

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

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫ

Satbayev University

Х А Б А Р Л А Р Ы

ИЗВЕСТИЯ

НАЦИОНАЛЬНОЙ АКАДЕМИИ
НАУК РЕСПУБЛИКИ
КАЗАХСТАН
Satbayev University

N E W S

OF THE ACADEMY OF SCIENCES
OF THE REPUBLIC OF
KAZAKHSTAN
Satbayev University

SERIES

OF GEOLOGY AND TECHNICAL SCIENCES

1 (457)

JANUARY – FEBRUARY 2023

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. Web of 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.

НАНПК сообщает, что научный журнал «Известия НАНПК. 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 НАНПК. 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.

Бас редактор

ЖҰРЫНОВ Мұрат Жұрынұлы, химия ғылымдарының докторы, профессор, ҚР ҰҒА академигі, Қазақстан Республикасы Ұлттық Ғылым академиясының президенті, АҚ «Д.В. Сокольский атындағы отын, катализ және электрохимия институтының» бас директоры (Алматы, Қазақстан) **Н = 4**

Ғылыми хатшы

АБСАДЫКОВ Бахыт Нарикбайұлы, техника ғылымдарының докторы, профессор, ҚР ҰҒА жауапты хатшысы, А.Б. Бектұров атындағы химия ғылымдары институты (Алматы, Қазақстан) **Н = 5**

Редакциялық алқа:

ӘБСАМЕТОВ Мәліс Құдысұлы (бас редактордың орынбасары), геология-минералогия ғылымдарының докторы, профессор, ҚР ҰҒА академигі, «У.М. Ахмедсафина атындағы гидрогеология және геоэкология институтының» директоры (Алматы, Қазақстан) **Н = 2**

ЖОЛТАЕВ Герой Жолтайұлы (бас редактордың орынбасары), геология-минералогия ғылымдарының докторы, профессор, Қ.И. Сатпаев атындағы геология ғылымдары институтының директоры (Алматы, Қазақстан) **Н = 2**

СНОУ Дэниел, Ph.D, қауымдастырылған профессор, Небраска университетінің Су ғылымдары зертханасының директоры (Небраска штаты, АҚШ) **Н = 32**

ЗЕЛЬТМАН Реймар, Ph.D, табиғи тарих мұражайының Жер туралы ғылымдар бөлімінде петрология және пайдалы қазбалар кен орындары саласындағы зерттеулердің жетекшісі (Лондон, Англия) **Н = 37**

ПАНФИЛОВ Михаил Борисович, техника ғылымдарының докторы, Нанси университетінің профессоры (Нанси, Франция) **Н = 15**

ШЕН Пин, Ph.D, Қытай геологиялық қоғамының тау геологиясы комитеті директорының орынбасары, Американдық экономикалық геологтар қауымдастығының мүшесі (Пекин, Қытай) **Н = 25**

ФИШЕР Аксель, Ph.D, Дрезден техникалық университетінің қауымдастырылған профессоры (Дрезден, Берлин) **Н = 6**

КОНТОРОВИЧ Алексей Эмильевич, геология-минералогия ғылымдарының докторы, профессор, РҒА академигі, А.А. Трофимука атындағы мұнай-газ геологиясы және геофизика институты (Новосибирск, Ресей) **Н = 19**

АГАБЕКОВ Владимир Еноквич, химия ғылымдарының докторы, Беларусь ҰҒА академигі, Жаңа материалдар химиясы институтының құрметті директоры (Минск, Беларусь) **Н = 13**

КАТАЛИН Стефан, Ph.D, Дрезден техникалық университетінің қауымдастырылған профессоры (Дрезден, Берлин) **Н = 20**

СЕЙТМҰРАТОВА Элеонора Юсуповна, геология-минералогия ғылымдарының докторы, профессор, ҚР ҰҒА корреспондент-мүшесі, Қ.И. Сатпаев атындағы Геология ғылымдары институты зертханасының меңгерушісі (Алматы, Қазақстан) **Н = 11**

САҒЫНТАЕВ Жанай, Ph.D, қауымдастырылған профессор, Назарбаев университеті (Нұр-Сұлтан, Қазақстан) **Н = 11**

ФРАТТИНИ Паоло, Ph.D, Бикокк Милан университеті қауымдастырылған профессоры (Милан, Италия) **Н = 28**

«ҚР ҰҒА 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/>

© Қазақстан Республикасының Ұлттық ғылым академиясы, 2023

Типографияның мекен-жайы: «Аруна» ЖК, Алматы қ., Мұратбаев көш., 75.

Главный редактор

ЖУРИНОВ Мурат Журинович, доктор химических наук, профессор, академик НАН РК, президент Национальной академии наук Республики Казахстан, генеральный директор АО «Институт топлива, катализа и электрохимии им. Д.В. Сокольского» (Алматы, Казахстан) **Н = 4**

Ученый секретарь

АБСАДЫКОВ Бахыт Нарикбаевич, доктор технических наук, профессор, ответственный секретарь НАН РК, Институт химических наук им. А.Б. Бектурова (Алматы, Казахстан) **Н = 5**

Редакционная коллегия:

АБСАМЕТОВ Малис Кудысович, (заместитель главного редактора), доктор геологоминералогических наук, профессор, академик НАН РК, директор Института гидрогеологии и геоэкологии им. У.М. Ахмедсафина (Алматы, Казахстан) **Н = 2**

ЖОЛТАЕВ Герой Жолтаевич, (заместитель главного редактора), доктор геологоминералогических наук, профессор, директор Института геологических наук им. К.И. Сатпаева (Алматы, Казахстан) **Н=2**

СНОУ Дэниел, Ph.D, ассоциированный профессор, директор Лаборатории водных наук университета Небраски (штат Небраска, США) **Н = 32**

