



## OUR AIM

The origins of this project were founded as part of fault investigation work on site during 2021 for a local water utility company. The pumping station was experiencing frequent tripping of equipment, raising concerns over the site resilience and its ability to meet the required consent.

As part of the investigation, an energy survey was conducted to assess the site loading and the potential root cause of the issue. The three main, two speed pump motors which dated back to the late 1970's ran on star delta starters and were believed to be the cause of the rogue tripping. Upon review of the data collected, these large 180/355kw motors were showing excessive starting currents, notably peaking instantaneously more than 4000's amps when starting in high speed.

Not only was the site running each pump approximately 3 times per hour, with each start requiring huge amounts of energy, but it was also found to be causing surges of transient pressure in the associated pipework and inconsistent flows to the treatment works further down the system. From further discussions with the responsible parties, the proposal to convert the site to variable speed control was considered critical, not just to stop the tripping but to also reduce wasted energy, improve the operation and ultimately reduce the carbon footprint.

One of the focus points of the task was to minimise disruption of the site operation and the impact on the day-to-day function, whilst carrying out the upgrade works. The newly installed system included all new IE4 ABB motors coupled with Ultra Low Harmonic ABB variable speed drives. This was the obvious choice and provided the ability to increase efficiency and resilience with a very short payback time. The original motor bedplates were replaced with bespoke units, manufactured and machined inhouse by MKE, keeping down time for each pump to a minimum.

The post installation surveys identified the original energy saving estimates were quite conservative. The reduced starting currents and significantly lower running currents has provided greatly improved efficiency of the system.

The feedback from the customer has been very good, not for just the elimination of the rogue tripping but also for the sizeable energy savings which have been seen.

## OUR IMPACT

Being a main terminal site for the water utility company, keeping the site fully operation is critical to maintaining the wastewater infrastructure for the surrounding area. Previously, consistent tripping of the large pumps on site posed a serious risk of pollution to the environment. We worked closely with the customer to mitigate these risks and to provide confidence in the new equipment for future site resilience.

The previous 1970's system consisted of three large two speed motors which enabled different set flows. Post original installation this system would have matched the required criteria and be



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at the forefront of design. Unfortunately, over many years of operation the heavy starts when running motors as large as these using star delta as the starting method, has led to excessive wear and damage to the equipment. This has led to a site which needed modernisation.

Using ABB Ultra Low Harmonic drives we have mitigated the potential issues associated with harmonics, whilst providing a clean user-friendly operating system. The reduced load of the new system has meant that a previously required generator upgrade to cope with the high starting currents is now no longer required, saving significant upgrade costs.

The concept of the project initially was to alleviate the tripping issues but with the added benefit of improving site efficiencies. Since the installation the rogue tripping issues have been resolved and significant improvements in operation have been observed. Energy consumption has been greatly reduced and in turn this has helped to limit the carbon footprint of the site.

The project is a continual process, and we are working with lead engineers to optimise the system to create a steady, stable system which instils confidence and reliability for the customer.

The reduction in pollution risk has been one of the biggest environmental benefits. As we are all aware water utility companies don't always get the best write up in the press, but we see a different side to things. Projects like this allow us to witness firsthand the continued investment and innovation being promoted and encouraged from within the water industry. MKE are proud to support innovations and take a leading role in looking for opportunities to look after our environment.

## OUR SUCCESS

From the initial concept through to delivery, the project needed the ability to be appraised for all aspects. This has been a cornerstone of the project from the beginning, not only to enable us to evaluate the successes of this project, but also determine any improvements for future works. Our plan to quantify the results was relatively straightforward, and we made a point of using measurable data to provide tangible assessments. To give us an impartial view of the project we have not only looked at the numerical data but also reflected upon anecdotal accounts from the relevant teams. This allowed us to not just see facts and figures but get a reliable impression of how the project outcomes and delivery were perceived.

Energy monitoring equipment has been used pre and post installation, to provide comparable data. Using this information, we have been able to estimate the energy savings as a direct result of this project and based on 12.5p/kWh the estimated savings are in the region of £57,330 year. In addition to financial benefit to the customer the carbon footprint has been greatly reduced with an estimated CO<sub>2</sub>e reduction of 144.8 ton/per year.

Monetary benefits aside the site resilience has also been significantly improved. Prior to the installation the site was seeing persistent tripping of the equipment approximately 50/month. Since the work has been completed false trips associated to the pumps has been reduced to roughly 6/month.

With such significant savings and efficiency improvements we are now working with the water utility company to look at other sites with a view of implementing similar systems to further improve their current operations.



## **CUSTOMER TESTIMONIAL**

Southern Water have worked with Mid Kent Electrical on our framework for 10+ years and have a great relationship with them, which consists of great communication, trust, and respect. MKE provide a high level of service through electrical repairs, service, drive repair and hire and even training our staff on equipment.

As described in this document, back in 2021 we were experiencing power blips and failures at one of our terminal pumping stations, which is also a bathing water site and considered to be a high-risk site should any critical equipment fail. As a result of the failures and risk we instructed MKE to investigate the possibilities of what we could do to improve the resilience of the site.

On completion of the work, we were very happy to see that the work carried out had resolved the power issues we were experiencing and there was a significant energy saving in addition to the reduction in alarms.

The benefits of this work have also been realised through job reduction on site with less callouts for failures, and a lower volume of alarms relating to power. January 2023 – April 2023 187 alarms, April – September 25 alarms.

In addition to the efficiency gains there is also a health and safety benefit as the new system is markedly quieter than the original greatly reducing the negative impact on those working close by.

### **MKE Engineering Group Ltd**

Unit 15b & 15c Dolphin Park, Upperfield Road, Eurolink, Sittingbourne, Kent, ME10 3UP.  
Telephone: 01795 471 089 | Fax: 01795 436 611