ISSN 2518-170X (Online)
ISSN 2224-5278 (Print)

«ҚАЗАҚСТАН РЕСПУБЛИКАСЫ ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫ» РҚБ

ҚАЙЫРЫМДЫЛЫҚ ҚОРЫ HALYK CHARITY FOUNDATION

«ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫ» РҚБ
«ХАЛЫҚ» ЖҚ

ХАБАРЛАРЫ

ИЗВЕСТИЯ

РОО «НАЦИОНАЛЬНОЙ
АКАДЕМИИ НАУК РЕСПУБЛИКИ
КАЗАХСТАН»
ЧФ «Халық»

N E W S

OF THE ACADEMY OF SCIENCES
OF THE REPUBLIC OF
KAZAKHSTAN
«Halyk» Private Foundation

SERIES

OF GEOLOGY AND TECHNICAL SCIENCES

1 (463)

JANUARY – FEBRUARY 2024

THE JOURNAL WAS FOUNDED IN 1940

PUBLISHED 6 TIMES A YEAR

ALMATY, NAS RK

NAS RK is pleased to announce that News of NAS RK. Series of geology and technical sciences scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of News of NAS RK. Series of geology and technical sciences in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential content of geology and engineering sciences to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы «ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы» ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Webof Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді геология және техникалық ғылымдар бойынша контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Известия НАН РК. Серия геологии и технических наук» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Известия НАН РК. Серия геологии и технических наук в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному контенту по геологии и техническим наукам для нашего сообщества.

ЧФ «ХАЛЫҚ»

В 2016 году для развития и улучшения качества жизни казахстанцев был создан частный Благотворительный фонд «Халык». За годы своей деятельности на реализацию благотворительных проектов в областях образования и науки, социальной защиты, культуры, здравоохранения и спорта, Фонд выделил более 45 миллиардов тенге.

Особое внимание Благотворительный фонд «Халык» уделяет образовательным программам, считая это направление одним из ключевых в своей деятельности. Оказывая поддержку отечественному образованию, Фонд вносит свой посильный вклад в развитие качественного образования в Казахстане. Тем самым способствуя росту числа людей, способных менять жизнь в стране к лучшему – профессионалов в различных сферах, потенциальных лидеров и «великих умов». Одной из значимых инициатив фонда «Халык» в образовательной сфере стал проект Ozgeris powered by Halyk Fund – первый в стране бизнес-инкубатор для учащихся 9-11 классов, который помогает развивать необходимые в современном мире предпринимательские навыки. Так, на содействие малому бизнесу школьников было выделено более 200 грантов. Для поддержки талантливых и мотивированных детей Фонд неоднократно выделял гранты на обучение в Международной школе «Мирас» и в Astana IT University, а также помог казахстанским школьникам принять участие в престижном конкурсе «USTEM Robotics» в США. Авторские работы в рамках проекта «Тәлімгер», которому Фонд оказал поддержку, легли в основу учебной программы, учебников и учебно-методических книг по предмету «Основы предпринимательства и бизнеса», преподаваемого в 10-11 классах казахстанских школ и колледжей.

Помимо помощи школьникам, учащимся колледжей и студентам Фонд считает важным внести свой вклад в повышение квалификации педагогов, совершенствование их знаний и навыков, поскольку именно они являются проводниками знаний будущих поколений казахстанцев. При поддержке Фонда «Халык» в южной столице был организован ежегодный городской конкурс педагогов «Almaty Digital Ustaz.

Важной инициативой стал реализуемый проект по обучению основам финансовой грамотности преподавателей из восьми областей Казахстана, что должно оказать существенное влияние на воспитание финансовой грамотности и предпринимательского мышления у нового поколения граждан страны.

Необходимую помощь Фонд «Халык» оказывает и тем, кто особенно остро в ней нуждается. В рамках социальной защиты населения активно проводится

работа по поддержке детей, оставшихся без родителей, детей и взрослых из социально уязвимых слоев населения, людей с ограниченными возможностями, а также обеспечению нуждающихся социальным жильем, строительству социально важных объектов, таких как детские сады, детские площадки и физкультурно-оздоровительные комплексы.

В копилку добрых дел Фонда «Халык» можно добавить оказание помощи детскому спорту, куда относится поддержка в развитии детского футбола и карате в нашей стране. Жизненно важную помощь Благотворительный фонд «Халык» оказал нашим соотечественникам во время недавней пандемии COVID-19. Тогда, в разгар тяжелой борьбы с коронавирусной инфекцией Фонд выделил свыше 11 миллиардов тенге на приобретение необходимого медицинского оборудования и дорогостоящих медицинских препаратов, автомобилей скорой медицинской помощи и средств защиты, адресную материальную помощь социально уязвимым слоям населения и денежные выплаты медицинским работникам.

