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Underground Water Contamination by Drilling Mud

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Abstract: Water is considered to be a basic nutrient of living creatures. Without it no one can live. It is not only important for humans but also important for animals and plants. It is used in a number of forms. There are no second words for its importance. It's a great blessing of God that we are getting water naturally from underground sources. It is also manufactured in industries but in very limited quantity. So water preservation and less contamination is our prime responsibility. But water contamination occurs while drilling a well because of the use of drilling mud. In this paper, some ways of groundwater contamination by drilling mud has been highlighted. The drilling mud is a principle component of oil well drilling and its composition is quite complex as it contains different additives for specific purposes. Entry of mud in the water aquifers is mainly due to the invasion and seepage from the surface storage facilities. So there is need to develop such a mud which will be non reactive with water and also the drilling waste must be disposed in such a way that it will be harmless to the environment and seepage could not occur.

Key words: Drilling mud, kick, contamination, underground water

INTRODUCTION

Drilling mud/fluid is one of the prime components of petroleum industry and is used during drilling a well. A variety of drilling muds are used now a days depending upon the lithological sequences of the drilling site. Main types are Water Base Muds (WBM) and Oil Base Muds (OBM) having additives and chemicals. As the main purpose of drilling a well is to reach the zone of interest in the safer way, more importance is given to drilling mud. All the troublesome formation such as heaving shales, loss circulation zones etc are generally tackled with this mud. Major functions of mud include the lubrication of bit, cooling the bit, cutting transportation and cutting suspension etc. Also during drilling process, kick is controlled primarily by the drilling mud. So for these reasons certain additives are added to control the mud properties.

Causes of contamination: During drilling there are much chances of contamination of underground water due to contact of drilling mud with it because of mud invasion. Invasion is a process in which drilling fluid enter into surrounding formations. The entered fluid is also known as mud filtrate. This entry is sometimes unavoidable for us due to a number of causes. Generally during drilling, borehole pressure is kept greater than the formation pressure to avoid any sort of entry of formation fluid into the well. So this pressure differential provides a push to mud to enter in porous and permeable formations (Gatlin, 1960; Adam *et al*., 1991). Mud seepage from the pits could also be problematic. At the surface drilling mud is kept in the mud pit which is open to the environment. If seepage occurs, it can change the composition of underground water beneath that pit. Figure 1 shows the diagram of a drilling process in which drilling mud is kept in pit from where seepage has occurred and it has contaminated the underground water.

It is also possible that when the project at the rig site is completed, mud present in pit is not properly disposed of and become dry. If rainfall occurs, there are chances of the seepage of hazardous chemicals which can be absorbed by the trees or plants roots which can be harmful for trees (Fig. 2). Also if there are fruit trees, fruits will indirectly cause damage to animals and human. The reason is the unhealthy components which are present in the composition of drilling mud.

Sayle *et al*. (2002) investigated the disposal of different types of mud in the marine environment. They conducted the survey that which type of mud is more toxic to marine life and how longer mud can be disposed off. Several other authors had discussed in past the proper disposal of drilling fluid as disposal is a very important issue for better healthy atmosphere (Leuterman *et al*., 1988; Bakhshian *et al*., 2009; Razmgir *et al*., 2011). Improper waste disposal can harm the animals and plants at the

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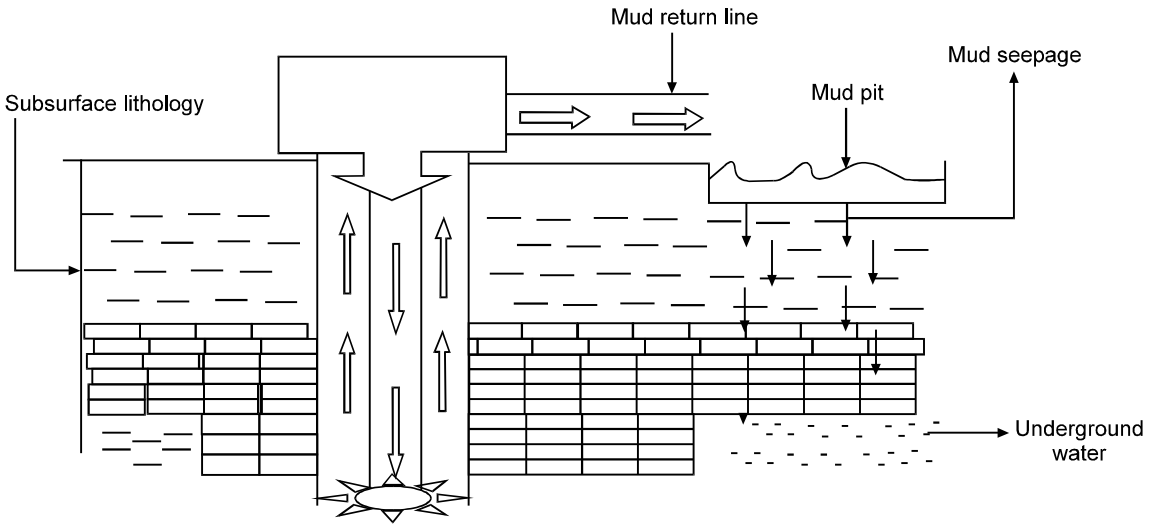

Fig. 1: Schematic of ground water contamination by drilling fluid seepage during drilling

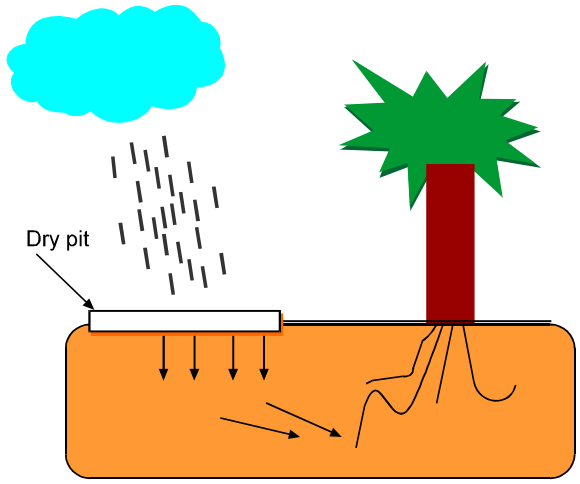

Fig. 2: Polluted water used as nutrient for tree

site area. If water at surface accumulates at these disposal sites, this water may not be appropriate for drinking of animals so it can be dangerous not only for their health but also for humans as humans use their meat.

Conclusion: In this paper various reasons of underground water sources contamination by drilling mud have been discussed. It is concluded that before starting drilling a well, proper drilling waste management plan must be formulated to avoid any sort of environmental and health damage to living beings. Also there is a need to use alternate way of drilling in which chances of mud invasion or the amount of mud/ mud filtrate invasion can be reduced. Further, the additives which are used in drilling mud should be non reactive with water. This will help in reduction of water contamination and hence availability of water in its purest form; hence confirming its availability as the healthier nutrient source.

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