ЗЕЛЬТМАН Реймар, Ph.D, руководитель исследований в области петрологии и месторождений полезных ископаемых в Отделе наук о Земле Музея естественной истории (Лондон, Англия) **Н = 37**

ПАНФИЛОВ Михаил Борисович, доктор технических наук, профессор Университета Нанси (Нанси, Франция) **Н=15**

ШЕН Пин, Ph.D, заместитель директора Комитета по горной геологии Китайского геологического общества, член Американской ассоциации экономических геологов (Пекин, Китай) **Н = 25**

ФИШЕР Аксель, ассоциированный профессор, Ph.D, технический университет Дрезден (Дрезден, Берлин) **Н = 6**

КОНТОРОВИЧ Алексей Эмильевич, доктор геолого-минералогических наук, профессор, академик РАН, Институт нефтегазовой геологии и геофизики им. А.А. Трофимука СО РАН (Новосибирск, Россия) **Н = 19**

АГАБЕКОВ Владимир Енокович, доктор химических наук, академик НАН Беларуси, почетный директор Института химии новых материалов (Минск, Беларусь) **Н = 13**

КАТАЛИН Стефан, Ph.D, ассоциированный профессор, Технический университет (Дрезден, Берлин) **Н = 20**

СЕЙТМУРАТОВА Элеонора Юсуповна, доктор геолого-минералогических наук, профессор, член-корреспондент НАН РК, заведующая лабораторией Института геологических наук им. К.И. Сатпаева (Алматы, Казахстан) **Н=11**

САГИНТАЕВ Жанай, Ph.D, ассоциированный профессор, Назарбаев университет (Нурсултан, Казахстан) **Н = 11**

ФРАТТИНИ Паоло, Ph.D, ассоциированный профессор, Миланский университет Бикокк (Милан, Италия) **Н = 28**

«Известия 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 соединений.*

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/>

© Национальная академия наук Республики Казахстан, 2023

Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75.

Editorial chief

ZHURINOV Murat Zhurinovich, doctor of chemistry, professor, academician of NAS RK, president of the National Academy of Sciences of the Republic of Kazakhstan, general director of JSC “Institute of fuel, catalysis and electrochemistry named after D.V. Sokolsky» (Almaty, Kazakhstan) **H = 4**

Scientific secretary

ABSADYKOV Bakhyt Narikbaevich, doctor of technical sciences, professor, executive secretary of NAS RK, Bekturov Institute of chemical sciences (Almaty, Kazakhstan) **H = 5**

Editorial board:

ABSAMETOV Malis Kudysovich, (deputy editor-in-chief), doctor of geological and mineralogical sciences, professor, academician of NAS RK, director of the Akhmedsafin Institute of hydrogeology and hydrophysics (Almaty, Kazakhstan) **H=2**

ZHOLTAEV Geroy Zholtaevich, (deputy editor-in-chief), doctor of geological and mineralogical sciences, professor, director of the institute of geological sciences named after K.I. Satpayev (Almaty, Kazakhstan) **H=2**

SNOW Daniel, Ph.D, associate professor, director of the laboratory of water sciences, Nebraska University (Nebraska, USA) **H = 32**

ZELTMAN Reyman, Ph.D, head of research department in petrology and mineral deposits in the Earth sciences section of the museum of natural history (London, England) **H = 37**

PANFILOV Mikhail Borisovich, doctor of technical sciences, professor at the Nancy University (Nancy, France) **H=15**

SHEN Ping, Ph.D, deputy director of the Committee for Mining geology of the China geological Society, Fellow of the American association of economic geologists (Beijing, China) **H = 25**

FISCHER Axel, Ph.D, associate professor, Dresden University of technology (Dresden, Germany) **H=6**

KONTOROVICH Aleksey Emilievich, doctor of geological and mineralogical sciences, professor, academician of RAS, Trofimuk Institute of petroleum geology and geophysics SB RAS (Novosibirsk, Russia) **H = 19**

AGABEKOV Vladimir Enokovich, doctor of chemistry, academician of NAS of Belarus, honorary director of the Institute of chemistry of new materials (Minsk, Belarus) **H = 13**

KATALIN Stephan, Ph.D, associate professor, Technical university (Dresden, Berlin) **H = 20**

SEITMURATOVA Eleonora Yusupovna, doctor of geological and mineralogical sciences, professor, corresponding member of NAS RK, head of the laboratory of the Institute of geological sciences named after K.I. Satpayev (Almaty, Kazakhstan) **H=11**

SAGINTAYEV Zhanay, Ph.D, associate professor, Nazarbayev University (Nursultan, Kazakhstan) **H = 11**

FRATTINI Paolo, Ph.D, associate professor, university of Milano-Bicocca (Milan, Italy) **H = 28**

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/>

© National Academy of Sciences of the Republic of Kazakhstan, 2023

Address of printing house: ST «Aruna», 75, Muratbayev str, Almaty.

UDC 626.1

**S.M. Koybakov^{1*}, M.N. Sennikov¹, T.A. Tolkinbaev², G.E. Omarova¹,
Zh.M. Mukhtarov¹**

¹Taraz Regional University named after M.Kh. Dulati, Taraz, Kazakhstan;

²Eurasian National University named after L. Gumilyov, Astana, Kazakhstan.

E-mail: *koibakov@mail.ru*

METHOD OF CALCULATION AND FORECAST OF THE DEGREE OF SNOW CAPACITY OF CHANNELS

Abstract. The article substantiates the regularities of the formation of snowdrifts in the channel excavation based on field, laboratory and computational-theoretical studies, since the process of snow-bearing channels is insufficiently studied. During the operation of the Irtysh-Karaganda canal, the experience of studying and solving issues of determining optimal methods of combating these processes has been determined. The substantiation of the influence of the direction of the impact of the blizzard wind and the parameters of the channel excavation on the degree of its susceptibility to snowdrifts given. In addition, based on the assessment and forecast of the possible consequences of drifts, methods proposed to combat winter difficulties on the canals in the form of congestion and congestion phenomena, which leads to a decrease in the channel capacity up to the complete cessation of water supply. In this case, the wandering of the stream causes the re-formation of the channel. The water retention formed above the jamming zone contributes to its exit to the shores or the breakthrough of the accumulated snow and ice mass down the channel, below this section there is a subsidence of snow and ice cover to the bottom and shores. Such difficulties can paralyze the functioning of the water supply tract, causing the termination of water supply to consumers for a long time.