В 2023 году наряду с другими проектами, нацеленными на повышение благосостояния казахстанских граждан Фонд решил уделить особое внимание науке, поскольку она является частью общественной культуры, а уровень ее развития определяет уровень развития государства.

Поддержка Фондом выпуска журналов Национальной Академии наук Республики Казахстан, которые входят в международные фонды Scopus и Wos и в которых публикуются статьи отечественных ученых, докторантов и магистрантов, а также научных сотрудников высших учебных заведений и научно-исследовательских институтов нашей страны является не менее значимым вкладом Фонда в развитие казахстанского общества.

С уважением,
Благотворительный Фонд «Халык»!

«ҚР ҰҒА» РҚБ Хабарлары. Геология және техникалық ғылымдар сериясы».
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)
Меншіктеуші: «Қазақстан Республикасының Ұлттық ғылым академиясы» РҚБ (Алматы қ.).
Қазақстан Республикасының Ақпарат және қоғамдық даму министрлігінің Ақпарат комитетінде 29.07.2020 ж. берілген **№ KZ39VPY00025420** мерзімдік басылым тіркеуіне қойылу туралы куәлік.
Тақырыптық бағыты: *геология, мұнай және газды өңдеудің химиялық технологиялары, мұнай химиясы, металдарды алу және олардың қосындыларының технологиясы.*
Мерзімділігі: жылына 6 рет.
Тиражы: 300 дана.
Редакцияның мекен-жайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., тел.: 272-13-19
http://www.geolog-technical.kz/index.php/en/

«Известия РОО «НАН РК». Серия геологии и технических наук».
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)

Собственник: Республиканское общественное объединение «Национальная академия наук Республики Казахстан» (г. Алматы).

Свидетельство о постановке на учет периодического печатного издания в Комитете информации Министерства информации и общественного развития Республики Казахстан **№ KZ39VPY00025420,** выданное 29.07.2020 г.

Тематическая направленность: *геология, химические технологии переработки нефти и газа, нефтехимия, технологии извлечения металлов и их соеденений.*

Периодичность: 6 раз в год.

Тираж: 300 экземпляров.

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, оф. 219, тел.: 272-13-19

http://www.geolog-technical.kz/index.php/en/

News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technology sciences.
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)
Owner: RPA «National Academy of Sciences of the Republic of Kazakhstan» (Almaty).
The certificate of registration of a periodical printed publication in the Committee of information of the Ministry of Information and Social Development of the Republic of Kazakhstan **No. KZ39VPY00025420,** issued 29.07.2020.
Thematic scope: *geology, chemical technologies for oil and gas processing, petrochemistry, technologies for extracting metals and their connections.*
Periodicity: 6 times a year.
Circulation: 300 copies.
Editorial address: 28, Shevchenko str., of. 219, Almaty, 050010, tel. 272-13-19
http://www.geolog-technical.kz/index.php/en/

NEWS of the National Academy of Sciences of the Republic of Kazakhstan
SERIES OF GEOLOGY AND TECHNICAL SCIENCES
ISSN 2224–5278
Volume 1. Number 463 (2024), 155–163
https://doi.org/10.32014/2024.2518-170X.372

© B.Z. Kaliyev, B.K. Mauletbekova*, T.D. Karmanov, B.A. Zhautikov, Zh.K. Tatayeva, 2024
Satbayev University, Almaty, Kazakhstan.
E-mail: b.mauletbekova@satbayev.university

TECHNIQUE AND TECHNOLOGICAL FEATURES OF SEPARATION OF SPENT DRILLING FLUIDS INTO LIQUID AND SOLID PHASES FOR THE PURPOSE OF REUSE OF SEPARATION PRODUCTS

Bakytzhan Z. Kaliyev — candidate of technical sciences, associate professor of Technological machines and transport department, Satbayev University, 050013, 22a Satpaev str., Almaty, Republic of Kazakhstan
E-mail: b.kaliyev@satbayev.university, https://orcid.org/0000-0002-7040-6319;
Bulbul K. Mauletbekova — PhD student, teacher of Technological machines and transport department, Satbayev University, 050013, 22a Satpaev str., Almaty, Republic of Kazakhstan
E-mail: b.mauletbekova@satbayev.university, https://orcid.org/0000-0003-4229-429X;
Togys D. Karmanov — candidate of technical sciences, associate professor of Technological machines and transport department, Satbayev University, 050013, 22a Satpaev str., Almaty, Republic of Kazakhstan
E-mail: t.karmanov@satbayev.university, https://orcid.org/0000-0003-1463-5392;
Bakhyt A. Zhautikov — doctor of technical sciences, professor, Vice-Rector for Academic Affairs, Satbayev University, 050013, 22a Satpaev str., Almaty, Republic of Kazakhstan
E-mail: b.zhautikov@satbayev.university, https://orcid.org/0000-0002-0908-4533;
Zhanar K. Tataeva — chief manager of the doctoral studies department, Satbayev University, 050013, 22a Satpaev str., Almaty, Republic of Kazakhstan
E-mail: z.tatayeva@satbayev.university, https://orcid.org/0009-0009-2874-1090.

