

Considerations When Sizing Harmonic Filters for Pump Applications

It is a common misconception that 100% speed of the pump is the same as 100% load on the filter. True full load of the equipment may actually be at the uncommon condition of full flow and full pressure within the pipes, meaning during regular operation of a pump it may never draw its full load current and in some cases, never load the harmonic filter more than 50%. This application note outlines the general and more application specific considerations when sizing the MTE Matrix® AP harmonic filter.

General Sizing Recommendations:

MTE filters are designed to carry their rated current at the published ambient temperatures. The Matrix® AP filter service factor is one (1) with an overload 1.5 times the rated current for only one minute. Generally, it is always best to select a filter by its current rating so that it's slightly higher than the current required by the nonlinear load, i.e. a drive or the motor full load amps (FLA). Service factor of a given motor should not be taken into consideration when sizing a harmonic filter when used with a drive. Be cautious with application sites having high background voltage harmonics, extreme altitudes and harsh environmental conditions and choose filter current rating accordingly. Check the product technical reference manual sizing charts and be sure guidelines are followed.

Additional Sizing Considerations for Pump Applications:

Due to the nature of pumping applications, there are several additional considerations to make when properly sizing a harmonic filter for a given application. While using the general sizing recommendations as outlined above will result in the selection of an adequately sized filter, there may be some cases in which certain factors lead to selection of a differently sized filter or configuration.

The capacitors within a harmonic filter cause a boost in voltage at light loads. A drive may fault on overvoltage if the voltage is boosted to a level above the drive's voltage range, preventing the drive from running. To help prevent this condition, a capacitor contactor can be added as an option to the Matrix® AP harmonic filter to bring the capacitors into the circuit once some load is applied. This is just one of many benefits to using a capacitor contactor. Other benefits are noted in the "Reasons MTE Matrix Filter Contactor Options Make Sense" document. Additional information on MTE's capacitor contactor options can be found in the product technical reference manual.

Some utilities are beginning to charge penalties to their customers for introducing too much harmonic content onto the grid. The amount of allowed harmonic content is outlined in IEEE-519: Recommended Practice and Requirements for Harmonic Control in Electric Power Systems. A harmonic filter should be appropriately sized in order to provide a sufficient amount of harmonic mitigation should meeting IEEE-519 be a requirement by the utility. The MTE Matrix® AP harmonic filter is guaranteed to reduce total harmonic current distortion (THID) down to 5% when at full load, and 8% THID at 30% load. Consider the percent load that will be on the harmonic filter under typical operation for a given application to get an idea of what the expected harmonic levels will be within a facility.

For additional considerations or if pump motor is oversized for the application demands, contact MTE Applications Engineering for guidance in sizing the harmonic filter.