Summary

Hybrid filters

Hybrid filters are systems that include a passive filter and an active filter in a single unit. They combine the advantages of both technologies and provide an optimum cost / performance ratio.

Figure 4 - Examples of active and hybrid filters.

Electronic compensators

Active or hybrid filters are also capable of compensating for low values or fluctuations of the Displacement Power Factor.

In this mode of operation, they are also known as "Static Var Compensators" (SVC) or "Hybrid Var Compensators" (HVC).

Solutions that support Variable Speed Drives (VFD)

AC-Line or DC-link chokes are commonly used with drives up to about 500kW unit power. When a large number of drives are present within an installation, the use of AC-Line or DC-link chokes for each individual drive is recommended. This measure increases the lifetime of the drives and enables use of cost effective mitigation solutions, such as active filters, for example, at the time of installation (see **Figure 5**).

C-less technology applies to Variable Speed Drives and offers a reduced current distortion compared to traditional technology. Combined with an advanced control algorithm, this solution is suitable for applications with low over-torque requirements like centrifugal pumps, fans and HVAC machines.

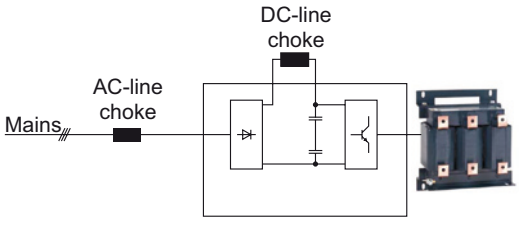

Figure 5 – Chokes for drives.

A multi-pulse arrangement is often used for drives above 400 kW, but could also be a reasonable solution for smaller power ratings (see **Figure 6**). A precondition is a dedicated transformer directly supplied from the MV network. The use of a 3-winding transformer providing a 12-pulse supply for the drive is considered standard. This limits the harmonic emission and in most cases, no further mitigation is necessary. Multi-pulse solutions are the most efficient in terms of power losses and compliance to standards is simplified.

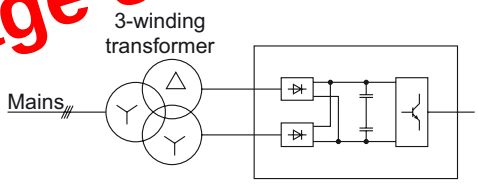

Figure 6 - Multi-pulse arrangement.

An Active Front End (AFE) is the best performing solution concerning harmonic mitigation with drives, limiting the THDi below 5 % (see **Figure 7**). All the applicable standard requirements can be met. No detailed system evaluation is necessary, making this solution the easiest to implement. In addition to harmonic mitigation, power regeneration and power factor correction are inherent.

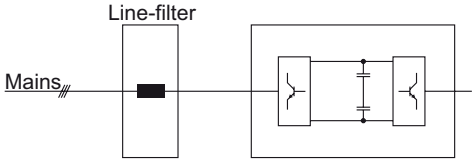

Figure 7 - Active Front End configuration.