

## ● PRESS RELEASE

### REVOLUTIONARY PUMP CONTROL

*NOVEMBER 2008*

**Under the terms of the 1997 Kyoto Protocol, it is incumbent on the pumping sector to reduce greenhouse gas emissions. This coupled with rising energy costs (58 percent since 2001) has led to a radical rethinking of how efficiencies can be improved with pump control systems. At the forefront of that thinking is Retroflo, an award-winning company from the UK whose unique system-wide solution represents a breakthrough in pump control technology.**

Changing legislation on energy and environmental issues are undoubtedly one of the biggest drivers of innovation in the pumping sector. In addition, new EU directives recognise the increased demand for the introduction of a systemic approach to the way pumps are used and controlled. What's clear is that the well-established component-based approach does not take into consideration the potential energy and efficiency savings from monitoring and controlling all the parts that make up a pumping installation.

Uniquely, Retroflo's patented pump control technology takes a systematic approach to the traditional problems associated with pumping non-constant fluids. Utilising the full range of pumping data available, Retroflo's RPC\_2000 system has been proven to deliver substantial energy-savings whilst dramatically reducing pump blockages. This is achieved through the continuous dynamic monitoring of the pump characteristics over a range of wet well levels and pump speeds. And the results speak volumes.

At pumping installations currently operating Retroflo systems there has been a minimum 12 percent reduction in energy costs. This combined with little or no operator call-outs, cleaner wells and the security of consented flow, has enabled pumping installations, in many cases for the first time, to operate at optimum efficiency.

It is this growing need for reduced OPEX (operational expenditure) and improved carbon management that has been the driving-force behind the Retroflo project. A recent study by the US Department of Energy concluded that with pumping stations accounting for around 25 percent of the world's electrical motor energy, the pumping sector now offers the largest opportunity for energy efficiency improvements in industry. It's now well established that component improvements alone will offer only small reductions, whereas a systematic approach can provide potential energy and operational savings of between 30-40 percent.

# Retroflo

REVOLUTIONARY PUMP CONTROL

With an estimated 75 percent of pumps over-sized by 20 percent to secure the consented flow of a pumping installation, the use of Variable Speed Drives (VSDs) is playing a significant role in energy reduction. Where VSDs are used a small reduction in pump speed can significantly reduce energy costs. For example: a reduction in motor speed of 20 percent (from 100 percent to 80 percent) equates to a 48.8 percent power reduction. But while process control and energy conservation are the two primary reasons for VSD operations, their use is not without problems.

In many cases the increased frequency of blockages and higher maintenance costs of running VSDs outweighs the energy-saving benefits. Many operators of non-constant fluid installations opt for the tried-and-tested option of fixed speed pumping rather than variable speed constant level pumping because of a lack of faith in VSDs to deliver trouble free consented flow. Fixed speed pumping also has its own problems. Cycling pumps on and off results in frequent high surges of electrical current, increasing energy costs and wear to parts of the pump. It is also well known that this batch type pumping can cause network problems through surges in the flow of the process.

The Retroflo RPC\_2000 is specifically designed to overcome the problems associated with VSDs and constant pumping. The system recognises that every pumping station is different, not only in physical parameters but also in its operating requirements for consents and storage, population served, and its position within a network.

These variables are calculated and processes are automated to realise the energy-saving benefits of VSDs while ensuring consent security. This in turn means less energy is consumed because pumps are running either slower, or less frequently, and asset life of pumps is increased because of the reduction in running.

The people behind Retroflo believe that the technology they have developed represents a revolution in pump control systems – and the world's first to offer pre-blockage detection, consent security, intelligent flushing cycles, periodic efficiency testing and asset data storage, within a single system.

Andy Laundon is one of the founders of Retroflo and its Operations Director. The Retroflo concept, he explains, was no 'Eureka!' moment, rather a clear idea of how a pumping installation could work efficiently: "It was an idea formed over many years in the industry, and with the knowledge I have gained from working with early variable speed operations."

"In the old days to ensure a station's continued consented flow, you would tend to install larger pumps to compensate for drop off in performance and wear over time, and those pumps would invariably be operated at full speed. Now customer's can install correctly sized pumps in the knowledge that "as new" performance will be maintained, with automated early warnings of wear, allowing preventative maintenance regimes to be undertaken."

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Anywhere where a consented flow is required blockages are a massive concern, with a consequence being untreated sewage discharges into the watercourse that can have a significant environmental impact. According to Environment Agency figures, the sewage and water industry caused 19 percent of serious water pollution incidents in 2007. Under the Urban Waste Water Treatment Regulations of 1994, water companies are subject to tough penalties should it be proven that sewerage pollution was caused by a pumping station not delivering its consented flow.

Understanding the issues related to securing a consented flow goes some way to understanding the concept behind Retroflo. The pass forward flow of a waste-water pumping station is usually calculated by multiplying the population of its catchment by industry guidelines (in litres per head per day), then factoring in infiltration and accommodating for any trade effluent flow, to determine the Dry Weather Flow rate. This is then further multiplied to accommodate for surface water which defines the pass forward flow.

Bob Dixon, Pumping Station Framework Manager for Northumbrian Water (NWL) has been involved with Retroflo's projects from the outset and understands issues relating to pumping stations better than most. As one of the country's 12 water and sewerage service providers, NWL is investing £380 million in improving the wastewater network through investment and operational improvements. Retroflo technology is part of this investment.

"NWL provided a platform to put the projects in place," explains Bob. "We have over 800 pumping stations, many inherited from local authorities, and we undertook a process of identifying what work needed to be done through asset surveys. The biggest issues identified were blockages."

