LEVEL OF HARMONICS PRODUCED BY THE VARIABLE FREQUENCY DRIVE CONTROLLER USED IN THE INDUCTION TYPE WATER PUMP MOTOR OF CENTRAL PHILIPPINE UNIVERSITY

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ABSTRACT

The determination of the level of harmonics produced by the variable frequency drive (VFD) controller used to control the induction-type water pump motor at the water pumping station of Central Philippine University (CPU) was focused specifically on the electrical noise or harmonic level generated by the controller in terms of its amplitude and frequency. The level of harmonic content was acceptable based on the IEEE Std 519-1992 of no more than 5% with the use of the controller and its effects on electronics and electrical systems connected in the same pick off point. It was also determined whether the system would significantly improve motor performance. Lastly, it was determined whether the system would significantly reduce energy consumption. Based on the results of the tests, the harmonics of the supply voltage at no load was 2.25%. During the system operation where a five (5) Hp induction type motor load was controlled direct-on-line (DOL), the harmonics generated was about 2.10%. However, by using the controller, it was found out that there was an increase in the amplitude and the number of harmonics present in the system. The harmonics produced at the source terminal with controller was

about 3.93 %, showing an increase of 1.83% compared to without the use of the controller. However, the increase is minimal because 3.93 % is within the acceptable limits of 5% for electronics circuits and systems. However, this is not acceptable for medical and other related highly sensitive instruments, which require a THD of not more than 3%. In contrast to this, the harmonics generated at the load terminal was about 8.42%, which was higher compared to the THD at the input terminal and was very much higher than the required allowable level. The controller produced a significant level of harmonics that could cause interference to nearby electronic appliances that are sensitive to electrical noise within very close proximity. Nevertheless, this noise or harmonic generated was not significantly induced at the source terminal. Furthermore, there was no reduction on the energy consumption with the use of the controller over the DOL control mode. In contrast, the use of the controller gave the following benefits: it eliminated the very high current surges and sudden high starting torque during the motor start up; balanced the motor supply between phases; and, caused an increase in the revolution-per-minute (rpm) of the motor thereby improving the performance of the motor. The same controller could be put to good use with some of the other pump motors around the campus.