Experimental study on sanding and fine migration during gas production from gas hydrate deposits

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Introduction

The controlling sanding and fine migration is one of the major issues for managing safe and efficient gas production from natural gas hydrate deposits. Produced sands toward the down-hole causes down-hole cavities and malfunction of down-hole equipment, and the migration of particles alter the properties of deposits near well-bore. Sanding and fine migration are often very severe when compared to the cases in conventional gas productions, since gas hydrate deposits are mostly unconsolidated. Most of field test production from gas hydrate deposits experienced severe or moderate sand production during the operations.

Experimental setups

An experimental system was designed to study sanding and fine migration during gas production from gas hydrate deposits. The system can maintain high pressure and low temperature to form hydrate in sediments and can house various types of screens and gravel packs for simulating in-situ well completion conditions. The screen used in this study is a commercially available wired wrap type screen with 100μm of nominal opening size. The gravel pack in this study is glass beads that mimic the grains size distribution of 40/60 gravel pack, which is one of the commercially available gravel packs and has a mean grain size value slightly higher than screen size.

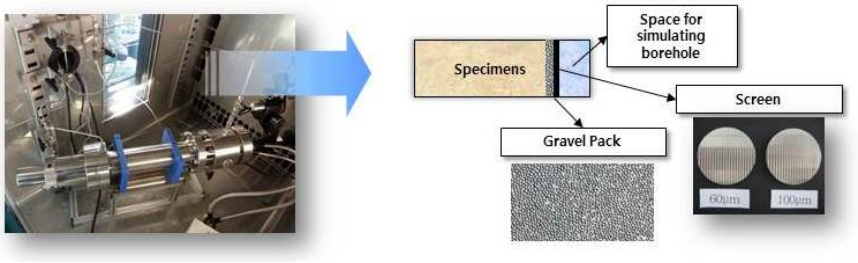

Fig. 1: The pictures of experimental setup (left) and the schematic diagram of the pressure cell (right)

Experimental results

The experimental results suggest that the commercially available screens and gravel packs can prevent sand production i.e. can stop sand from flowing into the well-bore. Wired wrap screen with 100μm of nominal opening size could prevent the production of sandy particles into a wellbore. However, the screen could not prevent production of silty particles. After installing gravel packs together with the screen, the production of silty sediments could be controlled. It is observed that the fine migration caused clogging near well-bore, severely deteriorating the near well bore permeability. Gas production rate decreased significantly because the fines migrated from deposits filled the pores of gravel pack, resulting in the reduction of permeability near the screen.

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