Blockages occur in the pumping of any non-constant fluid, such as sewerage, because of the gradual build-up of debris on the pump impellers. Over time this build-up leads to a blockage, meaning time consuming and costly call-outs, in many cases entailing the lifting of the pump from the wet well to carry out maintenance.

The RPC\_2000 utilises a Pre-Blockage Detection facility to overcome this problem. An initial analysis process records the characteristics of the pump across the range of well levels and pump speeds and the system constantly compares benchmark data against current data to determine the criteria of the unblocking cycle: i.e. reverse direction, its speed and duration, and the number of self-cleanse sequences made prior to pump trip.

"Prior to installing the system in our Red Row Pumping station, we had hoped for a reduction in blockages," says Bob Dixon. "Actually, we have virtually eliminated blockages, and we're not far from completely doing so."

# Retroflo

REVOLUTIONARY PUMP CONTROL

The successful installation of Retroflo technology in two pumping installations led the Retroflo team to realise the system had a far broader reach than first imagined. “We thought our system was unique and therefore patentable,” says Andy Laundon. “When it proved patentable, we decided to invest in the Research and Development of a one-size-fits-all instrument.”

What the company had effectively come up with was a new approach to a pumping control system. The next step was design a solution applicable to a wide range of manufacturers’ equipment (pumps and drives) that could either be installed in new operations, or integrated into existing systems.

Lee Bishton, Technical Director of Retroflo, has played a key role in taking the project from concept, through research and development, to the launch of the RPC\_2000.

“I knew what an operator would want from a system,” says Lee. “Our process was to use a collaborative approach – taking on board problems and coming up with solutions. Pump blockages in particular are an industry-wide problem. Solutions in the pumping industry seemed to exist at component level but not as a system-wide solution. We were able to find the solution through adopting a holistic approach where all the characteristics of a wet well (level, flow, speed) are monitored and analysed by a single system.”

In 2006 Lee began to write the control philosophy behind Retroflo. The first implementation and testing of the system began on NWL’s Red Row Pumping Station and was then rolled out to other NWL installations. Despite every pumping station being different, what soon became apparent to the design team was that they were able to standardise the processes required to monitor and analyse pump speeds, wet well levels and flow in any given installation.

“In effect,” says Lee, “we created a one-size-fits-all system that can be fitted or retro-fitted to any pumping station.”

At Dene House, a mid-sized NWL pumping station on the Northumbrian Coast, the benefits of the Retroflo system are clear to see. Since the system became operational in January 2008 the station log lists a single reactive call-out. During the same period in 2007 the log records 49 call-outs.

Leading UK contractor Byzak was appointed to NWL’s framework agreement for the refurbishment of pumping stations, including Dene House. Byzak is the approved installer for Retroflo and to date has completed the refurbishment of over 50 NWL stations with projects ranging from minor works to multi-million pound refurbishments.

Ian Gibson, a Project Manager for Byzak, oversaw the 10-week refurbishment of Dene House, which included installing the Retroflo system to control new pumps and VSDs. Over his 14 years in the water industry Ian has

# Retroflo

REVOLUTIONARY PUMP CONTROL

encountered the recurrent problems particular to pumping stations - principally frequent blockages and the resultant maintenance call-outs.

He explains: "The previous firm I worked for had two or three goes at sorting out the problems of troublesome stations - with little success. It's been good to be involved with this project. Working with NWL and Retroflo on a day-to-day basis I've seen the benefits of the system at the front-end. To be honest, I can't see how the industry can ignore it. It's what has been needed for a long time."

The retro-fit capability of the system provides opportunities for dealing with historically problematic sites and the success of such installations has been demonstrated by greatly improved carbon management and reduced maintenance costs. At Skinningrove, another NWL station, energy costs have been reduced by 20 percent following refurbishment and the installation of the system.

While it makes sense to focus on the system's pump control and pre-blockage facilities, the RPC\_2000's inbuilt diagnostic tools incorporate several other features aimed at improving efficiencies and performance. If you consider that pump installation costs account for about 10 percent of pump station expenditure, it is the life cycle costs that offer the greatest potential for savings.

For example, Retroflo's Intelligent Flushing Cycle uses historical data to predict the incoming flow rate, allowing the well to fill to a pre-set level before initiating a rapid well-emptying sequence. The benefits of this are twofold: dilution of settled solids in the well; and the rapid emptying of the well usually ensures self-cleansing velocities are generated in the rising main, alleviating solids settlement and septicity problems.

Another feature of the system is Periodic Pump Efficiency Testing, a process that monitors wear on pumps; alerting operators of maintenance issues should a pump begin to lose performance. While operational savings are mainly derived from lower energy costs and fewer call-outs, the benefits from improved asset lives cannot be ignored.

And far from being ignored, the RPC\_2000 is making the industry sit up and take note. Retroflo was a winner at the prestigious IET (Institute of Engineering and Technology ) Innovation Awards and has been shortlisted for the Pump Industry Awards 2008 in the Technical Innovation of the Year category.

*Future Water, The Government's water strategy for England* , published in February 2008, highlights the need for innovation in reducing the UK water industry's approximate four million tonnes of greenhouse gas emission. In his introduction Hilary Benn, Secretary of State for Environment, Food and Rural Affairs, states that: 'The way we pump, treat, and clean water has profound implications for energy use. ... The water industry is a major energy user, and there's a carbon impact here that simply has to be tackled. '

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The RPC\_2000 is uniquely positioned to be at the vanguard of improving the industry's carbon management. The impressive figures produced by the system in operation (see costs analysis chart) clearly demonstrate the efficiencies associated with its use. What is also clear is that the Retroflo RPC\_2000 has the potential for wide application across the pumping sector at large. When this happens the savings could be huge.

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## RETROFLO RPC\_2000



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