

Sanding: What Messages Does This Condition Send?

Introduction

An onset of sand production in a new well or one that has been in service for some time is the overture of a condition that often leads to a long, drawn out scenario that all too often involves costly maintenance, persistent equipment wear, and undesirable water production. A well that begins to regularly pump sand (even in small quantities) has a story to tell to the contractor, designer, owner and operator. Sand production doesn't just happen. Rather, it is the consequence of one or more factors associated with well design, construction, development and/or water quality. This memorandum briefly describes the various messages sent out by a sanding well.

“I'm OK.....you're OK.....”

So, you start up a well and happen to notice that the initial discharge contains sand. However, after a few minutes of pumping, the sand content becomes less and less until the discharge is apparently sand-free and clear. So, what's the message being sent by the well? Simply, “I'm OK.....you're OK”.

It is common for a well to pump a minor amount of sand on startup. When a well is started, there is an initial surge that often carries with it some quantity of sand. This is actually a very desirable effect because it provides a way for the well to rid itself of sand and sediment that have accumulated within the production zone(s). Many water utilities anticipate some sand production on start up by pumping to waste for several minutes before pumping directly into the water system.

Experience shows that wells pumped continuously for long periods of time do not benefit by a surge on start up. They do not have the means to momentarily agitate themselves so as to discharge sand that has built up within the filter pack and around the well screen over time. By turning off a pump periodically, a well will be able to purge some of that sediment on start up.

Keep in mind that it is important to monitor sand content so that one can determine if a real problem exists. Monitoring well discharge will be discussed further on in this memorandum.

Corrosion Effects

Let's examine an all-too-common scenario. During a pre-proposal meeting the prospective well owner states that he wants to minimize the cost of the well. The message to the designer (i.e., consultant and/or contractor) is that the least expensive materials should be used. In well design, this normally means the selection of mild steel blank casing and well screen. Thus, the scenario of well corrosion is set in motion. Perhaps unbeknownst to the well owner, he has pre-selected a type of steel that offers the least resistance to corrosion. In time, sometimes within the span of less than 3 to 5 years, his mild steel well screen may corrode sufficiently to permit the passage of unacceptable quantities of sand during pumping.

As corrosion continues, the well's perforations will widen thereby promoting sand production and excessive wear to the pump's impellers and internal parts.

The message from the well is that had more corrosion resistant steel been installed, sand production due to corrosion effects could have been avoided.

Filter Pack Problems

The recommended three-step process to properly select a filter pack is: (1) collect representative samples of the aquifer(s), (2) conduct sieve analyses to determine the size distribution of those sediments, and (3) use the sieve results to select a graded filter pack that is appropriately sized to the gradation of the aquifer(s). (See the reference list for more information on filter pack design.) When a filter pack is not properly selected, fine sediments or larger material may migrate from the aquifer(s), pass through the filter pack in unacceptable quantities, and become a major nuisance and maintenance issue.

When the filter pack is placed in the annular space between the borehole wall and well screen, it is important to have no gaps within this envelope. Intervals of unsupported borehole may slump against the well screen where they may easily pass through the perforations.

When a filter packed well produces sand, the messages from the well are: 1) the filter pack was not appropriately selected, 2) the filter pack was not properly installed, or 3) corrosion problems exist.

Well Development Issues

When a well is developed, one objective of the process is to draw out fine sediments from the aquifer zone(s) so that they can be pumped out. The desired effect is to widen the zone of graded material several inches beyond the filter envelope. Well development takes time and requires patience for it to achieve its best results. If development is discontinued prematurely, some fine sediment that could have been drawn out of the aquifer will remain in place. Later, when production pumping begins those sediments will likely migrate from the production zone to the well.

The message from a newly completed well that produces sand may be that it was not fully developed.

Monitoring

Regular monitoring of sand is a useful approach that many water utilities incorporate into maintenance programs. A simple test using the Rossum Sand Tester will quickly and accurately determine the quantity of sand that is being produced by the well. These data can be used to identify the telltale signs of sanding at its onset. The use of the Rossum Sand Tester is described in Technical Memorandum 005-7.

SUMMARY

Sand production is an undesirable condition that can be avoided through proper well design, construction and development. Once sanding begins water wells are likely destined to

continue pumping sand for much, if not all, of their useful lives. The effects are many and may include frequent pump replacements, consumer complaints, and increased maintenance to reservoirs, pipelines, valves, and meters.

References

Roscoe Moss Company, 1990, *Handbook of Ground Water Development*, John Wiley and Sons, New York, NY.

Roscoe Moss Company, 2005, Technical Memorandum 005-7: "Monitoring Sand Content: The Rossum Tester".

Roscoe Moss Company, 2006, Technical Memorandum 006-2: "Gravel Pack Design: The Nexus of Theory, Experience and Personal Preference".

About the Author

Robert Turnbull is the Chief Hydrogeologist of Roscoe Moss Company. In this capacity he provides technical support, as needed, to consultants, municipalities, and water districts to plan and design water supply wells. He can be contacted for such information or to answer inquiries regarding this technical memorandum via email at rturnbull@roscoemoss.com. His website is www.blthydro.com. The corporate website for Roscoe Moss Company is www.roscoemoss.com.