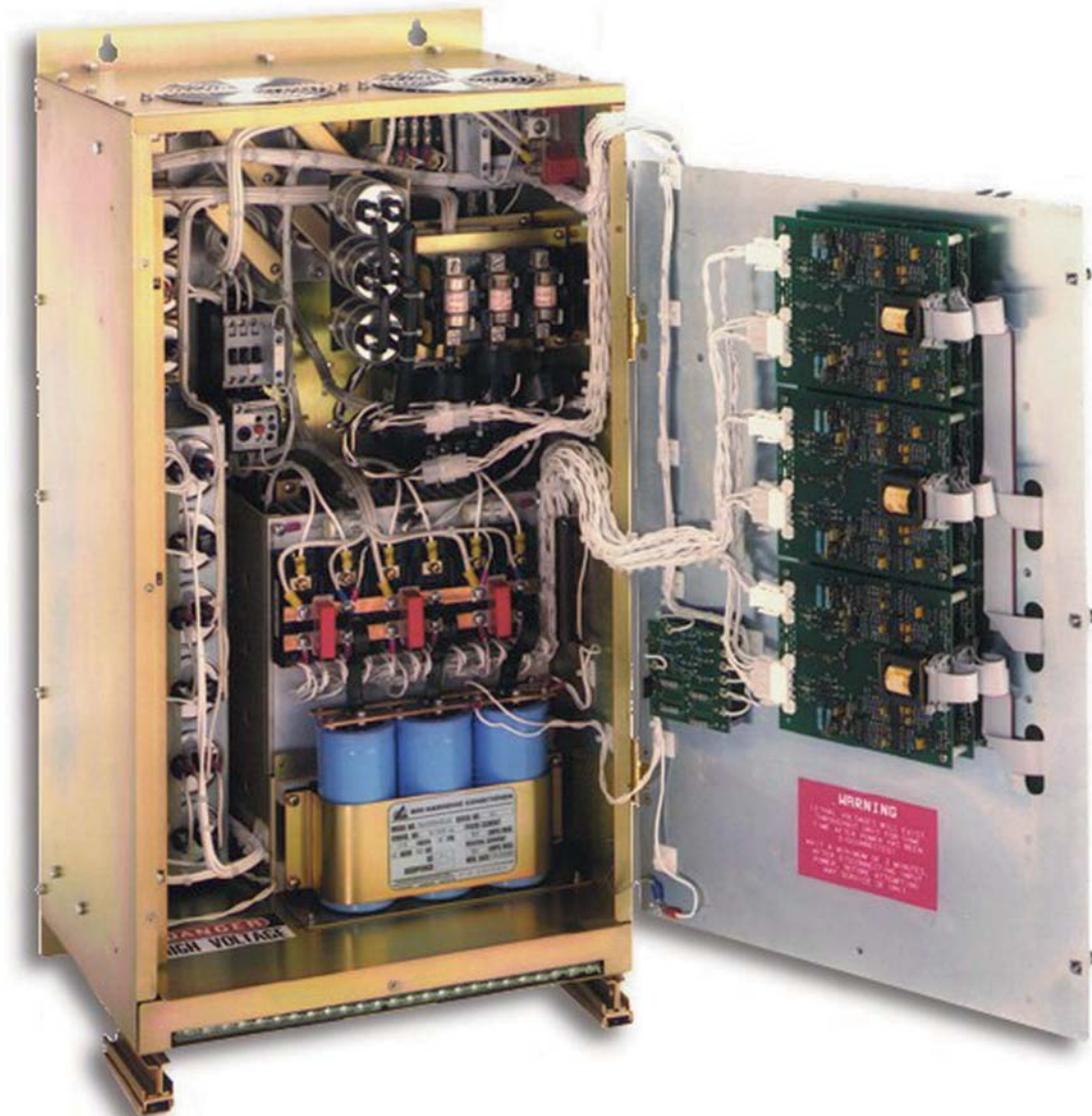


Cut Your Energy Bill

make no noise about it - active harmonic filters are the answer

Two of the biggest long term issues that will be facing the UK Water Industry throughout the remainder of this decade seem to be at loggerheads - if you address one, you make the other worse. But, as Jeff Whiting explains, with attention to detail and appropriate technology, energy efficiency can be achieved without causing harmonic corruption in the electrical mains.



