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Research on Processing of Drilling Fluid

Xiaowei Gong, Yi Pan, Shuangchun Yang
(Liaoning Shihua University, Fushun, Liaoning, China 113001)

Abstract:- Currently, the drilling fluid processing and recycling has gained more attention from various oilfields. Whether the waste drilling fluid's processing and recycling is good or not will directly affect the development of oil industry. Therefore, the urgent affair is to develop and research the processing method of waste drilling fluid.This article describes various processing methods of waste drilling fluid which are being adopted by oilfields, such as Microbial Treatment, Curing Agent and Curing Technology, Decentralized Processing Method, Mechanical Dehydration Method, Demulsification Method, Salt Cave Method, Reinjection Method, Waste Drilling Fluid Treatment at Sea, Backfill Method.This article has also compared the advantages and disadvantages of these methods, summed up the trend of the development of drilling fluid processing method.

Keywords:- waste drilling fluid; recycle; processing method.

I. INTRODUCTION

Drilling fluid is the blood of well drilling , and it plays a very important role in drilling operation.But its waste residues can cause the certain harm on the environment and ecology , and a certain degree of resources waste;So it is extremely urgent to recycle and process waste drilling fluid ;If the waste drilling fluid is handled properly, it will brings inestimable benefits instead of serious consequences for the environment, the entire oil industry, and ecological. In recent years, scientists have studied at home and abroad a variety of ways to deal with drilling fluid, and they have received the good effect. These methods include Microbial Treatment, Curing Agent and Curing Technology, Decentralized Processing Method, Mechanical Dehydration Method, Demulsification Method, Salt Cave Method, Reinjection Method, Waste Drilling Fluid Treatment at Sea, Backfill Method.Of course no matter which method owns deficiency, and the processing technology is not perfect enough, so there are obvious flaws and limitations; this article will analysis each method detailedly, put forward the deficiencies, and attach the author's opinions.

II. METHODS FOR PROCESSING WASTE DRILLING FLUID

A. Microbiological method

Microbiological method can make noxious substance low toxic and harmless, and it has become the preferred way for modern environment treatment.Microbes have the function of degrading organic matter into inorganic matter, so, using microbial treatment technology for the processing of waste drilling fluid owns practical significance.Its advantages are less investment, low energy consumption, less secondary pollution, simple operation under normal temperature, good water quality, strong adaptability, high oil removal efficiency, bacteria is easy to get, etc[1] .But the efficiency of microbial degradation of waste liquid is influenced by the temperature of the liquid , composition, surface active agent, biodegradable, acid alkali, oxygen and the availability of N and P sources, such factors result in the fact that it cannot degrading all the waste in waste liquid. What's more, a specific microbe can only degrade specific organic compounds[2] .So I think the microbiological method and future research should be along the direction of one-to-many.

B. Curing Agent and Curing Technology

Curing method[3] is a process that adding curing agent(curing materials) in the hazardous waste , transforming it from the non solid form into non-liquid or tightly solid which can meet certain requirements , this method can make waste maintain the appearance after treatment and does not need the container anymore.It mainly solidify various hydrocarbons, salts, all kinds of polymer, pollution factor and other toxic substances by curing agent ,so it can solve the harm of the waste liquid fundamentally.What's more,the advantage is construction convenient, economy applicable, small secondary pollution , and the solidified products can be used as building materials.Of course because the harmful composition for the environment is different in drilling fluid , and environmental management indicators are different in different areas , we also need to develop the specific curing agent.I think that, it is necessary to develop a kind of curing agent with high performance, high solidification speed, harmless, stable physical and chemical properties after curing, which can handle drilling fluid in most regions.

C. Decentralized Processing Method

Waste liquid distributed processing model can process sewage to random strain. Distributed processing method has the advantages of sustainable and low cost, so it is quite significant to do some research for it. For avoiding corrosion of drilling tool, and dissolution of calcium, magnesium salt, preventing hydrogen to exist in solid, and preventing solid crispy, we have to control PH value of drilling fluid between 8 to 11. So if the waste drilling fluid was centralized piled up, will inevitably cause soil in the region acid and alkali[4] .Of course if under the premise conditions and scatter alkaline waste drilling fluid reasonably to acid soil, we can both neutralize [5]and improve acidic soil, and save some abandoned drilling fluid processing costs. The downside is, of course, it needs certain freight, as well as suitable acid soil. I believe that, we can develop different acid and alkaline drilling fluid to neutralize different acid and alkaline waste liquid.

D. Mechanical Dehydration Method

Mechanical Dehydration Method is a way to make solid-liquid separation of drilling fluid, dry drilling fluid material or recycle it, which uses reinforcement measures such as chemical flocculant settlement[5] and mechanical separation , to separate the solid and liquid.Its disadvantage is that for different waste drilling fluid needs to use different flocculants, and flocculant is high costly. What's more, the flocculant is not easy to be microbesafter been used, so it always brings difficult for sludge processing[6] .I believe that the future research should be focus on improving the study of natural polymer flocculant, we can also process waste liquid before mechanical dehydration by physical method, chemical method and biological method ,to make the mechanical processing method more efficient, and to get the expected results.

