# Using Chemicals in Water Bores

Groundwater as a resource is under pressure from rural, industrial and urban activities. Chemicals are often used to recondition or rehabilitate bores which have declined in yield. Using chemicals to rehabilitate bores adds to this pressure unless it is done responsibly to ensure that there is little impact on the resource.

Increasing awareness of potential hazards and promoting the sensible use of chemicals will help to minimise adverse impacts on people and the environment.

## What is groundwater?

Groundwater is rainfall which soaks into the ground and gravitates into voids in the underlying strata. It accumulates in porous or fractured rocks where it becomes part of a groundwater system. It does not remain stationary, but moves under gravity according to the gradient of the water table.

Since movement does occur, any activity causing a change to water quality at one site can affect the water quality elsewhere.

## Why use chemicals?

In certain groundwater environments, encrustations of various types can occur on bore casings, screens and within pumps. The end result is deterioration in bore performance as water entry to the bore or pump is restricted.

Encrustations may be chemical deposits including:

- carbonates and manganese
- biological build-up such as iron bacteria
- fouling by clayey or fine particles blocking screens, slots and openings within the water bearing formation.

Most of the encrustations and blockages that form cannot successfully be cleaned solely by mechanical means. Chemicals are needed, usually in conjunction with mechanical action.

These problems are not the only causes of poor bore performance. Pump malfunctions, dry conditions and interference between bores should be investigated before chemical treatment is considered.

## Chemicals in use

Table 1 lists various chemicals that are used in the treatment of bores and the type of problems they target. A number of proprietary products have been developed specifically to treat bores. They may contain one or more of the chemicals listed, although the particular formulation is often not publicised.

**Table 1—Types of chemicals used in water bores**

| Chemicals | Use |
|---|---|
| Chlorine (derived from Calcium Hypochlorite or Sodium Hypochlorite)<br>Hydrogen Peroxide<br>Copper Sulphate<br>Potassium Permanganate | Disinfectant |
| Acid (Hydrochloric, Phosphoric, Sulphamic e.t.c.) | Removal of scale/encrustations |
| Polyphosphates (Sodium Polyphosphate, Sodium Hexametaphosphate i.e. 'Calgon') | Dispersing agent for treating clay and silt related problems |
| Proprietary products (usually acid based with a disinfectant, and incorporating an inhibiting agent to lower corrosiveness and a wetting agent to assist infiltration of chemicals) | A number of products are available which target all of the above |

## Are these chemicals harmful?

Used in the correct manner at the right dosage, these chemicals should have little impact on water quality or the handler. Used incorrectly, the results may be entirely different.

**Acids:** all are corrosive, dangerous to handle and release toxic fumes, particularly on contact with water.

**Chlorine:** of the three forms of chlorine that are available (gaseous, granulated or liquid), liquid chlorine or sodium hypochlorite is the safest to use, due to its relatively low concentration of chlorine.

- Chlorine as a gas or in solution is very corrosive and toxic. Safe handling and storage practices should be strictly observed.
- Do not use or store chlorine near petroleum products.
- Do not mix chlorine with acids.

**Copper sulphate:** this is very corrosive to aluminium. Regular use will also result in a build up of copper in the bore that could be harmful to humans.

**Polyphosphates:** these are safe to handle and are relatively mild compared with chlorine and acid.

## Use the right chemicals for the job

Before treating a bore, it is wise to determine the nature and cause of the problem in the first place. This allows the problem to be targeted and the appropriate treatment to be selected. Treating a bore with the incorrect chemical is a waste of time and money. For example, using a disinfecting agent to treat an encrustation will not result in any improvement in the bore's performance.

Each of the chemicals listed in Table 1 treats a particular problem. Proprietary products containing a combination of chemicals can be useful when the cause of the problem cannot be determined with any certainty. These products are also designed to decrease the corrosive effects of acid and chlorine, which have the potential to cause damage to pumps and steel casings. They are a viable alternative to the use of chlorine or acid.

## Procedure to follow

- Ensure that the pump is operating effectively and that local prevailing dry conditions are not responsible for decreased supply.
- Measure the depth of the bore to ensure that it has not collapsed or silted up.
- Check discharge water for tell-tale signs of solids, discoloration or smell, such as scale, slime, sand, gas etc. These will give a lead to the nature of the problem. Discolouration and odour may also result from the presence of sulphate-reducing bacteria. These generate hydrogen sulphide or 'rotten egg gas' which is corrosive to steel.
- If iron bacteria are suspected to be the problem, have the water analysed to see if they are present.
- Measure pH and conductivity of the water before any treatment is commenced. This is to ensure that there are little or no residual chemicals remaining in the bore on completion of the work.
- Disconnect the supply from the reticulation system to ensure that water is not available for consumption during treatment.
- Add chemicals to the bore and agitate the water to ensure the chemical solution penetrates all areas where it will be effective. Severity of treatment will depend on the nature of the problem.
- On completion, pump water to waste until pH and conductivity return to the levels before treatment. The pH should be within 0.5 units and conductivity within 10 per cent of pre-treatment readings, before reconnecting the supply to the reticulation system.

**Treatment**

The following points are important to remember when a bore is being treated with chemicals:

- Ensure that the chemical manufacturer's directions are followed and that appropriate safety precautions are taken. Chemicals should be used only by experienced personnel, particularly where directions specific to use in water bores are not provided.
- On completion of treatment the reticulation system should not be reconnected until the quality of the discharge water is almost of the quality measured prior to treatment.
- All discharged wastewater should be disposed of away from stock watering areas.

## Further information

Should you require assistance or advice on this topic, please contact a local groundwater consultant. You will find their contact details in the yellow pages under 'Natural Resources Consultants' or 'Boring and Drilling Contractors.'

More information on groundwater or other natural resource management topics is available on the Department of Environment and Resource Management's website at <www.derm.qld.gov.au>.

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