

# Water Well Health

## *Quick Break Training*

13 March 2009

Health can mean one of two things. Firstly there are the health risks to the people using the water well. Secondly there are the health risks to the well itself. Public health addresses the former concern with an extensive monitoring program and so will not be discussed further here. The health of the well itself is another concern. Traditionally the health of water wells has been addressed in engineering terms relating to production rates and maintenance issues. Newer concept also considers that the risk of a biomass infestation can also affect the performance of the well. There will almost inevitably be some level of microbiological activity within, and around, the well that will affect the health of the well. This microbial activity can relate to plugging (growth of the biomass) which would affect performance, or the impact that the biomass may have on the product water quality. Much of the losses in production efficiency in water wells have to be associated to some extent with the bacteriologically driven infestations that are generated in the wells. What is happening here is that the bacteria are concentrating on forming a biomass at the oxidation-reduction fronts where oxygen is coming from the oxidative side and nutrients from the reductive side with the groundwater flow (for an extraction well). This biomass focussing initially starts as a natural biological filter improving the quality of the water entering the bore hole. Water being pumped from the extraction well therefore appears to be better than groundwater because of this action (generally the iron and other metals along with organics would be removed by the biomass). The extraction well would be considered healthy. As the biomass grows not only is there commonly a reduction in the specific capacity but also the chemistry of the produced water changes. This decline in water quality is more a result of the biomass beginning to fail to function as a “natural” filter but releases some of the chemicals that had been accumulated. At the same time some of the bacteria active within the biomass will also be impacted by these destabilizations and there would also be periodic releases of bacteria into the produced water. Chemical testing of the product water commonly will show increases in the metal content (particularly iron) along with increases in the particulates and total organic carbon. BART testing of the product water will display more erratic ongoing increases in bacterial activity recognized by shortening time lapses and often changing reaction patterns. Shortening time lapses means the bacteria are getting more active and this may likely to be affecting the “health” of the extraction well.

An injection well has a very different set of “health” challenges since some type of water is being pumped into the well. That injected water now interacts along the flow lines from the well out into the surrounding groundwater flows. If there is any oxygen in the injected water then it can be expected that the oxidation-reduction front and biomass will be pushed backwards away from the well. It would therefore be expected that the bulk of the biomass activities would form at those sites. The challenge with an injection well is therefore how to determine the “health” of a well when the injected water is being impacted by a more dispersed biomass set farther away from the well. Clearly treatment will also become more difficult unless a satellite well is employed as a treatment input point as well as a sampling source for the well.

***Droycon Bioconcepts***, 315 Dewdney Avenue, Regina, Canada

(306) 585 1762 fax: (306) 585 3000 [www.dbi.ca](http://www.dbi.ca)

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