

Crownhill WTW

upgrade to the main source of potable water for Plymouth

by
Giles Leonard and & Phil Thomas

Crownhill WTW is the main source of potable water for the city of Plymouth, serving a population in excess of 250,000. The original works no longer delivers enough water to serve the increasing population, and is prone to various quality and throughput problems. As part of South West Water's AMP4 Capital maintenance programme, Enpure Ltd were engaged as designer and main contractor for an overhaul and upgrade of the works' rapid gravity filtration stage.



RGF 3 with new media

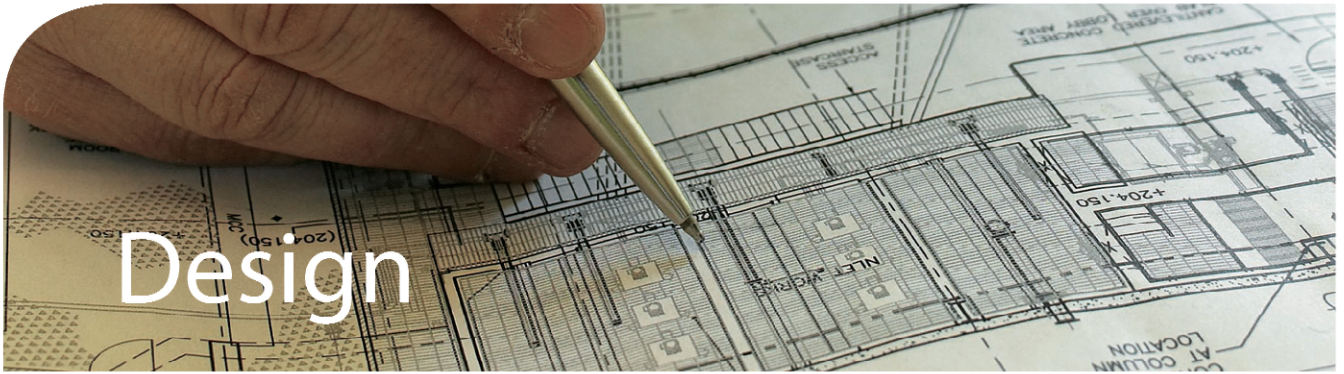
Courtesy of Enpure Ltd

The main challenge is that the twelve rapid gravity filters can no longer treat the required throughput of 88.9 MLD which the existing clarifiers permit. This is due to worn media and poor backwashing as a result of the backwash weirs being at the narrow end of the filter. Additionally, the depth and type of media, together with the existing nozzles do not present an adequate cryptosporidium barrier. Backwash water is taken directly from the filtered water channel, causing cessation of forward flow and associated chemical dosing control problems. Many of the filter valves are actuated by an old and unreliable hydraulic system; and the air scour blowers and backwash pumps are both old and incapable of achieving the rise rates specified in current technical standards.

The design for the scheme envisaged refurbishing and upgrading eight of the twelve RGFs, which will increase the unit throughput from about 7 MLD to 11 MLD; three others would be mothballed

and the twelfth used as a pipe route. The work in each filter comprises:

- Removal of sand and, after a pattern test to confirm there are no problems under the floor, removal of the nozzles;
- Repair of cracks in the 50 year old filter walls;
- Replacement of existing air scour distribution pipework to allow higher air flow rates;
- Provision of siphons, longitudinal troughs and raised end backwash weir to allow deeper media and more efficient removal of backwashings;
- New nozzles and media;
- Replacement of all hydraulic valve actuators and some electrical actuators, critical actuators to be battery backed;
- Provision of new filter outlet magnetic flowmeters and turbidity monitors.



Design



Technology



Delivery

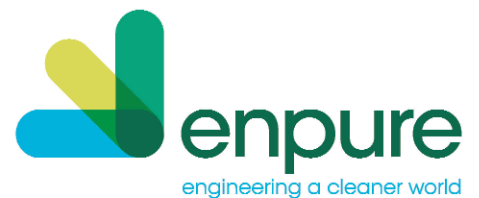


Responsibility

Creative technology and design that maximises value and minimises waste. Total commitment to our environmental

responsibility and dedication to performance – on time, on budget, on your terms. That's Enpure. Delivering solutions to satisfied

clients right across the water industry – as well as fresh thinking, higher standards and brand new ways of working.