Based on theoretical layouts, the transfer of snow particles at different angles of attack and wind speeds affecting the formation of the channel recess slope is justified. The dynamics of changes in the conjugate values of the wind angle of attack and the slope coefficient of the snow - bearing profile at different values determined. Various schemes of snowdrift in trapezoidal and polygonal channels have calculated. The assessment of the state of snow-carrying capacity of the trapezoidal cross-section channel in various cases of the snow transfer process has carried out.

Key words: canal, snowdrift, canal slope, coefficient of natural slope of snowdrift, prevailing direction of blizzard wind, jam-jam phenomena, snow-free profile.

**С.М. Қойбақов^{1*}, М.Н. Сенников¹, Т.А. Толқынбаев², Ғ.Е.Омарова¹,
Ж.М. Мұхтаров¹**

¹М.Х. Дулати атындағы Тараз өңірлік университеті, Тараз, Қазақстан;

²Л. Гумилев атындағы Еуразиялық Ұлттық университеті, Астана, Қазақстан.

E-mail: *koibakov@mail.ru*

АРНАЛАРДАҒЫ ҚАР ҮЙІНДІЛЕРІНІҢ ЕСЕПТЕУ ЖӘНЕ БОЛЖАУ ӘДІСІ

Аннотация. Мақалада табиғи жағдайда, зертханалық және теориялық- есептеу зерттеулері негізінде канал қазбаларындағы қардың пайда болу заңдылықтарының негіздемесі келтірілген, себебі каналдардың қардан тазарту процесі әлі жеткілікті деңгейде зерттелмеген. Ертіс-Қарағанды каналын пайдалану кезінде осы аталған процестермен күресудің оңтайлы тәсілдерін анықтау мәселелерін зерттеу және шешу тәжірибесі айқындалды. Боранды желдің және арнаны қазу параметрлерінің қар үйінділеріне әсер ету дәрежесіне әсері туралы негіздеме берілген. Сондай-ақ, сырғанаудың ықтимал салдарын бағалау және болжау негізінде каналдардағы қысқы қиындықтардың алдын-алу үшін, су беру толығымен тоқтатылғанға дейін каналдың өткізу қабілеттілігінің төмендеуіне әкелетін құбылыстардың кептелісі түрінде күресу әдістері ұсынылған. Бұл жағдайда, ағынның адасуы арнаның қайта құрылуына әкеледі. Су тіреуішінің қысымды-кептеліс аймағынан жоғары қалыптасқан жағалауға шығуына немесе жинақталған қар-мұз массасының арна бойымен төмен қарай сырылуына ықпал етеді және осы аймақтан төменгі ағын бойында қар-мұз жамылғысының түбіне және жағалауына шөгуі байқалады. Мұндай қиындықтар су құбыры жұмысын тоқтатып, тұтынушыларға ұзақ уақыт бойы су беруді тоқтатуына алып келеді.

Теориялық орналасулар негізінде қар бөлшектерінің әр түрлі жел есу бұрышы мен желдің жылдамдығымен тасымалдануына негізделеді және ол канал қазындысы беткейінің қалыптасуына әсер етеді. Желдің есу бұрышының коэффициенті мәндерінің және әр түрлі мәндердегі қарлы пішінінің еңіс коэффициентінің өзгеру динамикасы анықталды. Есептеулер арқылы трапеция және полигоналды каналдардағы қардың әр түрлі сызбалары анықталды. Қар тасымалдау процесінің әр түрлі жағдайларында каналдардың трапециодальды қимасына қар жинақталу және жылжу жағдайына бағалау жүргізілген.

Түйінді сөздер: канал, қар үйіндісі, арна еңісі, қардың табиғи жылжу еңіс коэффициенті, қарлы боранның бағыты, кептеліс құбылыстары, қарсыз профиль.

**С.М. Койбаков^{1*}, М.Н. Сенников¹, Т.А. Толкынбаев², Г.Е. Омарова¹,
Ж.М. Мухтаров¹**

¹Таразский региональный университет имени М.Х. Дулати, Тараз, Казахстан;

²Евразийский национальный университет имени Л. Гумилева, Астана, Казахстан.

E-mail: koibakov@mail.ru

МЕТОДИКА РАСЧЕТА И ПРОГНОЗ СТЕПЕНИ СНЕГОЗАНОСИМОСТИ КАНАЛОВ

Аннотация. В статье на основании натуральных, лабораторных и расчетно-теоретических исследований дается обоснование закономерностей формирования снежных заносов в выемке канала, так как процесс снегозаносимости каналов недостаточно изучен. При эксплуатации канала Иртыш-Караганда определен опыт изучения и решения вопросов определения оптимальных приемов борьбы с этими процессами. Дается обоснование влияния направления воздействия метелевого ветра и параметров выемки канала на степень подверженности ее снежным заносам. А также на основании оценки и прогноза возможных последствий заносов предлагаются способы борьбы по предупреждению зимних затруднений на каналах в виде заторно-зажорных явлений, которые приводят к уменьшению пропускной способности канала вплоть до полного прекращения подачи воды. При этом блуждание потока вызывает переформирование русла. Образованная выше зажорно-заторная зона подпора воды способствует ее выходу на берега или прорыву накопленной снежно-ледовой массы вниз по каналу, ниже этого участка наблюдается оседание снежно-ледового покрова на дно и берега. Такие затруднения могут парализовать функционирование работы водопроводящего тракта, вызывая прекращение водоподачи потребителям на длительное время.

