

Borehole rehabilitation

Borehole Engineering Services [BES] the borehole maintenance division of Drilcorp was recently commissioned by a specialist hydrogeological Consultant to overcome a biofouling problem on a major water production borehole.

The works had been attempted by BES two years previously when there had been a narrow window of opportunity during a factory closedown period. An obstruction within the borehole at 128mtr meant that only the top section from ground level to this depth could be treated inside the timescale available.

The borehole was in a good productive state and too important for its owner to close down for further remediation. It was agreed that BES would put forward proposals for getting past the obstruction and cleaning the full 245mtr borehole when the next opportunity arose.

Original remediation works and the problems encountered

The borehole had been drilled to 245mtr and 250mmØ mild steel surface casing was installed to a depth of 135mtr. A second 100mmØ casing was drop-set from 128mtr to 245mtr. This casing had a screened section covering 134mtr to 244mtr.

Remediation works commenced with a CCTV survey of the borehole which showed substantial build-up of biofouling matter. The CCTV camera could not pass into the drop set casing due to a dogleg which was up throwing the casing to the top side of the borehole and anything lowered down was passing into the annulus between the two casings. After several attempts to enter the drop set casing the Consultant decided to leave the lower section until a later date due to the lack of time available.

The 250mmØ casing was now scrubbed with a steel brush to loosen the biofilm. A special industry approved iron removal product 'Boresaver' was now introduced into the borehole at 128mtr and circulated before

being air lifted to settlement tanks and treated. Once the entire chemical was removed and the water chemistry had returned to its original state, the submersible pump was reinstalled and the borehole was put back into production.

BES carried out simulation trials for gaining entry into the drop set casing at their Seaham depot and put forward proposals to the Consultant on how to tackle the cleaning of the lower section of the borehole when the opportunity arose.

Proposal

After carrying out simulated trials it was decided to run a 50mm pipe with a 'bent' lead length down to the top of the drop set casing. Our CCTV camera would then be lowered to the base of the 50mm pipe and then using the camera to guide the operation, turn the pipe until it lined up with the drop set casing. Once aligned, the 50mm casing would be lowered into the drop set casing thus gaining

access to the bottom section of the borehole.

It was also proposed to use a new chemical process to treat the biofilm. This was to inject chlorine dioxide into the borehole. Chlorine dioxide had a proven track record in other industries for the treatment and removal of biofouling matter but we had not used it in boreholes to a depth of 245mtr.

Our proposals were accepted by both the Consultant and Client.

Final cleaning operation

An opportunity to carry out another cleaning operation arose in September 2017.

The submersible pump and rising main were removed and they once again were coated in a thick red-brown layer of biofilm. The borehole was scrubbed and airlifted to the top of the drop set casing. The 50mm pipe with the bent leading length was lowered and entered into the drop set casing with the aid of the camera. Now inside of the drop set cas-



ing, the camera was lowered down the remainder of the borehole. At 214mtr the borehole was found to have filled up with debris and rust which was blocking most of the screened section.

An air lifting tube was now lowered into the 50mm pipe and the borehole was blasted with compressed air to remove this loose debris and to clean the screens. This operation was successful however the bottom 10mtr of the casing could not be cleaned as the debris had solidified and could not be removed using this technique. The Consultant confirmed that this small section was not important to the productivity of the borehole and instructed to halt this operation.

The borehole was resurveyed and found to be clear to a depth of 235mtr.

A 25mm dosing pipe was installed to the base of the borehole and 100ltr of chlorine diox-

ide was pumped into the borehole at a rate of 20ltr/hr.

The borehole was then purged until all evidence of the chemical was gone. Purged water was tankered off site to a licenced waste disposal site.

The dosing pipe was left in the borehole for future cleaning operations.

The submersible pump and rising main were thoroughly cleaned and disinfected and put back into the borehole and after a relatively short period of discharge pumping the groundwater was suitable to be sent to production.

Outcome

The Consultant and Client were delighted to have a fully cleaned borehole working efficiently and with the dosing line still situated in the borehole ensuring that future cleaning operations would be a formality with little downtime and therefore cost.

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