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## Possible Methods of Oil Well Brine Disposal in McPherson County

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This report has been prepared at the request of the Kansas State Board of Health. It is in answer to the question: Is the pollution of the ground waters which is now taking place in McPherson County through contamination by oil well brines abatable? The writer believes that it is. Three possible methods are outlined below.

(1) The return of the brine to the producing horizons by means of off-structure wells. This is a method which has been successfully followed in several fields. Return wells are drilled beyond the limits of the oil pool where the elevation of the reservoir rock is lower than the lowest elevation where the reservoir rock carries oil. Such wells should be satisfactorily cased from the surface down to the reservoir rock. The waste brine is pumped down these wells into the reservoir rock, adding in actual volume less liquid than the producing wells are removing from the same formation. Needless to say, there are several dangers in this method, which, however, can be minimized by taking proper precautions. Too high pressures and improper casing may result in the brine breaking through into higher formations. Furthermore, corrosion of the casing by the brine may allow its escape. Too few return wells may cause the brine to move up the dip of the reservoir rock with a very uneven front by-passing some of the oil and preventing its eventual removal. Through misinterpretation of the subsurface structure it is conceivable that the return wells might be placed up-dip above some of the oil. Both the subsurface structure and the position of the oil-water contact in the reservoir rock should be known before this method can be safely undertaken.

(2) Brine disposal by means of solar evaporation, utilizing one or more of the shallow depressions lying southwest of McPherson. Some of these depressions were formerly occupied by lakes which have been drained by means of canals.

A report on the feasibility of using these natural basins for brine disposal has been prepared by Mason and Teis. The depressions have been formed by slumping of the mantle rock into caverns originating through the dissolution of the relatively shallow Wellington salt beds. Surface drainage and rain wash has flooded the basins with several feet of fairly impervious clay or gumbo. Dr. R. G. Moss of the Kansas Geological Survey staff investigated the permeability of the soil covering the site of reservoir no. 1 of the Mason-Teis report by means of a number of auger holes, and found the floor to be sufficiently impervious. Lake Inman, a near-by natural lake, is located in a similar depression. On October 26, 1933, the water level of Lake Inman was 16 feet above the ground water table in a near-by well. This is further evidence of the impermeability of the lake beds. The small amount of surface drainage which enters the reservoirs could be easily diverted.

Although the storage and evaporative capacity of the four reservoirs described by Mason and Teis is sufficient to handle present brine production in the McPherson County fields, it would be inadequate if the amount of brine produced were to increase greatly in the future. A 60,000 barrel daily production of Mississippi lime brine (100,000 parts per million of dissolved solids) would fill all four reservoirs with brine and precipitated solids in  $6\frac{1}{4}$  years. Either some method of removal of the precipitated solids would have to be found or else other similar depressions in the vicinity would have to be added to the reservoir system.

(3) Brine disposal by artificial evaporation. There are several processes by means of which brines can be evaporated through the application of heat. Ample quantities of natural gas are available in McPherson County. The present potential brine production of the oil fields of McPherson County is about double the amount of saturated brine which is evaporated daily in the six salt company plants now operating in Kansas. This method of brine disposal is worthy of further study. It might be possible to concentrate the brine first by solar evaporation and then produce salt by the application of heat.