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PROCESS FOR TREATING OIL WELLS

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This invention pertains to the art of treating oil wells to increase their production, and relates more specifically to the removal of clogging deposits of paraffinic, asphaltic, waxy and similar nature by means of an exothermic process involving the oxidation of organic reducing compounds.

Many processes have alreay been proposed to melt and remove obstructing paraffin wax deposits from oil wells by the heat-generating interaction of such agents as, for example, a strong acid and a caustic alkali, or a comminuted metal, an oxidizing compound and a caustic alkali.

These processes, however, often fail to generate an amount of heat sufficient to clean the well, and also often have the disadvantage of causing formation of insoluble precipitates by the interaction of the reagents used with the calcium and magnesium ions generally present in well brines, whereby the formation is further clogged, and the production of the well reduced.

It is, therefore, an object of this invention to provide a method for treating clogged oil wells by means of agents capable of developing a large amount of heat which is sufficient for complete removal of the obstructing deposits of the paraffinous, waxy, or asphaltic nature.

It is another object of this invention to provide for said treatment a heat generating process carried out in the presence of, or immediately followed by the application of a solvent capable of readily dissolving the paraffin wax at temperatures near its melting point, whereby said wax as well as the products of the heat-generating reaction, are removed from the well and are prevented from clogging the formation by solidifying on cooling. Other objects will be apparent as the invention is hereinafter more fully described.

The process of the present invention consists broadly in generating heat within the well by means of an exothermic reaction involving the oxidation of organic reducing compounds by inorganic oxidizing compounds. This may be effected by oxidizing organic reducing compounds by the nascent oxygen evolved by the decomposition of inorganic peroxides in aqueous solution according, for example, to the following equation:

$$Na_2O_2+2H_2O\rightarrow 2NaOH+H_2O_2+\text{heat}$$
$$2H_2O_2\rightarrow 2H_2O+O_2(\text{nascent})+\text{heat}$$
$$O_2(\text{nascent})+H_2CO\rightarrow H_2O+CO_2+\text{heat}$$

or by oxidizing organic reducing compounds by inorganic oxidizing compounds in an acid solution, according, for example, to the following equation:

$$Na_2Cr_2O_7+3HCOOH(\text{formic acid})+8HCl\rightarrow 2NaCl+2CrCl_3+3CO_2+7H_2O+\text{heat}$$

As organic reducing agents suitable for the present process, the following substances may be used: soluble carbohydrates such as monosaccharides, e. g., glucose, disaccharides, e. g., sucrose, polysaccharides, etc.; aldehydes such as formaldehyde, acetaldehyde, propionaldehyde, etc.; primary, secondary, mono, or polyhydric alcohols of relatively low molecular weight such as propyl alcohol, secondary butyl alcohol, glycerin, etc.; saturated monobasic or polybasic carboxylic acids of relatively low molecular weight such as formic acid, oxalic acid, lactic acid, tartaric acid, citric acid, etc., or their derivatives such as bromoacetic, trichloroacetic, aminoacetic acids, etc. However, the oxygen-containing organic reducing agents are preferred as these yield a greater amount of heat upon oxidation.

As inorganic oxidizing agents suitable for the present process, the following substances may be used: peroxides such as metal peroxides, hydrogen peroxide, etc., and water soluble metal nitrates, chlorates, perchlorates, chromates, dichromates, permanganates, and persulfates.

As solvents suitable for use in conjunction with the present process, the following solvents may be used: Carbon tetrachloride, benzene, gasoline, kerosene, kerosene extract, tetralin, ketones, such as acetone, methyl ethyl ketone, etc.

In treating a well by the process of the present invention, the following procedure may be followed:

A sample of the paraffin wax deposits is obtained from the well and subjected to tests to determine its melting point and the type of solvent especially effective in dissolving it at temperatures near its melting point. The melting points of paraffin waxes from oil wells usually fall within a temperature range of from 50° C. to 95° C.

The well is then bailed or pumped until free of liquid, and a suitable amount of the desired solvent is placed in the well, the quantity of said solvent being preferably in excess of that antici-