Minimisasi limbah lumpur pada pengeboran minyak lepas pantai (studi kasus anjungan pengeboran minyak lepas pantai lapangan maxus di laut jawa)

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Abstrak

Salah satu sektor industri yang memberikan kontribusi adalah industri perminyakan. Industri ini selain memberi dampak positif, juga menimbulkan dampak negatif berupa limbah diantaranya lumpur dari pengeboran.

Ada dua jenis Lumpur yang dipakai yaitu oil base mud dan water base mud. Berat jenis lumpur merupakan fungsi utama untuk menahan tekanan dari bawah tanah supaya tidak terjadi semburan liar. Untuk mendapatkan berat jenis tersebut harus digunakan bahan kimia yang mempunyai kandungan logom berat.

Rumusan permasalahan yang dapat disusun adalah sebagai berikut:
1. Apakah dengan mengubah penerapan konsep teknologi water base mud menjadi oil base mud dalam kegiatan pengeboran minyak lepas pantai, beban limbah berupa air lumpur buangan dapat dikurangi karena lumpur masih tetap dapat dipakai untuk pengeboran berikutnya?
2. Apakah penerapan konsep pengurangan komponen aditif dari sumber dalam kegiatan pengeboran minyak bumi di lepas pantai dapat menimbulkan dampak kemungkinan terjadinya semburan liar dan memberikan dampak manfaat bagi industri perminyakan tersebut yaitu berkurangnya beban limbah yang dihasilkan?
3. Apakah penerapan konsep minimisasi limbah dalam kegiatan pengeboran minyak bumi di lepas pantai tersebut di atas dapat meningkatkan efisiensi biaya produksi bagi industri perminyakan?
4. Apakah kegiatan pengeboran minyak lepas pantai di daerah operasi minyak lapangan Maxus mempunyai pengaruh dampak negatif terhadap kualitas air laut dan dampak positif langsung terhadap persepsi masyarakat sekitarnya?

Tujuan penelitian ini adalah:
1. Untuk mengetahui pengaruh pengurangan penggunaan bahan kimia (aditif) pada lumpur pengeboran terhadap kualitas limbah yang dihasilkan dan kemungkinan terjadinya semburan liar.
2. Untuk mengetahui pengaruh penerapan perubahan media air menjadi media minyak dalam pembuatan lumpur terhadap beban limbah yang dihasilkan setelah operasi Pengeboran.
3. Untuk mengetahui pengaruh penerapan konsep minimisasi limbah dalam kegiatan pengeboran minyak bumi di lepas pantai terhadap tingkat efisiensi biaya produksi pada industri perminyakan.
4. Untuk mengetahui pengaruh kegiatan operasi pengeboran minyak lepas pantai di daerah operasi minyak lapangan Maxus terhadap kualitas air laut dan terhadap persepsi masyarakat sekitarnya.

Hipotesis dalam penelitian ini adalah:
1. Pengurangan penggunaan bahan kimia (aditif) pada lumpur Pengeboran akan mengurangi bahaya limbah yang dihasilkan serta mengurangi resiko terjadinya semburan liar.

2. Penerapan perubahan media air menjadi media minyak dalam pembuatan lumpur akan menurunkan beban limbah yang dihasilkan setelah operasi Pengeboran.
3. Penerapan konsep minimisasi limbah dalam kegiatan pengeboran minyak bumi di lepas pantai akan meningkatkan efisiensi biaya produksi pada industri perminyakan.
4. Kegiatan operasi pengeboran minyak lepas pantai di daerah operasi minyak lapangan Maxus menimbulkan dampak menurunnya kualitas air laut dan persepsi negatif masyarakat sekitarnya.

Jenis penelitian ini merupakan penelitian kuantitatif dengan metode survei dan ekspos fakto. Penelition ini dilakukan di daerah operasi wilayah Maxus di Laut Jawa dan berlangsung selama kurang lebih 6 bulan, yaitu sejak Desember 2001 - Juni 2002.

Tahapan penelitian meliputi penentuan jenis penelitian yaitu penelitian kuantitatif dengan metode survei dan ekspos fakto, penentuan lokasi penelitian yaitu di daerah operasi Maxus, penentuan rancangan penelitian yang meliputi variabel penelitian. tahapan penelitian, pengumpulan data, dan analisis data serta, perencanaan upaya minimisasi limbah lumpur dari sumbernya.

Secara umum parameter kualitas badan air masih berada pada kisaran di bawah baku mutu dengan dijumpai beberapa unsur logam berat Ni, Cd dan Pb yang masih di atas ambang baku mutu. Keberadaan ketiga unsur logam berat tersebut meskipun masih di atas baku mutu tetapi belum terlihat pengaruhnya terhadap kehidupan biota laut.

Dari survey tentang pengaruh kegiatan operasi Pengeboran terhadap persepsi masyarakat, ternyata disimpulkan bahwa persepsi masyarakat terhadap kegiatan tersebut positif. Dengan kondisi tekanan awal dan akhir yang berbeda, secara prinsip bila penggunaan berat jenis lumpur pada operasi Pengeboran terlalu besar kemungkinan terjadi hilang lumpur sangat besar. Bila terjadi kehilangan lumpur maka kemungkinan terjadinya semburan liar sangat besar.

Secara prinsip, volume limbah yang dibuang di lingkungan pada media water base mud lebih besar bila dibandingkan dengan memakai media oil base mud.