Abstract. Disposal of spent drilling fluid at uranium deposits using flocculants is a process of cleaning and neutralizing spent drilling fluid in order to minimize its negative impact on the environment. The development of a plant for the disposal of spent drilling fluid in uranium deposits using flocculants is an important task, since the spent drilling fluid contains various contaminants, including heavy metals and radioactive elements, which can harm the environment. The use of flocculants in this process improves disposal efficiency, as they are able to remove solids and other contaminants from the drilling fluid, which reduces its toxicity and reduces the amount of waste released to the surface. The development of a plant for the disposal of used drilling fluid should include several stages, such as the selection of suitable flocculants and determining their optimal dosage, the development of a dewatering and solid waste recovery process, and the selection of appropriate equipment and technologies for the process. In addition, the design of the plant must take into account compliance with local regulations and environmental regulations, as well as ensure the maximum efficiency and economy of the process. The result of the study is the creation of a useful model for the disposal of waste drilling fluids, which relates to the field of disposal of waste drilling fluid

accumulated during the construction of technological wells for underground leaching of uranium ore.

Keywords: waste drilling fluid, drill cuttings, flocculation, disposal, sludge reservoir, in-situ leaching

© Б.З. Калиев, Б.К. Маулетбекова*, Т.Д. Карманов, Б.А. Жаутиков, Ж.К. Татаева, 2024
Satbayev University, Алматы, Қазақстан.
E-mail: b.mauletbekova@satbayev.university

БӨЛУ ӨНІМДЕРІН ҚАЙТА ПАЙДАЛАНУ МАҚСАТЫНДА ПАЙДАЛАНЫЛҒАН БҰРҒЫЛАУ ЕРІТІНДІЛЕРІН СҰЙЫҚ ЖӘНЕ ҚАТТЫ ФАЗАЛАРҒА БӨЛУДІҢ ТЕХНИКАСЫ МЕН ТЕХНОЛОГИЯЛЫҚ ЕРЕКШЕЛІКТЕРІ

Калиев Бакытжан Заутбекович — т.ғ.к, «Технологиялық машиналар және көлік» кафедрасының қауымдастырылған профессоры, Satbayev University, 050013, Сәтбаев көшесі, 22а, Алматы қ., Қазақстан Республикасы
E-mail: b.kaliyev@satbayev.university, https://orcid.org/0000-0002-7040-6319;
Маулетбекова Бұлбұл Кусманқызы — докторант, «Технологиялық машиналар және көлік» кафедрасының оқытушысы, Satbayev University, 050013, Сәтбаев көшесі, 22а, Алматы қ., Қазақстан Республикасы
E-mail: b.mauletbekova@satbayev.university, https://orcid.org/0000-0003-4229-429X;
Карманов Тогыс Досмурзаевич — т.ғ.к, «Технологиялық машиналар және көлік» кафедрасының қауымдастырылған профессоры, Satbayev University, 050013, Сәтбаев көшесі, 22а, Алматы қ., Қазақстан Республикасы
E-mail: t.karmanov@satbayev.university, https://orcid.org/0000-0003-1463-5392;
Жаутиков Бахыт Ахатович — т.ғ.д., профессор, Академиялық мәселелер жөніндегі проректор, Satbayev University, 050013, Сәтбаев көшесі, 22а, Алматы қ., Қазақстан Республикасы
E-mail: b.zhautikov@satbayev.university, https://orcid.org/0000-0002-0908-4533;
Татаева Жанар Курмашевна — докторантура бөлімінің бас менеджері, Satbayev University, 050013, Сәтбаев көшесі, 22а, Алматы қ., Қазақстан Республикасы
E-mail: z.tatayeva@satbayev.university, https://orcid.org/0009-0009-2874-1090.

