



Variable Frequency Drives and Power Modeling

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A variable-frequency drive (VFD) is an electronic controller that adjusts the speed of an electric motor by modulating the supply voltage and frequency. VFDs are enjoying rapidly increasing popularity at water and waste-water facilities, as they draw less energy while still meeting pumping needs. In addition to saving energy, VFDs offer several other advantages including "soft start" capability which lessens mechanical and electrical stress on the motor thus extending motor life, more precise control of processes, closer pressure tolerances in water distribution systems. However, because of the nature of this technology, VFDs can produce harmonic distortion on the utility side — which can affect the quality of power. On the motor side, VFDs cause other problems which stem from the high-frequency pulsed output voltage. Such pulses can be magnified by the impedance of the cable connecting the VFD to the motor thus putting high stress on the insulation. Continued use of VFDs require empirical evidence to substantiate analytical power flow models in electrical systems at utilization levels. Both theoretical and experimental research will be conducted on the static and dynamic motor characteristics with and without variable-frequency-driven motor systems under normal loading.



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