 is too high and will not *transform*, as some would desire. In a perfect transformer with a ratio of 1:1250, the input of 1 Vrms would be expected to produce an output of 1250Vrms. However, as the input is increased to 3Vrms the output is not the expected 3750Vrms. One might suspect that the core flux density is in saturation, but calculations prove otherwise. Some other phenomenon is therefore occurring related to the combination of high frequency switching and high turns ratio. The design will be more successful in the 20 – 30kHz range and with a turns ratio resulting in an output voltage under 3000Vrms. Research continues in this area to exactly define the optimum point where high frequency and high voltage will result in a working transformer.