На основе теоретических раскладок обоснован перенос снежных частиц при различном угле атаки и скорости ветра влияющих на формирование откоса выемки канала. Определена динамика изменения сопряженных значений угла атаки ветра и коэффициента откоса снегозаносимого профиля при различных значениях. Расчетным путем определены различные схемы снежного заноса в трапециадальных и полигональных каналах. Произведена оценка состояния снегозаносимости канала трапециодального сечения при различных случаях процесса снегопереноса.

Ключевые слова: канал, снегозаносимость, заложение откоса канала, коэффициент естественного откоса снежного заноса, преобладающее направление метелевого ветра, заторно-зажорные явления, снегонезаносимый профиль.

Introduction. In areas with strong snowstorms during the winter operation of canals, sections that run in a deep recess and are located perpendicular to the prevailing winds are of particular danger. Under the influence of snow masses of considerable thickness, the ice cover pressed through with the formation of jamming phenomena, which leads

to a decrease in the throughput of the channel up to a complete cessation of water supply. In this case, the wandering of the stream causes the reformation of the channel (Brethouwer, 2021). The water backwater formed above the jamming zone contributes to its outflow to the banks or the breakthrough of the accumulated snow-ice mass down the channel, and below this section, the snow-ice cover settles to the bottom and banks (Dyunin, 1990).

The snow-carrying capacity of canals currently studied extremely insufficiently. There are no proven methods for calculating this phenomenon, which are necessary in the design. Some experience in the study of these issues has been accumulated in recent years in connection with the operation of the Irtysh-Karaganda canal (Trofimova et al, 2010). In addition, we have an attempt to generalize the long-term material available in relation to railways and roads, as well as to develop methods for combating this phenomenon.

Patterns of formation of drifts in channels. With a natural slope of a snow drift, the air flow, meeting on the way of advancement with the channel, flows around it according to the laws of aerodynamics. The embankment (cavalier) of the canal causes its narrowing along the vertical, leads to an increase in the speed in the lower layers, which excludes the possibility of snow drift within the windward slope and embankment bed. In contrast, the excavation of the channel causes the flow to expand vertically, as a result, the speed in the lower layers decreases, which creates conditions conducive to snowfall in the form of a skid.

Materials and basic methods. Theoretical and experimental studies (Ibrayev et al, 2022) established that the area of displacement of a turbulent jet flowing down from a certain threshold is limited by straight lines (Brethouwer, 2021). The upper boundary of spreading, which corresponds to the condition of maintaining the initial longitudinal velocity, has an angle of inclination to the horizon of the order of 5° , and the lower one, equal to zero longitudinal velocity, is about 10° . Hence it follows that for an irrotational flow around a recess, its opening angle should not exceed 10° , or the slope coefficient (m) should not be less than 6. However, this does not mean that the natural slope of a snow drift that forms in the channel channel under prolonged exposure to a certain wind force (velocity) must coincide with the line of zero longitudinal velocities, as some researchers admit (Trofimova et al, 2010).

The value of the coefficient of natural slope of a snow drift depends on the wind speed during a blizzard and the initial speed of snow transfer. With an increase in wind speed, the natural slope becomes steeper, and the coefficient decreases to 6, and with a decrease, it flattens.

According to a number of authors (Imanaliyev et al, 2022), the wind speed at which the transfer of snow particles on a horizontal terrain begins, ranges from 3 to 4 m/s, depending on the roughness of the underlying surface, the physical and mechanical properties of snow particles, and others. factors. It is quite obvious that in the presence of a slope, this value will be different (Trofimova et al, 2010). From the equilibrium condition of a snow particle on such a surface, it is easy to determine the initial transfer velocity:

$$V_H^\varphi = V_H \sqrt{\cos\varphi \pm \frac{\sin\varphi}{f_{\text{TP}}}} \quad (1)$$

or the horizontal component:

$$U_H^\varphi = V_H \cos\varphi \sqrt{\cos\varphi \pm \frac{\sin\varphi}{f_{\text{TP}}}} \quad (2)$$

where V_H - initial snow transfer rate on sloping terrain;

φ - angle of inclination of the underlying surface;

f_{TP} - coefficient of friction of snow particles on the underlying surface.

In formulas (1) and (2), the plus sign in the radical expression corresponds to the rise, the minus sign - to the descent of the underlying surface in the direction of the wind.

Verification calculations show that at an angle of inclination of the underlying surface = 10°, corresponding to the lee slope of the channel excavation, the value can be taken equal to, the correction factor in this case is 0.92–0.96 (Hunt and et all, 1988).

Based on the analysis of the change in the epora of the longitudinal velocities of the turbulent jet in the spreading zone. The values of the slope angle of the underlying surface of the slope coefficient were obtained, corresponding to the initial snow transfer velocity of 3 m/s: at wind speeds of 10, 15, 20 and 30 m/s, respectively - 3°40' and 15.7; 4°50' and 11.8; 5°30' and 10.3; 6°30' and 8.9.

The values and characterize the natural slope of the snowdrift in the channel excavation at = 3 m/sec. As can be seen, their values do not correspond to the line of zero longitudinal velocities. Calculations of parameters of snow drift in channels.

We considered the influence of the angle of attack of the wind on the formation of a snowdrift (Hunt and et all, 1988). Its maximum parameters in the channel observed at perpendicular winds. The lower boundary of the maximum drift in normal wind direction is at a distance from the windward edge of the channel (Fig. 1, section 1-1). The cross-sectional area in this case is

$$F = \frac{1}{2} h^2 (m_0 - m), \quad (3)$$

Where h - excavation depth subject to snow drift;

m - channel slope factor.

With oblique winds, the area of maximum drift in their direction (section 2-2) is found as

$$F = \frac{1}{2} h^2 \left(m_0 - \frac{m}{\sin\alpha} \right), \quad (4)$$

Where α - angle of influence of the wind to the axis of the channel.

