Ageing Water Wells

Quick Break Training **13 March 2009**

Water wells change as they age. Water is extracted from the well or injected into the well. That ongoing process of water movement causes environmental changes in, and around, the well. Wear and tear of all of the mechanical parts of the pumps and the screens are naturally going to impact the well but it is perhaps the clogging and plugging that has the most impact causing changes in specific capacity and water quality.

What is clogging? Clogging is caused by solids coming up against the slots or perforations of the well and causing physical blockages ("clog-jam") of the water pathways into the well. This leads to a reduction in the specific capacity that relates to the speed with which the solids interfere with the movement of water into the well. It can be a long slow process or it can be fast depending upon the nature of the well. Most commonly the solids causing this are sands and silts but clays and finer grades of gravel can also be involved. Sometimes these solids can be surged out of the well if they can pass through the perforations or slots. Often though these solids become bonded into the biomass which makes surging difficult unless there has been an effective treatment applied to disrupt and disperse the biomass causing the bonding of the solids. When that treatment is applied then the fines (particularly the silts and sands) will flow into the well and have to be air lifted out by surging. Even after such treatment and removal of the clogging there is a probability that it will come back. This means regular treatment with air-lift surging should become a routine practise on the wells impacted by clogging.

What is plugging? Plugging is caused by the growth of biomass inside the well as well as in the natural filters around the well. As the biomass grows into the water pathways entering the well, there is a gradual constriction (throttling) of the water pathways infested by the biomass. The form of this constriction follows the natural trends common in biofilms where there is a cycle of expansion, stabilization and minor contraction. This means that the specific capacity does not drop steadily but as a series of sudden minor but rapid decline each followed by a longer period of stability. Plugging may incorporate solids that are moving towards the well. Additionally the biomass will also accumulate materials such as ferric oxides and hydroxides, carbonates, and organics that cannot be so easily broken down. This makes the chemistry of the biomass more complex and challenging to treat.

Effects of Fouling on Well Aging, As the injection or extraction water well ages then both clogging and plugging can occur to affect the performance of the well. This aging is complicated by the fact that the clogging can become incorporated into the biomass as a plugging. Where there is a steady and continuous drop in performance (e.g. linear decline in specific capacity) then clogging is the most likely cause. Here the life expectancy for the well would be predictable and extendable using air-lift surging. Where there is an erratic (step-wise) decline in performance then this is more likely to be a plugging event. In this case treatments can be used to disperse the biomass with air-lift surging to remove any clogging that has bioaccumulated.

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