Аннотация. Флокулянттарды пайдалана отырып, уран кен орындарында пайдаланылған бұрғылау ерітіндісін кәдеге жарату, оның қоршаған ортаға теріс әсерін азайту мақсатында пайдаланылған бұрғылау ерітіндісін тазарту және залалсыздандыру процесі. Флокулянттарды пайдалана отырып, уран кен орындарында пайдаланылған бұрғылау ерітіндісін кәдеге жарату қондырғысын әзірлеу маңызды міндет болып табылады, өйткені пайдаланылған бұрғылау ерітіндісінің құрамы қоршаған ортаға зиян келтіруі мүмкін ауыр металдар мен радиоактивті элементтерді қоса алғанда, әртүрлі ластаушы заттарды қамтуы мүмкін. Бұл процесте флокулянттарды қолдану кәдеге жарату тиімділігін жақсартуға мүмкіндік береді, өйткені олар бұрғылау ерітіндісінен қатты заттар мен басқа ластаушы заттарды кетіруге қабілетті, бұл оның уыттылығын төмендетуге және жер бетіне шығарылатын қалдықтардың көлемін азайтуға мүмкіндік береді. Пайдаланылған бұрғылау ерітіндісін кәдеге жарату қондырғысын әзірлеу

қолайлы флокулянттарды таңдау және олардың оңтайлы мөлшерлемесін анықтау, сусыздандыру және қатты қалдықтарды шығару процесін әзірлеу және процесті жүргізу үшін тиісті жабдықтар мен технологияларды таңдау сияқты бірнеше қадамдарды қамтуы керек. Сонымен қатар, қондырғыны әзірлеу кезінде жергілікті экологиялық қауіпсіздік ережелері мен ережелерінің сәйкестігін ескеріп, процестің максималды тиімділігі мен үнемділігін қамтамасыз етуі керек. Зерттеудің нәтижесі уран кенін жерасты шаймалау үшін технологиялық ұңғымаларды салу кезінде жинақталған пайдаланылған бұрғылау ерітіндісін кәдеге жарату саласына жататын пайдаланылған бұрғылау ерітінділерін кәдеге жарату үшін пайдалы модель құру болып табылады.

Түйін сөздер: пайдаланылған бұрғылау ерітіндісі, бұрғылау шламы, флокуляция, кәдеге жарату, шлам жинағыш, жерасты ұңғымаларын шаймалау

© Б.З. Калиев, Б.К. Маулетбекова*, Т.Д. Карманов, Б.А. Жаутиков, Ж.К. Татаева, 2024
Satbayev University, Алматы, Казақстан.
E-mail: b.mauletbekova@satbayev.university

ТЕХНИКА И ТЕХНОЛОГИЧЕСКИЕ ОСОБЕННОСТИ РАЗДЕЛЕНИЯ ОТРАБОТАННЫХ БУРОВЫХ РАСТВОРОВ НА ЖИДКУЮ И ТВЕРДУЮ ФАЗЫ С ЦЕЛЬЮ ПОВТОРНОГО ИСПОЛЬЗОВАНИЯ ПРОДУКТОВ ОТДЕЛЕНИЯ

Калиев Бакытжан Заутбекович — к.т.н., ассоциированный професссор кафедры «Технологические машины и транспорт», Satbayev University, ул. Сатпаева, 22а, 050013, г.Алматы, Республика Казахстан
E-mail: b.kaliyev@satbayev.university, https://orcid.org/0000-0002-7040-6319;
Маулетбекова Бұлбұл Кусманқызы — докторант, преподаватель кафедры «Технологические машины и транспорт», Satbayev University, ул. Сатпаева, 22а, 050013, г.Алматы, Республика Казахстан
E-mail: b.mauletbekova@satbayev.university, https://orcid.org/0000-0003-4229-429X;
Карманов Тогыс Досмурзаевич — к.т.н., ассоциированный професссор кафедры «Технологические машины и транспорт», Satbayev University, ул. Сатпаева, 22а, 050013, г.Алматы, Республика Казахстан
E-mail: t.karmanov@satbayev.university, https://orcid.org/0000-0003-1463-5392;
Жаутиков Бахыт Ахатович — д.т.н., профессор, Проректор по академическим вопросам, Satbayev University, ул. Сатпаева, 22а, 050013, г.Алматы, Республика Казахстан
E-mail: b.zhautikov@satbayev.university, https://orcid.org/0000-0002-0908-4533;
Татаева Жанар Курмашевна — главный менеджер отдела докторантуры, Satbayev University, ул. Сатпаева, 22а, 050013, г.Алматы, Республика Казахстан
E-mail: z.tatayeva@satbayev.university, https://orcid.org/0009-0009-2874-1090.

Аннотация. Утилизация отработанного бурового раствора на месторождениях урана с использованием флокулянтов — это процесс очистки и обезвреживания отработанного бурового раствора с целью минимизации его негативного воздействия на окружающую среду. Разработка установки для утилизации отработанного бурового раствора на месторождениях урана с использованием

флокулянтов является важной задачей, поскольку отработанный буровой раствор содержит различные загрязнители, включая тяжелые металлы и радиоактивные элементы, которые могут нанести вред окружающей среде. Использование флокулянтов в данном процессе позволяет улучшить эффективность утилизации, так как они способны удалять твердые частицы и другие загрязнители из бурового раствора, что позволяет снизить его токсичность и уменьшить объем отходов, выделяемых на поверхность. Разработка установки для утилизации отработанного бурового раствора должна включать несколько этапов, таких как выбор подходящих флокулянтов и определение их оптимальной дозировки, разработка процесса обезвоживания и выделения твердых отходов, а также выбор соответствующего оборудования и технологий для проведения процесса. Кроме того, разработка установки должна учитывать соответствие местных норм и правил экологической безопасности, а также обеспечивать максимальную эффективность и экономичность процесса. Результатом исследования является создание полезной модели для утилизации отработанных буровых растворов, которая относится к области утилизации отработанного бурового раствора, накапливаемого при строительстве технологических скважин для подземного выщелачивания урановой руды.