The projection of this section onto the normal direction (section 3-3) is determined by the expression

$$F = \frac{1}{2} h^2 (m_0 \sin \alpha - m), \tag{5}$$

We introduce the notation $K_m = \frac{m}{m_0 \sin \alpha}$, then under the influence of wind of any direction, formula (5) will look like:

$$F = \frac{1}{2} m_0 h^2 \sin \alpha (1 - K_m), \tag{6}$$

As the angle of attack α decreases, the lower boundary of the limiting snowdrift approaches the lee edge. At some ratio of the values of α and m , the equality can be realized, which means that the surface of the maximum drift coincides with the slope plane of the channel. This is the non-loadable profile that meets the condition (Karnovich and et al, 1986).

For all values $\alpha \leq \frac{\arcsin m}{m_0}$, there will be no snowdrifts in the channel bed (Karnovich et al, 1986). The conjugate values of α and m here for the particular case $m_0 = 6 \dots 12$ are given in Table. 1. With a slope coefficient $m \leq 2,5$ and an angle of attack of the wind not higher than 15° , drifts are not observed.

Table 1 - The conjugate values of the angle of attack of the wind and the slope coefficient for a snow-covered profile at various m_0

m_0	The value of α at m									
	0,5	1,0	1,5	2,0	2,5	3,0	6,0	8,0	10,0	12,0
6	4°31'	9°43'	14°25'	19°13'	24°50'	30°00'	90°00'	-	-	-
8	3°26'	7°25'	10°56'	14°25'	18°03'	22°20'	48°33'	90°00'	-	-
10	2°52'	5°44'	8°38'	11°32'	14°30'	17°28'	36°51'	53°08'	90°00'	-
12	2°14'	4°32'	7°25'	9°44'	12°07'	14°25'	30°00'	42°03'	56°01'	90°00'

Table 1 (section 3-3) shows that with oblique winds, the natural slope of the snow drift, which is usually determined along the normal to the axis of the channel (roads and railways), is equal to $m_0 \sin \alpha$. Its values found in the literature range from 5 to 15 and are explained by a different combination in real conditions of the speed of the snowstorm wind, its angle of attack and the initial speed of snow transfer (Imanalyiev et al, 2022). However, they not taken into account by researchers (Hunt and et all, 1988).

In the channel, under the influence of snowstorm snow, the drift gradually formed starting from the lee edge (Karnovich et al, 1986). Moreover, in the direction of the wind, it is formed with a natural slope m_0 , steeply turning down the front edge, which we take as vertical (Zhaparkulova et al, 2021).

Calculation formulas for determining the cross-sectional area of various snowdrift patterns in the trapezoidal and polygonal channels summarized in Table 2. The following designations additionally introduced (Paipai et al, 2015):

$$K_{b_6} = \frac{b_6}{m_0 h \sin \alpha}, K_h = \frac{h_1}{h}, K = \frac{m_1}{m_0 \sin \alpha}, Km = \frac{m_2}{m_0 \sin \alpha}, \tag{7}$$

Where, x - the length of the incomplete snow drift, counted from the lee edge;
 b_0 - Intermediate berm width;
 h_1 - Depth of excavation below intermediate berm to ice cover;
 m_1 - channel slope factor below intermediate berm;
 m_2 - the same, above the intermediate berm.

It should note that schemes 2.1–2.5 and the corresponding calculation formulas are also applicable for a channel with a cavalier. In hydro technical practice (Nedrigi, 1983), in order to avoid time-consuming calculations when assessing the parameters of snowdrift on channels, it recommended to use the nomograms shown for schemes 1.4 and 1.3, respectively (Table 2).

Depending on the ratio of the slope coefficient and the angle of attack of the wind, the channels can have snow-bearing and snow-bearing profiles. Formula (7) serves as a criterion for such a separation (Paipai and et al, 2015).

This process can be completed if the storage capacity of the canal bed is fully used, and incomplete - if the capacity is not used (Mukhtarov et al, 2022). A completed skid considered limiting if its lower limit remains on the ice cover (Table 2, Schemes 1.1 and 2.1) and non-limiting if it reaches the windward slope. Incomplete snowdrift accumulates within the windward slope or reaches the ice cover (Jiang Feng et al, 2020).

Forecast of the degree of snow covering of the channel bed. It is of interest to assess the degree of snowdrift in a channel of a trapezoidal section in various cases of the completeness of the snowdrift process (Karnovich et al, 1986):

1. The lower boundary goes to the windward slope with the width of the channel along the bottom equal to zero $K_b=2K_m$

$$\frac{F_c}{F_k} = \frac{1 - K_m}{1 + K_m}; \quad (8)$$

2. Snow drift goes to the windward slope:

$$\frac{F_c}{F_k} = 1 - \frac{K_B^2}{2(K_B - K_m)(1 + K_m)}; \quad (9)$$

3. Ends on the opposite edge:

$$\frac{F_c}{F_k} = \frac{1 - K_m}{2}; \quad (10)$$

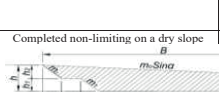
4. The lower border remains on the ice:

$$\frac{F_c}{F_k} = \frac{1 - K_m}{2K_B - K_m}; \quad (11)$$

where: F - cross-sectional area of a snowdrift in a canal;

F_k - the same, channel channels above the ice cover (Kitaev et al, 2010).

Table 2. Summary table for calculating the snow carrying capacity of channels.

