

like. The amount of activator, if used, is not critical and need only be sufficient to provide the desired rate of reaction. Generally, a metallic cation activator will be present in an amount from about 0.00025% to about 0.0025% by weight of the soak solution.

Other activators which are effective in the present invention have been discovered to be water soluble organic hydroxyl compounds having the empirical formula



where  $a$  is an integer from 1 to about 5, and  $Z$  is a radical selected from the group consisting of  $\text{H}$ ,  $\text{OH}$ , and  $(\text{OC}_b\text{H}_{2b})_n\text{OR}$  where  $b$  is 2, 3, or mixtures thereof,  $n$  is an integer from 0 to about 3, and  $\text{R}$  is a radical selected from the group consisting of  $\text{H}$ ,  $\text{C}_x\text{H}_{2x+1}$ , and  $\text{C}_y\text{H}_{2y+1}\text{CO}$ , where  $x$  is an integer from 1 to 5 and  $y$  is an integer from 1 to 3. Preferably  $a=2$  or 3, and  $Z=(\text{OC}_b\text{H}_{2b})_n\text{OR}$  provided that when  $n=0$ ,  $\text{R}=\text{C}_x\text{H}_{2x+1}$ . Thus it is preferred that the water soluble hydroxy-containing organic compound activator contain at least one ether group or radical within its molecular structure. Generally, a water soluble organic hydroxyl compound activator will be present in the soak solution in an amount from about 0.1% to about 2.5% by volume, preferably from about 0.2% to about 1.0% by volume.

If desired, the peroxide can be used in conjunction with known oxidizers for aqueous fluids containing polysaccharide polymers, such as persulfates, percarbonates, perborates, peroxydiphosphates, hypohalites, alkali metal and hydrogen peroxides, and the like.

The soak solution contacts the filter cake for a period of time which is at least sufficient to decompose the polysaccharide polymers in the filter cake to such an extent that the filter cake becomes a loosely adherent mass of bridging particles. The higher the formation temperature, and hence, the higher the temperature to which the soak solution is heated, the lower the time required to contact the filter cake with the soak solution. Generally, the soak solution will contact the filter cake from one to ten hours. Thereafter the filter cake is contacted with a wash solution to remove the remaining filter cake solids, principally the bridging particles and any remaining polymers and polymer degradation products.

The wash solution is one in which the bridging particles are at least partially soluble. Thus if the bridging solids are water soluble, the wash solution is undersaturated with respect to the bridging solids. If the bridging solids are acid soluble, a suitable acidic solution is used as the wash solution. If the bridging solids are oil or solvent soluble, a suitable oil or solvent is used as the wash solution.

It is preferred that the wash solution have no appreciable effect on the permeability of the hydrocarbon-containing formation. Thus aqueous solutions containing one or more salts which inhibit the swelling and/or dispersion of particles within the formation are preferred. Representative of such salts are potassium salts, such as potassium chloride and potassium acetate, ammonium chloride, quaternary ammonium salts of low molecular weight, such as tetramethyl ammonium chloride, tetraethylammonium chloride, and in general tetraalkylammonium salts in which the alkyl groups independently contain from 1 to about 4 carbon atoms, and other salts as is known in the art. Preferably the wash solution will contain from about 0.05% to about 10% by

weight of the salt, most preferably from about 0.1% to about 5%.

It is particularly preferred that the wash solution contain from about 2% to about 5% by weight potassium chloride or ammonium chloride.

The following is a typical embodiment of the process of this invention. The process is to be implemented after the borehole has been drilled and the completion fluid and all production tools are in place in the hydrocarbon-containing section of the open hole. The completion fluid is assumed to have contained one or more polysaccharide polymers therein such as xanthan gum and epichlorohydrin crosslinked hydroxypropyl starch, and sized sodium chloride bridging particles in a brine saturated with respect to sodium chloride. In the case illustrated hereinafter, it is assumed that a 1259 kg/m<sup>3</sup> fluid is required for well control.

1. Prepare the following fluids:

a. SPACER FLUID (Typically about 8 m<sup>3</sup>):

Prepare a polymer-viscosified spacer push pill by adding 8.57 kg/m<sup>3</sup> biopolymer, such as xanthan gum, to 1259 kg/m<sup>3</sup> calcium chloride solution, preferably saturated with respect to sodium chloride by the addition of 37 kg/m<sup>3</sup> of sodium chloride thereto.

b. DISPLACEMENT FLUID (Typically about 8 m<sup>3</sup>):

Calcium chloride solution having a density of 1259 kg/m<sup>3</sup>, preferably saturated with respect to sodium chloride by the addition of 37 kg/m<sup>3</sup> of sodium chloride thereto.

c. BREAKER FLUID (Typically about 6.35 m<sup>3</sup>):

Prepare sufficient volume of breaker solution to fill the open-hole section of the borehole as follows: Add 35.7 kg/m<sup>3</sup> sulfamic acid and 14.28 kg/m<sup>3</sup> alkaline earth peroxide breaker to a 1259 kg/m<sup>3</sup> calcium chloride solution, preferably saturated with respect to sodium chloride by the addition of 37 kg/m<sup>3</sup> of sodium chloride thereto, and preferably, adding about 0.6 volume % of ethyleneglycolmonobutylether as an activator for the peroxide.

d. WASH PILL (Typically about 28.6 m<sup>3</sup>):

Prepare a 1139 kg/m<sup>3</sup> calcium chloride solution.

e. WASH FLUID (Typically about 47.5 m<sup>3</sup>):

Prepare a 1259 kg/m<sup>3</sup> calcium chloride solution. It is preferred that all of the fluids be filtered, such as through diatomaceous earth, as is well known in the art of solids free completion fluids.

2. Displace the salt-polymer completion fluid from the hole with the viscosified spacer fluid (a) followed by the displacement fluid (b).

3. Spot the breaker fluid (c) in the open-hole section to cover the salt-polymer filter cake on the sides of the borehole. Follow the breaker fluid with the wash pill (d).

4. Soak the filter cake for one to six hours (the soak time decreases as the temperature increases).

5. Circulate out the breaker fluid and the wash pill with the wash fluid (e) keeping the formation pressure under control by circulating under choke.

6. Wash the open hole by circulating the wash fluid until the filter cake is removed from the formation.

Look for loss of fluid volume to indicate clean up of the filter cake.

The invention will be understood in light of the following specific examples, which are merely illustrative