Ключевые слова: отработанный буровой раствор, буровой шлам, флокуляция, утилизация, шламонакопитель, подземное скважинное выщелачивание

Introduction

To date, the accumulation and disposal of spent non-radioactive drilling fluids is carried out in sludge reservoirs constructed and operated by operating fields. According to the legislation of the Republic of Kazakhstan in the field of ecology, the disposal of treated drilling fluids in sludge reservoirs is strictly limited, respectively, the period before their disposal or processing is no more than 12 months. In addition, in accordance with the principle of hierarchy, waste management programs developed by companies should contain information on the volume and composition of waste generated, methods of their accumulation, collection, transportation, neutralization, recovery and disposal, as well as a description of proposed measures to reduce waste generation, increasing the share of their reuse, recycling and disposal.

A significant content of clay mass in the composition of drill cuttings significantly slows down its drying and makes it practically impossible to reuse the cuttings during the allowable period of accumulation. Significant annual volumes of drill cuttings (about 30 thousand tons), as well as the lack of ready-made solutions for the processing of used drill cuttings on the market, create a significant risk for the industry of additional costs for the disposal of drill cuttings, or the imposition of fines from authorized state bodies in the field of ecology. (Kuandykov et al., 2022)

Avoiding additional costs is possible only through the development of adapted equipment and technology for environmentally friendly processing of drill cuttings, with the implementation of the full reuse of processed products. (Muradkhanov et al., 2014)

Materials and methods

There are a number of similar methods for the disposal of waste drilling fluids. A known method for the elimination of waste water-based drilling fluid (Author's certificate SU 1677052 dated 15.09.91). This method of disposal of used water-based drilling fluid involves the introduction of a flocculant into the used drilling fluid, which results in the formation of a solid phase and a liquid phase. The goal is to simplify the solid phase recycling technology by increasing the degree of dehydration into the separated solid phase.

Liquid glass and hydrolytic lignin are successively introduced to further increase the degree of dehydration of the solid phase. Liquid glass is a viscous liquid obtained by melting silica and alkalis at high temperatures. It is used as a binder in various industrial processes and has high adhesion and water resistance.

Hydrolytic lignin is a natural polymer produced by the hydrolysis of wood. It is widely used in various industrial processes as a binder and stabilizing agent due to its unique physical and chemical properties.

The use of liquid glass and hydrolysis lignin helps to increase the efficiency of solid phase dehydration and simplify the technology of its subsequent disposal.

The disadvantage of this method is the two-stage sequence of the technological process, which leads to the complication and rise in the cost of disposal of the used drilling mud.

An analogue of the proposed method is the method of disposal of used drilling fluid (RF Patent No. 2229494 dated May 27, 2004), which is common and is used to clean drilling fluids from various contaminants such as clay, sand, oil, metal particles, etc.

In this case, the FLOK-S reagent is used, which is an organic-mineral combination of a composition containing calcium oxide, polyglycol, oligosaccharide and monosaccharides. Calcium oxide is the main component of the reagent, which has a coagulating effect and helps to compress the solid particles of the drilling fluid into denser sediments.

Polyglycol and saccharides, in turn, act as flocculants, promoting the formation of larger particles and accelerating the separation of the solid phase in the centrifuge.

After treatment of the solution with the FLOC-S reagent, the drilling fluid is subjected to centrifugation, where it is separated into liquid and solid phases. The liquid phase can be reused in the drilling process, while the solid phase is usually sent for further disposal or disposal.

The disadvantage of this method is the complex composition of the reagent and the complication of the technological process associated with processing in a centrifuge, where after processing the separated solid phase of the drilling fluid is very difficult to extract.

Drilling waste treatment plant (Patent RU 2 047 728) is also one of the ways to dispose of drilling fluids. This device is a drilling waste treatment plant, which includes a drilling wastewater treatment unit, coagulant and flocculant solution tanks, pumps and injection pipelines. It is also equipped with a sludge and waste drilling mud treatment unit with an additional injection pipeline and a chemical dissolution tank.

