An ABB power quality active filter is producing a dramatic improvement in potentially-damaging network harmonic distortion at the new Padstow foreshore pumping station.

Background
South West Water is investing around £1 billion in ‘Clean Sweep’ – Europe’s largest coastal clean up operation. One of the places that has seen the benefit is the picturesque Cornish fishing village of Padstow. Here, the project, which includes a new foreshore pumping station, is helping to safeguard the beautiful coastline which contrasts a rugged landscape with sandy beaches and an abundance of wildlife.

The need
Western Power Distribution, the local DNO (Distribution Network Operator) was concerned that the drives installed in the pumping station could give rise to unacceptable harmonic distortion on the local network. Many of the common loads in industrial and commercial applications are non-linear, such as variable speed drives, rectifiers, UPS systems, computers etc. These loads draw a current from the source that does not follow the voltage wave shape and hence introduce potentially harmful distortion into the power network. This can lead to overheating of cables, motors and transformers, damage to sensitive equipment, tripping of circuit breakers and blowing of fuses as well as premature ageing of the installation.

Solution
ABB was asked to investigate and provide a solution. The result is the installation of ABB PQF (Power Quality Filter) active filters which were developed to provide a reliable and cost-effective solution to this kind of problem.

The filters continuously monitor the current in real time to determine what harmonics are present. They then inject harmonic currents with exactly the opposite phase to the components that are to be filtered in to the network. The two harmonics effectively cancel each other out so that the feeding transformer sees a clean sine wave.

Two traces illustrate the effect of filtering

Dramatic result
The traces from Padstow provide a dramatic illustration of the effect. The diagram illustrates the contrast between the unfiltered 400 V AC three-phase supply with serious distortion of the current waveform and the effect of the ABB solution. In Trace 1, instead of two crossover points per cycle, there are six – while Trace 2 shows the effect of energising the ABB 70 A active filter type PQFL. After filtering there is a considerable improvement in the waveform and a 60 percent reduction in the current distortion.

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