

Laboratory Evaluation of Solid Induced Formation Damage

Steve S. K. Sim*

Alberta Research Council, 3608 33 St. N.W. Calgary, AB T2L 2A6

Sim@arc.ab.ca

ABSTRACT

Reduction of flow capacity near injection and production wells due to solid plugging is a common occurrence during the operation of petroleum properties and can severely affect the economic viability of the project.

Common inorganic solids that induced formation damage are carbonate or sulphate of divalent cations due to mixing of incompatible injection and formation brines. Sulphide and hydroxide of iron may also be precipitated in reservoir rich in Siderite and Chlorite during acid treatment or acid gas disposal. Solids can also be deposited adjacent to the wellbore during production of reservoir fluids due to shifting of chemical equilibrium caused by changes in pressure, temperature or pH. These types of solids include calcium carbonate, asphaltene and paraffin. Solids which are natives to the formation can be problematic too. Kaolinite, pyrobitumen and coal fines are loosely attached to formation rocks and can be easily mobilized resulting in plugging of pore throats.

This paper will present several special core analysis techniques used to investigate the damage mechanism and quantify the extent of permeability reduction caused by solid plugging. Methodologies employed to evaluate the effectiveness of chemical agents used for prevention and mitigation of formation damage will also be discussed.