MPE 95TH ANNIVERSARY 1925-2020

Company Bulletin

for EMC, EMP, HEMP & TEMPEST Protection

Issue 25

Array of variable frequency drives in situ

MPE high-current power line filters mounted onto an EMP shield

An MPE engineer uses thermal imaging to check a filter under test

Solving the problem of variable frequency drives

During 2020 MPE was asked by a UK defence client to resolve a site issue where HEMP filters from another manufacturer had been installed – and yet were displaying high temperature rises when loads were increased close to the required operational levels.

The filters were rated between 400A and 1200A and mounted onto an EMP shield. When measured, temperature increases exceeded 25°C, with the filters proving hot to the touch. Left unresolved, this would almost certainly have led to filter failure in the near future, and furthermore the certifying authority would not sign off the installation to allow operations to begin.

A review by MPE showed that variable frequency drives (VFDs) were being used on the application. Tests confirmed that, when these were disconnected, temperature rise was within normal limits, but that, with these drives connected, temperature within the filters increased significantly.

Variable frequency drives work by rectifying mains AC power to DC, then chopping the DC at a higher frequency, which is then used to drive an AC motor. Owing to the technology used, the resulting sine wave contains many harmonics. The total harmonic distortion may be expected to be within 5%, with individual harmonics being up to 3%.

Since the harmonics lie within the pass band of the filter, it tries to attenuate any power present at the given frequencies, and that manifests itself as overheating of the filter. However, because of the advanced design of MPE HEMP filters and the careful selection of their materials of construction, they are far less susceptible to such damaging harmonics.

Accordingly, in late 2020 the original filters installed on the site were replaced by ones designed and manufactured by MPE. When tested with VFDs in the circuit and with full operational loads connected, the maximum temperature rise measured was below 11°C, over 50% lower than the temperature rise recorded on the previous manufacturer's filters. As a result, the site is now fully commissioned and operational, having been signed off successfully by the certifying authority.

Detailed application notes on the use of MPE HEMP power line filters in conjunction with variable frequency drives may be downloaded from here.

To discuss your company's specific requirements, please call MPE's specialist Technical team on +44 (0)151 632 9100 or email sales@mpe.co.uk