According to the description of the patent, the containers of coagulant and flocculant solutions are placed on the chassis of a vehicle. This means that the unit can be moved to the job site by means of a vehicle, which is its advantage over stationary units.

However, from the point of view of design and principle of operation, this drilling waste treatment device is not the closest analogue, since its drilling wastewater treatment unit, mud tanks and pumps work in a single system, while the device described in the question, has a separate unit for processing the sludge of WWV and waste drilling mud, with an additional injection pipeline and a container for dissolving reagents. (Tusupbaev et al., 2020)

Thus, although the device of the patent has its advantages, including the ability to move and mobility, it is not the closest analogue in design to the described device for processing drilling waste.

The proposed technology for the disposal of waste drilling fluid accumulated during the construction of technological wells for underground leaching of uranium ore is based on the process of separating water and separately grounds (clay, sludge) from a mixture of waste drilling mud (WDM) directly at the drilling site, and reusing products offices for technical needs, as well as improving the ecological climate of the region, reducing transport costs, reducing the number of human resources for servicing transportation.

Also, for the implementation of the proposed technology, the design of the installation for the disposal of waste drilling mud was developed. The unit is a set of equipment designed for the neutralization and purification of waste drilling fluid, which is formed during drilling of wells in uranium deposits. A feature of the developed installation is the use of flocculants, which will speed up the process of flocculation and sedimentation of suspended particles in solution.

The developed technology for the disposal of the used drilling fluid and the installation for its implementation carry out the process of processing the used drilling fluid with the help of a coagulant and a flocculant to separate solid particles from the liquid phase. Let us describe the process of flocculation using the action of coagulants and flocculants in the installation. First, the spent drilling fluid is fed through the reagent dispenser to the disperser, where the mud is mixed and treated with the help of a coagulant and a flocculant. The coagulant helps to group the smallest particles into larger ones, thereby facilitating the process of their further filtration, and the flocculant helps to bring together the formed large particles into larger groups, which makes it possible to easily separate solids from liquids. Then the mixture is sent to the tank for settling the solid fractions of the mixture, where they settle to the bottom and can be removed. The liquid phase can be removed from the system and reused.

Results

The article provides information on the development of technology and equipment for its implementation, thus: in this technology, the developed Superflok-M reagent of a non-ionic type and liquid glass in certain proportions are used. These reagents help speed up and improve the process of separating solids from the liquid phase and provide a more efficient separation of the used drilling fluid into two phases: solid and liquid. (Tusupbaev et al., 2018)

An installation has been created that will clean and dispose of the used drilling mud. The technological scheme of the plant for the disposal of waste drilling fluid is shown in Figure 1, where 1 is a sump; 2 - croup; 3 - suction line, 3 - slurry pump, 5 - discharge line; 6 - dispenser; 7 - dispersant; 8 - container for settling the solid fractions of the mixture; 9 - gate valve; 10 - slide; 11 - working ladder; 12 - jet pump.

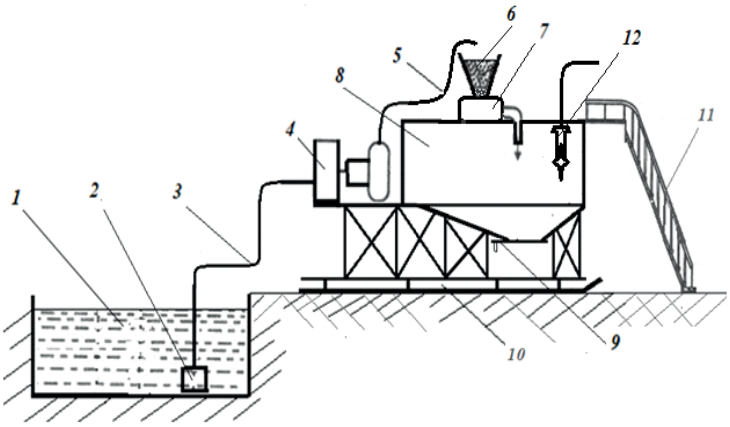

Figure 1. Technological scheme of the installation for separation of spent drilling mud into liquid and solid phases

