

# **Injection Well Hydraulic Performance and Clogging Detection**

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## **ABSTRACT**

**INJECTION WELL ISSUE:** It has been recognized that the operation of injection wells is very different than conventional production wells. Injection wells are far more sensitive and unforgiving with hydraulic operation data being difficult to interpret. A clear understanding of the injection hydraulic forces must be gained and used as guidance in developing, equipping and operating injection wells in order to achieve an optimal and sustainable program.

**WELL DEVELOPMENT:** Injection wells should be developed using injection forces. For this task, large volume, low velocity back-flush events are used to simulate injection and well clogging. Conventional surge and pump practices are used to clear the dislodged material. Injection development achieves that "seasoned" operation upfront, resulting in very little clogging from mechanical grain redistribution when switching between production and injection.

**WELL EQUIPMENT:** Well bore injection equipment and the system piping configuration play a monumental role in injection hydraulics and well bore clogging. Minor flaws in design could cause cascading water, air entrainment, pipeline draining, formation jetting, silt and algae mobilization, promote bacterial development, or induce the precipitation or flocculation of minerals. Following key hydraulic rules, like maintaining back-pressure and avoiding air entrainment, lend to a more successful operation.

**INJECTION OPERATIONS:** Establishing injection design rates and maintaining operation has been simplified through the use of the "Effective Hydraulic Area" calculations. These formulas determine the effective area connecting the well bore to the aquifer and then determines the hydraulic behavior of flow through this area for almost any selected operation rate. The tool has allowed us to set design rates and make accurate rate reductions and increases, netting predictable performance from the wells. The analytical method also allows clogging to be determined on a daily basis, enabling causes to be pinpointed and optimum back-flush frequencies to be determined.