AIM – Protect the mains supply from harmonic corruption

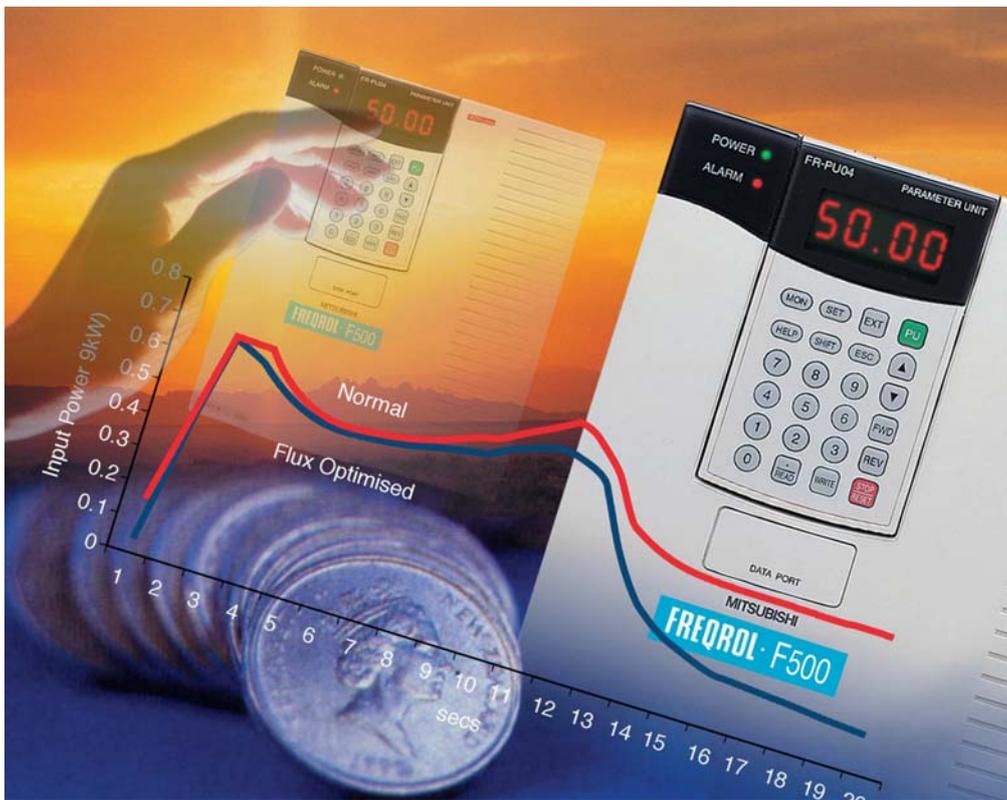
courtesy Mitsubishi

The Water Industry uses a lot of energy, mainly pumping water from reservoirs across the country to points of use. But energy costs money and its production creates greenhouse gases. So, the pressure is on to reduce consumption.

One of the best ways to do this is to fit electronic variable speed drives to pumps so that they can be tuned to exactly match demand at any given moment, rather than running flat out all the time. But drives, like all electrical equipment, create harmonic corruption in the electricity supply (this is called 'noise') and new legislation is tightening up on this.

Everybody is in favour of energy efficiency, especially now that there are many financial and tax incentives to encourage its take up with penalties for poor performance. But most people are completely overwhelmed when it comes to working out what is best for their particular situation and where to start.

This is where the *Melsmart Energy Centre* comes in. It is a one stop shop that you can ring up for objective advice. It provides access to experts in every field of energy saving, from tax and finance, through the use of the latest technologies to cut energy requirements, to strategies for long term gains in even the most complicated of situations.



The Energy Centre is the gateway to a comprehensive network of experts, whose specialist knowledge and equipment can be called upon whenever appropriate. The expertise encompasses many technologies such as HVAC, lighting and compressed air, but also disciplines such as law, finance, tax, which can have profound effects on energy plans. The Energy Centre specialises in many areas of energy saving technology, including inverters, motors and control while offering an objective analysis of the situation, for example.

At the heart of any water operation is the humble pump, or more usually a very large number of pumps. But each pump can be very wasteful of energy because for decades it has been common practise for engineers to oversize pumps. This reduces the likelihood of them being overwhelmed by extreme demand or flood conditions, but produces excess flow which has to be redirected back to the reservoir or holding tank. In energy terms this is very wasteful because power consumption increases as a function of pump speed.

Fitting a variable speed drive to each pump, therefore, seems very attractive, but each drive has the potential to cause noise in the electrical mains. The effects of harmonic noise are many. They reduce the efficiency of power generation, transmission and utilisation; age the insulation of components; cause malfunctioning and failure of electronic equipment; overheating and failure of electric motors and power factor correction capacitors.

They also create problems with resonance due to the interaction of capacitors with harmonics and cause huge inaccuracies in metering equipment. Fuses can be burned out and circuit breakers tripped; computers, TVs and telephone systems disrupted.

Legislation to protect the quality of the main supply was enacted in the middle 1990s and is steadily being tightened up. Fortunately, there are several types of filter currently in use to prevent harmonics from polluting the mains.

The most common type is probably the simple choke, which has the attraction of being relatively cheap but is only about 50 percent effective. Twelve-pulse bridge filters typically cancel out 80-90 per

cent of all harmonics, but are too bulky for installations where space is at a premium. Switched bridge harmonic controllers are the 'Rolls Royce' of filters, achieving greater than 95 per cent correction, but are out of reach of most budgets.

Each type of filter has its niche and collectively they have kept harmonics at bay so far. But the way ahead looks like making significant use of a new harmonic control technology, namely, active filters. In fact their performance/cost ratio is unrivalled by existing technologies, and potential users are already showing so much interest that they seem destined to become the dominant type of filter within a relatively few years.

In operation, active filters absorb incoming harmonic currents, invert them and feed them back to the mains to 'neutralise' further currents in the same way that noise reduction equipment functions in in-car stereos. They have several notable characteristics that distinguish them from current filter types. One is their very fast response to load changes, such as when a large pump comes on line, an area where all other technologies struggle to maintain performance. Another is that active filters are not affected by changes in system impedance so are inherently non-resonating. A third is that they can be fitted to individual items of equipment, at a motor control centre level to control several pieces of equipment, or at switchboard level to service an entire plant or factory; thus making retrofitting into existing facilities very easy and low cost.

The take up of active filters is likely to be rapid, so that *Melsmart Energy Centre* has acted proactively brought a team of specialist engineers and technologists, who have worked on both the development of the concept and its application across a number of industrial sectors, as a new specialist service.

The Energy Centre has proved itself adept at transferring technology out of the lab into the field and from one sector to another. It is gearing up to do the same with Active Harmonic Filters. ■

Note: The Editor & Publishers wish to thank Mitsubishi Electric for the above article on Active Harmonic Filters