The method is carried out as follows: From the sump 1, through the chute 2, through the suction line 3, by the slurry pump 4, through the injection line 5, the spent drilling fluid is pumped into the dispenser 6 and then into the disperser 7, where it is treated with a coagulant and flocculant. The optimal concentration of the coagulant and flocculant from the dispenser 6 in the form of a solution and the waste drilling fluid flow with the help of a slurry pump 3 is pumped into the disperser 7, where it is subjected to intense turbulent movement with an adjustable optimal hydrodynamic speed. The disperser 7 is made in the form of a pipe, one side of which is larger than the other, inside of which a plurality of sequentially located movable mixing elements are installed, which independently rotate on axes passing perpendicular to the larger wall of the pipe, which makes it possible to provide equal shear rates in each section of the pipe and creates the possibility promptly change the mode of processing the suspension along the pipe due to the interdependent control of the speed of rotation of the mixing elements. After the dispersant, the mass treated with reagents is drained into a container for settling solid fractions of the mixture 8. In container 8, the optimal concentration of coagulant and flocculant in the form of a solution and the spent drilling fluid are intensively mixed with an optimal speed gradient of 1500 s-1 and at the outlet of the device for 10–12 sec, the drilling fluid slurry settles and the solid content in the drain is less than 25 mg/l. At the optimal dose of flocculant, the drilling fluid suspension settles within 30 minutes and the solid content in the drain is 300–700 mg/l. As a result, coagulant molecules and flocculant macromolecules are evenly adsorbed on the surface of the mud particles of the drilling fluid, which leads to efficient separation into liquid and solid phases in

a short period of time. As a result, there is an instant separation into two phases: solid (clay, sand and rocks) and liquid (water from drilling mud). (Karmanov et al., 2023)

Further, the water formed on the surface is pumped out by a jet pump 12 for further use, the settled thick mass is thrown out through the gate valve 9 into a heap. The entire unit is mounted on a skid of a frame structure 10. The pumping units located above are serviced using a working ladder 11, and the separated water is pumped out using a small-sized water pump 12.

The proposed method makes it possible to isolate up to 70% of the liquid phase from the initial solution and obtain a precipitate with a moisture content of 30–35 %.

When developing a device for the disposal of waste drilling fluid, it is necessary to take into account the requirements of environmental safety and process efficiency. You should also take into account the features of the geological conditions and the chemical composition of the waste solution in a particular area.

As a result, the development of technology and equipment for the disposal of spent drilling mud can significantly reduce the negative impact on the environment and increase the efficiency of the underground leaching of uranium ores.

Conclusions

The aim of the development was to develop an effective method for separating spent drilling fluids into liquid and solid phases, as well as a special device for its implementation, which will reduce the negative impact on the environment and reduce the cost of its transportation. At the same time, the separation products can be reused as valuable components in the production of drilling operations.

The developed complex of technology and equipment for the disposal of waste drilling fluid is an important innovative solution for drilling wells for underground uranium ore leaching.

The uniqueness of the proposed utility model lies in the use of special non-ionic reagents as a coagulant and flocculant, which make it possible to separate up to 70% of the liquid phase from the initial solution and obtain a precipitate with a moisture content of 30-35%. (Karmanov et al., 2021)

REFERENCES

T.K. Karmanov, N.K. Tusupbaev, N.S. Asanov, B.Z. Kaliev, M.T. Oralbekov. (2023). Patent for invention No. 8018 «Method of disposal of spent drilling mud and installation for its implementation» — dated 28.04.2023.

I.V. Muradkhanov, Yu.A. Pulya (2014). «Drilling flushing and grouting solutions», North Caucasus Federal University, — Stavropol, 2014, — 106 p., — UDC: 622.244.4 (075.8).

E.V. Babayan, N.Yu. Moisa (2019). «Drilling fluids», Infra-Engineering, — Moscow, 2019, — 332 p., — UDC: 622.244, — ISBN: 978-5-9729-0287-3

G.G. Yagafarova, D.V. Rakhmatullin, A.N. Insapov, G.M. Kuznetsova, N.R. Mirsaitov (2019). «Modern methods of disposal of drilling waste», Petroleum engineering, 2018. — Vol. 16. — No. 2. — Pp. 123–129

L.K. Brui, N.V. Shemlei, T.V. Atvinovskaya (2019). «Drilling and grouting solutions», textbook, Educational institution «Gomel State Technical University named after P.O. Sukhoi», 2019. — ISBN 978-985-535-429-2

N.K. Tusupbaev, N.L. Medyanik, A.M. Esengaziev, S.M. Bilyalova, M.A. Ertaev (2020). Intensification of the processes of thickening and dehydration of tail pulp by ultraflocculation treatment», Physical

and technical problems of mineral development, 2020. — No. 4. — Pp.149–156. —DOI: 10.15372/FTPRPI20200414

N.K. Tusupbaev, Zh.A. Erzhanova, S.M. Bilyalova, G.A. Toilanbai (2018). «Flocculation of quartz suspension in the presence of superfloculants of various charges», Complex use of mineral raw materials. —№4. 2018. — ISSN 2224–5243 (Print), — https://doi.org/10.31643/2018/6445.26

E.V. Averkina, E.V. Shakirova, L.A. Butakova (2020). «The effect of flocculant reagents on the parameters of clay suspensions», Irkutsk National Research Technical University, Irkutsk, Russia, Earth Sciences and Subsoil Use, 2020, — 43(2):230–241. — DOI: http://dx.doi.org/10.21285/2686-9993-2020-43-2-230-241