Kesimpulan peneliiian ini adalah:
1. Pemakaian oil base mud dapat mengurangi jumlah volume pembuangan limbah lumpur, karena lumpur bekas oil base mud masih dapat digunakan kembali.
2. Penurunan berat jenis sesuai dengan penurunan tekanan formasi akan .mengurangi jumlah pemakaian bahan kimia, terutama yang mengandung logam berat. sehingga dampak yang ditimbulkan juga makin berkurang. Penurunan jumlah bahan kimia akan menurunkan biaya operasi dan pengelolaan lingkungan.
3. Secara umum semua parameter kualitas badan air masih berada dalam batas baku mutu yang ditetapkan sehingga daerah wilayah operasi masih cukup baik. Tetapi beberapa komponen logam berat seperti Ni, Pb, dan Cd masih berada di atas baku mutu, namun secara berangsur ketiga unsur tersebut cenderung mengalami penurunan.
4. Penilaian masyarakat tentang kegiatan operasi minyak dan gas Maxus terhadap kehidupan kegiatan sosial ekonomi mereka ternyata positif baik.

5. Meskipun kualitas air dan persepsi masyarakat baik, tetapi perubahan parameter bawah tanah menghendaki penurunan berat jenis yang dipakai, karena pemakaian berat jenis yang tinggi memungkinkan terjadinya kehilangan lumpur. Bila hal tersebut terjadi, penahan tekanan formasi tidak ada sehingga akibatnya semburan liar dapat terjadi.
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Minimizing Mud Waste in Offshore Oil Drilling (A case study at the Maxus Offshore Oil Drilling Platform in the Java Sea)One of the industrial sectors that provide considerable contribution has been petroleum industry. This industry brings out positive effect, and it also causes negative effect in the form of various sorts of waste including mud and sludge produced by the drilling activity.

There are two types of mud in use, oil base mud and water base mud. The specific gravity of the mud constitutes the prime function that is to restrain the underground pressure from surging up, and thus no wild spouts would occur. In order to obtain such specific gravity we must employ certain chemicals that have heavy metal content.

The formulation of the problematic questions can be practically arranged as follows:
1. Can the alteration made in the application of water base mud concept into that of oil base mud in the offshore oil drilling activity reduce the waste load that comprises muddy waste water, considering the fact that the application of oil base mud technology makes the mud remain potentially usable in the next drilling?
2. Can the application of concept on additive component reduction from the source in the offshore petroleum drilling activity raise possible effect that causes wild spouts, and will such application give beneficial effect to the oil industry, that is the decrease in the waste load produced?
3. Can the application of waste minimization concept in the offshore petroleum drilling activity as mentioned above improve the efficiency of production cost in the oil industry?
4. Is offshore oil drilling in the Maxus operation area viewed positively by the existing community in the vicinity of the project?

The objectives of the research are:
1. To know and understand the extent of the effect resulting from reducing the (additive) chemicals applied in the drilling mud to the quality of the waste produced, and to the possible occurrence of wild spouts.
2. To see the effect of change from the application of the water media into oil media in mud production, especially towards the waste load associated with the drilling operation.
3. To see the effect of waste minimization concept in the offshore oil drilling activity towards the level of the efficiency in production cost.
4. To observe the effect of Maxus offshore oil drilling operation activities to the sea water quality and to the community existing in the neighborhood.

The hypothesis in the present research includes:
1. Reduction in the use of (additive) chemicals in the drilling mud will mitigate the hazards of the waste produced, and to lessen the risk of wild spouts occurrence.
2. The change from water media into oil media in mud production eation will decrease the waste load associated with drilling operation.

3. The application of waste minimization in offshore petroleum drilling will improve the efficiency of production costs in the oil industry.
4. The offshore oil drilling activities in the Maxus field is detrimental to the sea water quality, and creates negative perception to the community.

This is a quantitative research conducted through survey and fact exposing method. The present research was conducted at the Maxus operations in the Java Sea, and took approximately 6 months, starting from December 2001 to June 2002.

The phases in the research cover the designation of the research type, which is to be a quantitative research with survey and fact exposing method, and the designation of the research site, namely the Maxus operation zone. The designation of the research arrangement covers research variables, research phases, data collection, and data analysis as well as planning the efforts to minimize the mud waste from the source.

In general, the water body quality lies in the range of being under quality standard with a number of heavy metals elements (Ni, Cd, and Pb) above the threshold limit value. Although, three heavy metal elements are above the standard value, their effect to the sea aquatic life is yet to be seen.

From the survey conducted on the negative influence brought about by the drilling operation to the local society's perception, it turns out that such community's perception toward the activity is favorably positive.

With the beginning and end pressure being different, it can be principally postulated that when the use of the mud's specific gravity at the drilling operation is excessively high it is very likely that the loss of the mud is substantially high. When such high loss of mud occurs it is very likely that a wild spout will occur.

In principle, the volume of waste entering is greater for the water base mud media compared to the oil base mud.

The conclusions of the present research are:
1. The application of oil base mud reduces the volume of the disposed mud waste, because the oil base mud media can be reused.
2. The decrease in the specific gravity will, in accordance with the decrease in the formation pressure, reduce the number of the chemicals in use, particularly of those that contain heavy metal. As a result, the environment impact will be less. Subsequently, the reduction of chemicals wed reduces the operating and environmental management costs.
3. For the most part, all water quality parameters are within the acceptable limit. This means that the environmental quality of the operation area is reasonably good. However, there are several heavy metal components such as Ni, Cd, and Pb that are above the threshold limit value. However, the quantity of these three elements tends to gradually go down.
4. The opinion of the local community on the oil and gas operation activities proves to be positive.
5. In spite of the good water quality and the favorable perception from the local people. The change in underground parameter necessitates a decrease in the mud specific gravity mud will potentially result in

more mud loss. When this happens, wild spouts are bound to happen as there is not enough mud to counter the pressure.