AC to AC Frequency Converters with a Three-Phase Isolated Vector Switching Structure

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an integrated power conversion process to achieve AC to AC frequency conversion without an intermediate DC link.

OVERVIEW

Many power conversion applications require the conversion of AC power at one frequency to AC power at another. Most commercial AC to AC converters, such as those that achieve variable speed control in AC motors, involve an intermediate DC link. An alternative to such systems is the matrix converter, which directly converts AC power at one frequency to AC power at another. However, matrix converters require bi-directional, high power semiconductor switches that, due to the high currents and voltages they must handle, tend to be expensive and can limit the reliability of converter systems.

THE INVENTION

A UW-Madison researcher has developed an integrated power conversion process involving a multi-phase transformer and a multi-pole, three-phase switching structure to achieve AC to AC frequency conversion without an intermediate DC link. In essence, the transformer – already included in the system for isolation purposes – is made to serve double duty. It provides electrical isolation and voltage step up/step down, and it phase shifts the vector components of the waveforms to bring about frequency conversion.

APPLICATIONS

• AC to AC power conversion

KEY BENEFITS

• Provides bi-directional power flow and sinusoidal input and output waveforms
• In applications where transformer isolation and voltage step up or step down are required, this system could provide cost savings of up to one-third
• Eliminates need for a DC link energy storage capacitor, thereby increasing system
reliability over conventional converters
• Eliminates need for the additional semiconductor switches required by matrix converters

ADDITIONAL INFORMATION

Tech Fields
Engines & Power Electronics - Power converters

CONTACT INFORMATION

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867.