



The Science of Water Treatment

Water Quality Scientist Patric Bulmer Explains...

Water Treatment - How we do it...

The problem

As you will have already seen, we need to take

water from various sources and this water varies in quality. At treatment works like Cheddar we use simple physical treatments like sand filtration and microstraining, but this form of treatment would be inadequate for the more problematic waters like the River Severn. For this water we need a much more complex form of treatment which uses chemical forms of treatment as well.

This section is a guide to some of the key elements of how we treat these more complex waters and in particular the science of this water treatment.

Clarification

If you leave water long enough the tiny particles that make the water look 'muddy' will eventually settle to the bottom. Unfortunately waiting for nature to do all the work would take too long and so we have a way of artificially making the particles "clump" together...this process is called CLARIFICATION. It works by making the smaller particles stick together to form bigger particles which, because of their weight, settle out quickly. To achieve this we add a chemical called a **coagulant** to the water. The coagulant we use is ferric sulphate.

Clarification is an important first step in making the water clean. In fact, this process removes over 90% of the bacteria, viruses and solid material from the water. But it is still not fit to drink. We need to remove anything which could cause a health hazard.

A scientific explanation

Ferric sulphate works because it is positively charged. The dirt, on the other hand, is mostly negatively charged and so the two are attracted, like a magnet to metal, to each other forming these bigger, heavier, 'clumps'.

Rapid sand filtration

At our treatment works using clarification, filtration is mostly done through a 1m thick bed of sand, through which the water flows at a rate of between 6 and 9 metres per hour. This is rapid compared with the flow through a slow sand filter (like those at Cheddar) so we call them rapid gravity filters. These are more effective at dealing with the dirtier waters than the slow sand filters.

Ozone/Disinfection

Once all the particles have been removed from the water, we add ozone to the water by bubbling it in through special pipes. The ozone destroys bacteria, viruses, any traces of pesticides there may be in the water, as well as breaking down the compounds which can cause taste and odour. The water is then ready for more filtration.

Advanced filtration

Filtering the water through sand is very good at removing solid material, but it cannot remove anything dissolved into the water. Examples of this kind of dissolved material are true colour, and the taste and smell of the water.

To remove dissolved material we use Granular Activated Carbon (GAC). This is a very useful material which can remove colour, taste and smell, and traces of pesticides from the water. (GAC is explained on the next page).



Disinfection

Once the water has been cleaned and the taste removed, all we need to do is add chlorine to kill any bacteria that are still there. Chlorine is added at our treatment works as a dissolved gas. It is allowed about one hour at a level similar to the amount you would find in a swimming pool.

Once this has been done we reduce the level of chlorine, using a chemical called sulphur dioxide. The chlorine that remains is enough to ensure that there is no bacterial regrowth in the water mains on the way to your home.