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Bore Maintenance and Rehabilitation

Bores may be out of sight, but maintenance is vitally important to their continued productive use. While the maintenance of the pumping system is similar to an above ground system, the bore itself has some unique maintenance requirements, that if not met can result in reduced water flows, or the complete loss of the bore as a viable water source. Due to the highly specialised nature of bores, much of the maintenance required will have to be carried out by specialists.

***Bore pumps** are affected by general wear, and for optimum performance, need to be removed regularly, checked and cleaned. Maintenance of bores, foot valves and strainers can help to reduce pump energy use, stress, and wear on the pump.*

Many older bores were installed with a steel casing. Depending on the water quality, the steel casing may become rusted and release iron particles, damaging the pump, increasing pipe and component wear, blocking sprinklers and reducing the overall efficiency of the irrigation system.

***Iron bacteria are commonly found in bores** and consume iron dissolved in the water, using it as an energy source before depositing it on solid surfaces. These deposits:*

- *Increase friction loses and decrease the flow area through screens and pipelines, causing increased pumping costs.*
- *Plug the voids in the aquifer surrounding the bore, leading to decreased yield.*

- *Increase resistance to heat flow across surfaces in submersible pumps, causing operating problems and potential burn out.*
- *Affect water quality (taste, colour and odour), as well as causing undesirable staining.*
- *Cause clogging of drip irrigation systems.*

Accurate identification of the problem is critical to the success of maintenance and rehabilitation. Before commencing maintenance work, check for any historical information about the bore, as well as details of other bores in the local area if possible.

A physical examination of the bore and bore casing should then be made using techniques such as geophysical logging, dye testing, using down-hole cameras or ultrasonic bond tools

***Bore maintenance** requirements depend on the types of formations, depths the bore is drilled, and groundwater quality. Encrustations, or sediment blockages can occur on bore casings, screens, in gravel packs, and in pumps. These blockages can be removed using a combination of physical or chemical repair methods such as:*

***Jetting**—circulating a high-pressure water jet in the bore.*
***Surging**—moving a tightly-fitting plunger up and down in the bore.*
***Bailing**—moving a bailer (a long steel tube with a foot valve) up and down in the bore.*
***Airlifting**—air pressure used to discharge silty water.*
***Pigging or swabbing**—insertion of bullet shaped 'pigs' (poly) or swabs (soft foam) into the pipeline system. Hydraulic or pneumatic pressure pushes the pig or swab through the pipeline cleaning the pipe and removing debris.*
***Brushing**—using a wire brush to remove deposits.*
***Sonar or ultrasonic treatments** are a less common methods used to remove encrustations.*

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***Chemicals** are generally used in conjunction with mechanical methods to break up or dissolve encrustations or blockages. Before chemically treating a bore, determine the nature and cause of the problem so the appropriate treatment can be applied. During treatment, the supply should be disconnected to ensure that water does not enter the reticulation system. All discharged waste water should be disposed of in a manner that will not affect the environment or existing users. Chemical treatments are categorised as follows:*

***Disinfectants**—Chlorine, hydrogen peroxide, copper sulphate, potassium permanganate.*
***Acids**—for scale/encrustation removal (hydrochloric, phosphoric, sulphamic acids).*
***Clay dispersants**—Polyphosphates.*
Detergents
***Proprietary products**—Usually incorporate an inhibiting agent to lower corrosiveness, and a wetting agent to assist infiltration of chemical. Sodium hexametaphosphate (e.g. Calgon).*

Treatments may also be required on delivery pipes.

The bore maintenance process

- *Before commencing works, measure the pH and Electrical Conductivity (EC) of the bore water, and carry out a specific capacity test for comparison after the treatment.*
- *Mechanically clean the interior of the casing and screens.*
- *Dose the bore with appropriate chemicals. The bore should be agitated with a surging block for at least 24 hours.*
- *Remove residues and chemicals by pumping until the pH is within 0.5 of a unit of pH, and EC within 10% of the measured value taken prior to the treatment.*
- *Conduct a specific capacity test after the treatment and compare against the capacity of the bore prior to treatment.*

Maintenance tasks don't change the physical structure of the bore. If initial investigations show damage to the bore, or there is no improvement in bore performance after treatment, rehabilitation works may be necessary.

***Rehabilitation** may change the structure of the bore, changing its performance characteristics. Bore rehabilitation must be carried out by a licensed driller, with a bore permit being required to complete this type of work.*

The rehabilitation of any bore must be carried out in accordance with state or territory requirements. Due to the uncertainties of bore construction and history, structural mechanical repairs present more problems than drilling a replacement bore, and makes accurate costing of structural mechanical repairs difficult.

As some methods of rehabilitation reduce the diameter of the casing, a decision must be made as to whether the loss of capacity in the bore due to the reduction in casing size is preferable to decommissioning the bore and drilling a replacement. During rehabilitation, the structural integrity of the casing, and the section of the bore hole where the water is sourced from (the production interval), should be monitored regularly to identify early warning signs of problems.

Rehabilitation of bores can include:
• Relining the bore with a new casing—where large sections of the casing or screen have failed.
• In-situ repairs— where smaller sections require repair e.g. putting a patch across the affected area. This has a minimal effect on the overall diameter of the casing.
• Repairing screens.
• Removing and replacing the casing—there is a risk of borehole collapse with this type of repair.
• Sealing a zone.

Records of the performance of the bore during its life should be kept, as this will provide an ongoing record for future reference, and will be helpful if rehabilitation is ever required.

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