Schematic numbers	Snow drift patterns	Application conditions	Calculation formulas	
1. Trapezoidal channel				
1.1		$K_B \geq 1 + K_m$	$F = \frac{1}{2} m_o h^2 \sin \alpha (1 - K_m)$	(8)
1.2			$F = \frac{1}{2} m_o h^2 \sin \alpha \left[(1 - K_m) - \frac{(1 + K_m - K_B)^2}{1 + K_m} \right]$	(9)
1.3		$K_m \leq K_X \leq 1$	$F_X = \frac{1}{2} m_o h^2 \sin \alpha \left[(1 - K_m) - (1 - K_X)^2 \right]$	(10)
1.4		$K_X = K_m$	$F_o = \frac{1}{2} m_o h^2 \sin \alpha K_m (1 - K_m)$	(11)
2. Polygon channel				
2.1		$K_B \geq \left[1 + K_{m_1} K_{h_1} + K_{b_0} + K_{m_2} (1 - K_{h_1}) \right]$	$F = \frac{1}{2} m_o h^2 \sin \alpha \left[(1 - K_{m_1} K_{h_1}^2) - K_{m_1} (1 - K_{h_1}^2) - 2K_{h_1} K_{b_0} \right]$	(12)
2.2		$\left[(1 + K_{m_2}) (1 - K_{h_1}) + K_{b_0} \right] \leq K_X \leq (1 + K_{m_1}) K_{b_0} + K_{b_0} + K_{m_2} (1 - K_{h_1})$	$\frac{1}{2} m_o h^2 \sin \alpha \left[(1 - K_{m_1} K_{h_1}^2) - K_{m_1} (1 - K_{h_1}^2) - 2K_{h_1} K_{b_0} \right]$	(13)
2.3		$K_{m_1} (m_1) K_{h_1} (h_1) + K_{b_0} (b_0) + K_{m_2} (m_2) (1 - K_{h_1}) \leq K_B \leq (1 + K_{m_2}) (1 - K_{h_1})$	$F = \frac{1}{2} m_o h^2 \sin \alpha \left[(1 - K_{m_1} K_{h_1}^2) - K_{m_1} (1 - K_{h_1}^2) - 2K_{h_1} K_{b_0} \right]$	(14)
2.4		$\left[K_{m_1} (m_1) K_{h_1} (h_1) + K_{b_0} (b_0) + K_{m_2} (m_2) (1 - K_{h_1}) \right] \leq K_X \leq 1$	$F_X = \frac{1}{2} m_o h^2 \sin \alpha \left[(1 - K_{m_1} K_{h_1}^2) - K_{m_1} (1 - K_{h_1}^2) - 2K_{h_1} K_{b_0} - (1 - K_X)^2 \right]$	(15)
2.5		$K_X = K_{m_1} (m_1) K_{h_1} (h_1) + K_{b_0} (b_0) + K_{m_2} (m_2) (1 - K_{h_1})$	$F_o = \frac{1}{2} m_o h^2 \sin \alpha \left[(1 - K_{m_1} K_{h_1}^2) - K_{m_1} (1 - K_{h_1}^2) - 2K_{h_1} K_{b_0} - (1 - K_X)^2 \right]$	(16)

Results and discussions. For small values of K_B i.e. with deep recesses, the greatest snow carrying is observed. As the channel spreads or increases, it K_B decreases. The influence K_m is also not the same: it will be maximum at small K_B and minimum K_B - at large (Mokrov and et al, 2010).

The area of the graph between curve 1 and straight line 3 refers to the completed non-limiting snowdrift and between straight line 3 and the axis K_m - to the completed limit. In the latter case, the maximum relative snow carrying capacity of the channel is 0.5 (Rustem and et al, 2021).

At $\frac{F_C}{F_K} > 0.5$, only complete non-limiting snowdrift is possible, and at $\frac{F_C}{F_K} < 0.5$, both limiting and unlimited (Panpai and et al, 2015).

Skidding within the lee slope and intermediate berm does not affect the ice cover and considered safe or acceptable for canal operation. Access to the ice cover can also be

safe or acceptable if the skid height does not exceed the allowable value, and vice versa (Paipai and et al, 2015).

Choosing the best way to deal with snowdrift (Hunt, 1988). We will carry out further analysis on the example of a channel with a trapezoidal section. In this case, the snow capacity of the lee slope determined by formula (11).

Denote by the depth h_{kp} of the excavation at which the allowable height of snowdrift on the ice cover ensured. These values related by the relation:

$$h_{kp} = \frac{h_c^{дон}}{1 - K_m} \dots \dots \dots (12)$$

The snow capacity of the slope with the depth h_{kp} of excavation will be equal to

$$F_o^{(h_{kp})} = \frac{1}{2} m_o h_{kp}^2 \sin \alpha K_m (1 - K_m). (13)$$

Then the relation $F_o / F_o^{(h_{kp})}$ expressed as follows:

$$\frac{F_o}{F_o^{(h_{kp})}} = \left(\frac{h}{h_{kp}} \right)^2, (14)$$

ИЛИ

$$\frac{F_o}{F_o^{(h_{kp})}} = \left[\frac{h}{(h_1 c_{дон})} (1 - K_m) \right]^2, (15)$$

A graphical representation of dependence (15) shown, where the curve corresponds to the condition of equality of snow supply to the snow capacity channel of its lee slope, and the straight line parallel to the axis $F_o / F_o^{(h_{kp})}$ - the condition of equality of the depth of the excavation, the permissible height of the snow drift on the ice cover. (Grechishchev et al, 2012).

Therefore, only zone 2 needs measures against snowdrift. The nature of such works depends on the ratio between the volumes of snow brought to the channel and the snow capacity of its lee slope h , as well as between the depth h_{kp} of the excavation and the critical depth. With a slight excess of the first indicator over the second, it is advisable to increase the snow capacity of the lee slope due to its location, the creation of an intermediate berm, or to provide for the simplest low-power protective devices. Analysis of formula (11) shows that the highest snow capacity of the slope is observed at $K_m = 0,5$. Therefore, the position of slopes can be justified only up to $K_m = 0,5$ (Loitsyansky, 1973).