B. Mauletbekova, B. Kaliev, T. Karmanov (2021). « Utilization of spent drilling fluids during drilling of technological wells in JSC «NAC «KAZATOMPROM »», Industry of Kazakhstan. — №1 (113) 2021. — Pp.89–92. — ISSN 1608–8425

Mukhiyadin A., Makhazhanova U., Serikbayeva S., KassekeyevA A., Muratova G., Karauylbayev S., Muratkhan R., Kenzhebay A. (2023). Application of information technologies and methods for processing big data to the management of the educational process during the pandemic// *Journal of Theoretical and Applied Information Technologythis link is disabled,* 2023, — 101(2). — Pp. 458–470, — https://www.jatit.org/volumes/Vol101No2/7Vol101No2.pdf

T. Karmanov, B. Kaliev (2021). «Promising technology of drilling technological wells of underground borehole leaching of uranium», Industry of Kazakhstan. —№1 (113) 2021. — Pp. 35–38. — ISSN 1608–8425

Sh. Abibolla, B. Kaliev, T. Karmanov (2021). «The composition of drilling mud when drilling technological wells in unstable clay rocks», Industry of Kazakhstan. — №1 (113) 2021. — Pp.73–75. — ISSN 1608–8425

Kuandykov T.A., Karmanov T.D., Kuldeyev E.I., Yelemessov K.K., Kaliev B.Z. (2022). *«*New technology of uncover the ore horizon by the method of in-situ leaching for uranium mining*»,* News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences, 2022, — 2022(3). — Pp. 142–154. — http://www.geolog-technical.kz/assets/20223/11.142-154.pdf

Karmanov T.D., Kaliev B.Z., Nugumanov K.K., Chelpanov I.B., Kochetkov A.V. (2016). Technical Means of Maintaining Wells on a Set Route», Chemical and Petroleum Engineering, 2016, — 52(7-8). — Pp. 578–581. — https://doi.org/10.1007/s10556-016-0236-z

Orazbayev B.B., Ospanov Ye.A., Orazbayeva K.N., Makhatova V.E., Urazgaliyeva M.K. Shagayeva A.B. (2019). Development of mathematical models of R-1 reactor hydrotreatment unit using available information of various types. *Journal of Physics: Conference Series.* 2019. — 1399(45). — 156053. — https://doi.org/10.1088/1742-6596/1399/4/044024

CONTENT

Publication Ethics and Publication Malpractice
in the journals of the National Academy of Sciences of the Republic of Kazakhstan

For information on Ethics in publishing and Ethical guidelines for journal publication see http://www.elsevier.com/publishingethics and http://www.elsevier.com/journal-authors/ethics.

Submission of an article to the National Academy of Sciences of the Republic of Kazakhstan implies that the described work has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis or as an electronic preprint, see http://www.elsevier.com/postingpolicy), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. In particular, translations into English of papers already published in another language are not accepted.

No other forms of scientific misconduct are allowed, such as plagiarism, falsification, fraudulent data, incorrect interpretation of other works, incorrect citations, etc. The National Academy of Sciences of the Republic of Kazakhstan follows the Code of Conduct of the Committee on Publication Ethics (COPE), and follows the COPE Flowcharts for Resolving Cases of Suspected Misconduct (http://publicationethics.org/files/u2/New_Code.pdf). To verify originality, your article may be checked by the Cross Check originality detection service http://www.elsevier.com/editors/plagdetect.

The authors are obliged to participate in peer review process and be ready to provide corrections, clarifications, retractions and apologies when needed. All authors of a paper should have significantly contributed to the research.

The reviewers should provide objective judgments and should point out relevant published works which are not yet cited. Reviewed articles should be treated confidentially. The reviewers will be chosen in such a way that there is no conflict of interests with respect to the research, the authors and/or the research funders.

The editors have complete responsibility and authority to reject or accept a paper, and they will only accept a paper when reasonably certain. They will preserve anonymity of reviewers and promote publication of corrections, clarifications, retractions and apologies when needed. The acceptance of a paper automatically implies the copyright transfer to the National Academy of Sciences of the Republic of Kazakhstan.

The Editorial Board of the National Academy of Sciences of the Republic of Kazakhstan will monitor and safeguard publishing ethics.

Правила оформления статьи для публикации в журнале смотреть на сайтах:
www:nauka-nanrk.kz
http://www.geolog-technical.kz/index.php/en/
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)

Подписано в печать 15.02.2024.
Формат 70x90$^{1}/_{16}$. Бумага офсетная. Печать – ризограф.
18,0 п.л. Тираж 300. Заказ 1.

РОО «Национальная академия наук РК»
050010, Алматы, ул. Шевченко, 28, т. 272-13-19