

Case Study: Slotted Pipe Causes Dramatic Production Losses in a Major Well Field

Introduction

Slotted pipe (either plasma-cut or mill-slotted) is commonly used to construct wells in many parts of the world because it is all that is locally available. Manufactured from low carbon steel (i.e., mild steel), the slots are usually cut at the factory; however, some well contractors slot the blank (i.e., blind) pipe after they take delivery and before installation.

The investments made to construct a new well or to develop a well field are great. Those investments, which are made in good faith, are based on the assumption that the wells will be functional and productive for many years. However, the reality is that wells constructed with slotted pipe all-too-often experience rapid decline in capacity. Slotted pipe typically clogs soon after construction, which leads to deeper pumping levels and higher operational costs due to the head loss through the slots as they fill with sediment and/or biofilm.

This memorandum describes the experience of a major well field in Ethiopia where slotted pipe was installed.

Scenario

Forty (40) wells were constructed about 10 years ago (i.e., 2000) in Akaki, which is within the Addis Ababa Region of Ethiopia. Specifications for the wells stipulated the use of slotted pipe, the most commonly used type of steel, perforated pipe in the country. The wells were developed, but information was unavailable as to the method and the time expended. (It is speculated by the author that development was most likely conducted for only a few hours by airlift pumping followed by pumping with submersible unit.)

The wells reportedly performed admirably at first. Production of each well was about 90 l/s (1427 gpm). The cumulative production of the 40 wells was 140,000 m³/day. Naturally, the water purveyor was pleased with those results and expected that the production would be consistently high throughout the well's lifetime.

Unfortunately, the typical scenario of slotted pipe was set in motion soon after construction; the production capacity of the wells declined markedly. Within but a few years, the cumulative production of the well field had dropped to less than 40,000 m³/day. The loss of 100,000 m³/day had a major impact to the water utility.

The dramatic loss of production caused by the clogging of the slotted pipe turned the once productive well field into a highly inefficient and ineffective water source. In the last few years, the wells have continued to lose production capacity and are no longer reliable. New replacement wells are being considered.

Lessons Learned

If the scenario described above was one-time occurrence, it would be a different matter. However, slotted pipe is widely recognized for its poor performance, which is well documented. The collective experiences of water utilities around the world attest to fact that

wells with slotted pipe quickly lose production capacity and cost more to operate because of the head loss through the screen caused by clogging.

This unfortunate Ethiopian scenario should be taken to heart by all well designers, well owners and well contractors. Several lessons can be learned:

1. Do not repeat the mistakes of the past when designing water wells.
2. When possible, discontinue the use of poor quality, inefficient, clogging-prone, slotted pipe in favor of efficient and reliable louvered or wire-wrapped well screen.
3. Consider that each new well is an investment which should be functional, productive, and efficient for many years. Settle for nothing less.
4. Take the initiative and develop well specifications that stipulate the use of highly efficient well screens such as louvered screen and continuous wire-wrapped screen.
5. Eliminate the use of slotted pipe whenever possible.

At this time when many water providers are working to improve the availability of potable water, well designers should understand that their decisions have consequences. In Ethiopia, decision-makers are determined to construct wells that will operate efficiently for many years. The designers of the Akaki well field learned their lesson the painful way. They are resolved not to “repeat their mistakes of the past”.

About the Author

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