In cases where the depth of the excavation is slightly higher than its critical value, it is advisable to take measures to reduce the drift height on the ice cover to an acceptable value. This is achieved by cutting off some part of the canal edge with a slope factor $m_o \sin \alpha$. This method must be used for large volumes of snow.

Conclusion. The choice of the optimal method of combating snow resistance was determined on the basis of a multifactorial analysis of the relationships between the

volume of snow transfer into the channel and the snow capacity of its slope, the depth of the opening and the critical depth of the trapezoidal channel.

The final choice of measures, consisting in the positioning of lee slopes, cutting the edge of the channel, the use of snow protection devices of various designs, must be carried out based on technical and economic calculations for comparing options.

From the equilibrium state of snow particles on the surface, the transfer rate was determined depending on the roughness of the lower surface, the physical and mechanical properties of snow particles and other factors, which makes it possible to determine and justify the following conditions:

The natural slope m_0 of the snowdrift V_H in the channel depends on the initial speed of snow transport and the speed of the snowstorm wind V_0 . For example at $V_H = 3-4$ m/s and $V_0 = 20-25$ m/s $m_0 = 10$ is obtained.

The snow profile of the channel and the criterion for its evaluation depend on the slope coefficient of the channel and the angle of attack of the blizzard line.

Information about authors:

Koybakov Seytkhan – Doctor of Technical Sciences, Professor, Professor of the Department of “Water Resources”, Taraz Regional University named after M.Kh. Dulati, Taraz, Kazakhstan; <https://orcid.org/0000-0002-2786-0313>, koibakov@mail.ru;

Sennikov Mikhail – Doctor of Technical Sciences, Professor, Professor of the Department of “Water Resources”, Taraz Regional University named after M.Kh. Dulati, Taraz, Kazakhstan; <https://orcid.org/0000-0003-4944-2128>, Sennikov_m@mail.ru;

Tolkinbaev Temirkhan – Doctor of Technical Sciences, Professor, Professor of Eurasian National University named after L. Gumilyov, Astana, Kazakhstan; <https://orcid.org/0000-0002-8549-3064>; tolkynbayev61@mail.ru;

Omarova Galya – Doctor of Technical Sciences, Associate Professor of the Department of “Water Resources”, Taraz Regional University named after M.Kh. Dulati, Taraz, Kazakhstan; <https://orcid.org/0000-0001-7776-6600>; Galiyaomar@mail.ru;

Mukhtarov Zhanseyit – Master of Technical Sciences, PhD Doctor Student, the Department of “Water Resources”, Taraz Regional University named after M.Kh. Dulati, Taraz, Kazakhstan; <https://orcid.org/0000-0002-0400-3546>.

REFERENCES

- Brethouwer Geert (2021). Turbulent flow in curved channels, Published online by Cambridge University. Press: Journal of Fluid Mechanics, Volume 931, <https://doi.org/10.1017/jfm.2021.953> (in Eng).
- Dyunin A.K. Mechanics of snowstorms//Novosibirsk, publishing house of the Siberian Branch of the USSR Academy of Sciences, 1990.378p. (in Russ.).
- Grechishchev S.E., Brushkov A.V., Pavlov A.V., Grechishcheva O.V. Experimental study of cryogenic pressure in freezing moisture-saturated saline soils//2012. Cryosphere of the Earth, vol. 16, no. 1, pp. 33-36. (in Russ).
- Hunt J.C.R., Wray A.A., Moin P. (1988) Eddies, stream and convergence zones in turbulent flows. Proceedings of the 1988 Summer Program, Stanford University, California, pp. 193-208 (in Eng).
- Ibrayev T.T., Li M., Bakbergenov N., Panenka P., Batyrbayeva A. Problems of the use of water resources and the ways of their solution in Kazakhstan. News of National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences, 2022 (4), pp. 69-80. (in Eng).
- Imanaliyev T., Koybakov S., Karlykhanov O., Amanbayeva B., Bakiyev M. Prospect for development

of water resources management in the South of Kazakhstan. News of National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences. <https://doi.org/10.32014/2518-170X.240> Volume 6, Number 456 (2022), 80-95. (in Eng).

Jiang Feng, Xu Weilin, Deng Jun and Wei Wangru (2020) Flow Structures of the Air-Water Layer in the Free Surface Region of High –Speed Open Channel Flows Research Article, <https://doi.org/10.1155/2020/5903763> (in Eng).

Karnovich V.N., Novozhenin V.D., Smirnov E.A. Features of the operation of channels in winter conditions/M., Energoatomizdat, 1986.80 p. (in Russ.).

Kitaev L.M., Titkova T.B. Estimation of snow cover according to satellite information//2010. Earth's cryosphere, pp. 76-80. (in Russ.).

Loitsyansky L.G. Mechanics of liquid and gas. M., “Nauka”, 1973, 848s. (in Russ.).

Mokrov E.G. and Yu.A. Using the snowpack development model to determine the parameters of avalanche formation//2010. Earth's cryosphere, v.14, no. 2, pp. 79-86. (in Russ.).

Mukhtarov Zh.M., Ibatullin S.R., Kalinin M.Yu., Omarova G.E., Development of methodological foundations and research of technical solutions to increase the volume of the Northern Aral Sea with mineralization of the flow of the Syrdarya River. News of National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences. <https://doi.org/10.32014/2518-170X.244> Volume 6, Number 456 (2022), 131-146. (in Eng).

Nedrigi V.P. (1983) Hydraulic facilities. Designer Reference. Moscow “Stroyizdat” Publishing house, 1983, p. 543 (in Russ.).

Paipai Pan, Guoyue Chen, Kazuki Saruta, Yuki Terata. Snow Cover Detection Based on Visible Red and Blue Channel from MODIS Imagery Data. January 2015. International Journal of Geosciences 06(01):51-66. DOI:10.4236/ijg.2015.61004 (in Eng).