An existing disused reaction tank has been repaired and covered to provide a clean backwash water tank. Two small submersible pumps, sited in the filter outlet channel, will keep the backwash tank replenished without interrupting forward flow. The new submersible backwash pumps are sited in the tank. New air scour blowers are sited in the existing pump hall. The existing air scour and backwash manifolds are being retained, fed by both the new and existing equipment during the filter refurbishment. The new pumps, blowers and actuated valves will be controlled by a new control system using Profibus technology.

The network restriction means that works shutdowns of no more than 6 hours duration are possible posing a significant challenge to the execution of the upgrade. To overcome this, the new air scour and backwash equipment is being installed and tested off line, in parallel with the works in the first filter. As each filter is returned to service, it will be washed by the new system. The control system is designed to determine whether the next filter queuing to wash has been refurbished or not, and assigns control to the new or the old PLC accordingly. The scheme is on programme for delivery by November 2010.

Crownhill WTW is close to a major office block, a housing development and a retail park. Registering the project with the Considerate Contractors Scheme is an approach that Enpure Ltd find helpful to promote this wider picture within both our team, our supply chain and our clients organisation. Two other aspects are worthy of note. Firstly, the sand from two filters, rather than being disposed of, is being re-used as part of an environmental project in disused lagoons at Tottiford WTW near Bovey Tracey (the remaining sand is to be cleaned and recycled elsewhere). Secondly, the backwash is very close to the major civil works as is a long established carp pond; protection for the fish has been provided with the advice and assistance of the Plymouth Koi Society.

Koi Carp

Our team were concerned not to cause any unnecessary harm to the Koi which live in a large pond close to the intended works area and so contacted Plymouth & District Koi Keepers' Society to seek advice. Sandra and Brian Crocker visited site and explained that stress was one of the biggest problems with the health of the Koi which was easily brought on by the noise, vibration and extra traffic and people working around the pond. This stress, apparently could be further aggravated because during the winter months the Koi are in a form of hibernation and generally resting.

To overcome the problem it was decided that the pond should be enclosed achieved by erecting a surround scaffold two metres high covered with monoflex sheeting. This has become known as "Koi Hilton" on site. An access point for viewing the fish was also provided. It was further decided that rubber pads and matting would be placed under the stabilizers and feet of cranes, skips and site equipment and that all drivers and operators of machinery on site



Enclosed Koi Pond

Courtesy of Enpure Ltd

should be briefed to lower skips to the ground as gently as possible. Cushion material (which would help to reduce the noise and vibrations being transmitted through the ground) would be placed on the floor of the concrete tanks and chambers to minimise the impact of falling concrete from demolition work.

It was agreed with the Koi Club that two members would visit the site once or twice a week as required to monitor the fish and hopefully eliminate any potential problems. Following a recent visit Sandra Crocker on behalf of the Koi Club said she was very pleased with the way the carp were being protected and sheltered from the noise and vibration of the ongoing work. She went on to say how impressed she was with Enpure's proactive approach, on-going involvement, care to detail on the problem and overwhelmed with the warm welcome and hospitality received from our staff during the monitoring visits. Sandra added:

"We, as a Koi Club, are occasionally called in after a problem has occurred, when it is often too late to help. It is refreshing to be involved in a well planned project from start to finish, which is a credit to Enpure, and we would like to support Enpure in making the industry aware of how a responsible approach has led to a first class outcome".

The major subcontractors involved with the scheme include: Tecker Limited (filter works); May Gurney (civil works and EICA installation); Steeltech Limited (pipework and mechanical installation); Blackburn Starling Limited (MCC and UPS) and Hyder Consulting (civil design).

Note: The Editor & Publishers thank Giles Leonard, Project Manager with Enpure Limited and Phil Thomas, Project Manager with South West Water for providing the above article for publication. ■



The UK Water Projects Publication is now online.
over 500 case studies from the 2004 - 2010 editions
indexed in six categories, sub-divided into over 50 index headings:

Water Company, Consultants, Civil Engineers, Process Engineers,
Plant & Equipment Suppliers & Publication Date



experience it for yourself at www.WaterProjectsOnline.com



New backwash tank

Courtesy of Enpure Ltd



Backwash Pump Tank Discharge

Courtesy of Enpure Ltd