E. Demulsification method

Demulsification method [7] is mainly used to separate oil and water,which consists of chemical demulsification method, physical demulsification method and biological demulsification method, combined demulsification method and membrane demulsification method.It is widely used in the current deal with the waste drilling fluid, The widely used is chemical demulsification method, which is to apply demulsifying agent to emulsified oil drilling wastewater; and through a chemical action, complementary with other separation methods, to achieve the purpose of emulsion stability, demulsification, and oil-water separation.However,the shortcoming of this method is that it has no specificity—for different emulsifying crude oil needs different types of demulsifier, and the chemical additives is costly.I believe that future research direction of demulsification method will shift to physical demulsification method, because it can achieve the goal of one-to-many processing waste drilling fluid in the emulsified oil.

F. Salt cave method

Currently at home and abroad, using salt cave method[8] to bury industrial waste underground has been very good applications.For large harmful , difficultly handled and high treatment costed waste drilling fluid, the most effective treatment way is to bury it deeply. And alt cavity method is considered as a relatively safe method.But salt cave method need to choose good geological conditions, and need the salt layer of good sealing ability. It makes hole mainly by water soluble salt leaching underground to form water-eroded cave, and its advantage is good sealing ability, good security, low cost, large capacity, and less land occupation, etc.

G. Reinjection method

For some unwieldy, big toxicity and high treatment cost waste drilling fluid we can handle it by the reinjection method[9] . The method includes injecting impermeable strata processing method [10] and injecting into layers or borehole annulus processing method[11] .Injecting impermeable strata processing method mainly use waste drilling fluid in fracturing fluid, drilling in impermeable strata, fracturing fluid into formation fracture by mercury.When mercury is not around the formation of cracks , the cracks will be closed on its own to prevent fluid migration.This method is suitable for toxic and difficult in processing waste drilling fluid,and its advantage is that the harmful substance can be isolated permanently without migration, but the disadvantage is the high processing costs;The injecting formation or borehole annulus processing method, is to inject waste drilling fluid through the hole to the oil and gas produced layers or safety ground, sometimes the waste drilling fluid can also be injected into the annular space.But this method's practical condition is harsh, and the depth of the strata must meet certain requirements.

H. Waste drilling fluid treatment at sea

Abandoned drilling fluid at sea[12-13] was divided into water-based and oil-based.We usually process water-based waste drilling fluid by taken to shore method, injection of underwater security underlying processing method and in-place emission method. Among these ways, to shore centralized processing method is mainly for processing waste drilling fluid which is difficult for handling at sea and with bigger toxicity; injection of underwater security formation is mainly suitable for waste drilling fluid that is unfavorable in direct emissions, and far off shore ;and in-place emission method is mainly for processing the non-toxic or low toxic waste drilling fluid. For processing oil-based abandoned drilling fluid we usually adopt mechanical separation,

thermal recovery method. After degreasing the oil and organic matter by solvent ,we always discharge the waste drilling fluid into the sea and transport it to the shore to process intensively, But the former three methods are not able to thoroughly remove oil in the oil base. According to the characteristics of the marine waste drilling fluid, I think we should put the method of dealing with waste drilling fluid on land comprehensively, and developed a kind of special method for processing waste drilling fluid at sea.

I. Backfill method

Currently at home and abroad backfilling method is adopted to process the non-toxic or low toxicity waste drilling fluid. The backfill method is divided into simple backfill method and seal backfill method. The simple backfill method aims at ordinary water base drilling fluid, the custom way is completing the original excavation hole with soil. According to the need we can air the scrapped well before filling holes for a period of time, but no more than a year[14] For sealing backfill method, this method is mainly used for salt water and oil-based drilling fluid. It usually put a layer of organic soil around and at the bottom of the pit, again in organic soil covered with a layer of polyethylene plastic as a cushion, and then cover a layer of organic soil. Of course, we can also add reinforcement layer or impervious membraneat and around the bottom of the pit .I think that for simple backfill method, the best way is to landfill the excavating soil in the original order.

III. CONCLUSIONS AND RECOMMENDATIONS

There are various methods for dealing with waste drilling fluid, but these methods have certain practical limits. Therefore, when using these methods, we should be thoughtful, adjust measures to local conditions, and endeavor to get twice the result with half the effort.Of course if we want to manage the waste drilling fluid pollution problems more effectively ,I believe that we should grab from the source, carry out cleaner production, develop the non-toxic, environment friendly, lower toxicity, lower costly drilling fluid.What's more ,we should use environment friendly chemical treating agent for drilling, to solve the problem of waste drilling fluid pollution to the environment essentially.In addition, we can also take some measures to control emissions of waste drilling fluid, such as developing new kind of drilling fluids, controlling the hole size.The most important thing should be strengthen management control and strengthen well site waste management.Well management will bring good returns.For improving the work efficiency, and achieving maximum economic benefits, well site should set rules, such as different types of waste material shall be stacked separately.

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