Rustem E., Yestaev K., Abdimomynova M., Abduvalova A., Tassybayev A., (2021) Study of new design of spillway channels with artificial roughness//ISSN 2303-4521. Periodicals Engineering and Natural Sciences Original Research. Vol. 9, № 4, September: 117-133 (in Eng).

Trofimova I.E., Makarov S.A., Balybina A.S., Opekunova M.Yu. Geocryological risks under modern climate change and man-made impacts on nature//2010. Cryosphere of the Earth, pp. 61-68. (in Russ.).

Zhaparkulova E.D., Amanbayeva B.Sh., Dzhaibekova R.A., Mirdadayev M.S., Mosiej J. Geological structure of soils and methods of water resources management of the Asa River. News of National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences. <https://doi.org/10.32014/2021.2518-170X.91> Volume 4, Number 448 (2021), 130-137 UDC 551.4:631.432. (in Eng).

CONTENTS

A.M. Abdibay, K.K. Anuarbekov, J. Chormanski, Y.T. Kaipbayev, A.E. Aldiyarova REGULATION OF WATER-SALT REGIME OF IRRIGATED LANDS IN THE LOWER REACHES OF THE SYRDARYA RIVER.....	6
Zh.K. Akasheva, D.A. Bolysbek, B.K. Assilbekov STUDY OF CARBONATE ROCK DISSOLUTION USING X-RAY MICROCOMPUTED TOMOGRAPHY: IMPACT OF ACID FLOW RATE.....	20
K.M. Akishev, D.S. Zhamangarin, S. Zhardemkyzy, T.T. Murzabekov, A.Yu. Nurgaliyev, M.Yu. Zhiganbayev APPLICATION OF THE PRINCIPLE OF SPECIAL STATES IN DEVELOPING SIMULATION MODEL.....	33
I.N. Aliyev HYDRODYNAMIC CHARACTERISTICS OF ONE DIMENSIONAL DISPLACEMENT OF OIL BY LIQUID.....	45
S. Joldassov, S. Tattibaev, Z. Bimurzayeva, M. Bayzhigitova, G. Loginov ANALYSIS OF EXISTING METHODS FOR CALCULATING THE ROUGHNESS COEFFICIENT OF CHANNELS ALONG THE PERIMETER OF THE CHANNEL.....	56
F. Issatayeva, G. Aubakirova, G. Rudko, A. Mausymbaeva, R. Madysheva TRANSFORMATION OF INDUSTRIAL ENTERPRISES IN THE COUNTRIES WITH TRANSITIONAL ECONOMIES: THE DIGITAL ASPECT.....	72
M.K. Karazhanova, L.B. Zhetekova, S.V. Abbasova, K.K. Aghayeva, G.S. Sabyrbaeva STUDY OF INTERRELATIONS BETWEEN COMPOSITION AND PROPERTIES OF HIGH-VISCOUS OIL.....	92
S.M. Koybakov, M.N. Sennikov, T.A. Tolkinbaev, G.E. Omarova, Zh.M. Mukhtarov METHOD OF CALCULATION AND FORECAST OF THE DEGREE OF SNOW CAPACITY OF CHANNELS.....	102
M. Kabibullin, K. Orazbayeva, V. Makhatova, B. Utenova, Sh. Kodanova REFORMING UNIT OPERATION CONTROL IN OIL AND GAS REFINING TECHNOLOGY.....	113

S. Lutsenko, Y. Hryhoriev, A. Kuttybayev, A. Imashev, A. Kuttybayeva DETERMINATION OF MINING SYSTEM PARAMETERS AT A CONCENTRATION OF MINING OPERATIONS.....	130
A.S. Madibekov, A.M. Karimov, L.T. Ismukhanova, A.O. Zhadi, A.B. Yegorov COPPER POLLUTION OF THE SNOW COVER IN ALMATY.....	141
A.T. Mazakova, Sh.A. Jomartova, T.Zh. Mazakov, G.Z. Ziyatbekova, A.A. Sametova MATHEMATICAL MODELING AND DEVELOPMENT OF AN AUTOMATED SYSTEM FOR SEARCHING RING STRUCTURES IN GEOLOGY.....	154
A.D. Mekhtiyev, Y.N. Abdikashev^{2*}, Y.G. Neshina², P.A. Dunayev¹, Z.D. Manbetova¹ MONITORING THE GEOTECHNICAL CONDITION OF UNDERGROUND MININGS USING DIGITAL TECHNOLOGIES.....	166
Ye.V. Ponomareva, M.V. Ponomareva, F.M. Issatayeva, I.V. Sukhanov CRITERIA OF PROSPECTING AND EVALUATION WORKS FOR COPPER AND POLYMETALLIC ORES AT THE EAST ATABAY SITE.....	177
K. Seitkazieva, K. Shilibek, A. Seitkaziev, R. Turekeldieva, N. Karpenko ECOLOGICAL AND MELIORATIVE SUBSTANTIATION OF GRAY-EARTH-MEADOW SALINE SOILS OF ZHAMBYL REGION.....	189
I.K. Umarova, D.B. Makhmarezhabov, A.A. Umirzokov INVESTIGATION OF THE USE OF ION FLOTATION FOR THE EXTRACTION OF COPPER FROM SULFURIC ACID SOLUTIONS.....	202
M.K. Urazgaliyeva, R.Y. Bayamirova, K.T. Bissembayeva*, G.S. Sabyrbayeva, A.A. Bekbauliyeva METHODS FOR ASSESSING THE CHARACTERISTICS OF OIL RESERVES WITH FUZZY GEOLOGICAL INFORMATION AND DEVELOPMENT OF OIL FIELDS.....	211
O.G. Khayitov, L.Sh. Saidova, S.Zh. Galiev, A.A. Umirzokov, M. Mahkamov INTERRELATION OF PERFORMANCE INDICATORS OF TECHNOLOGICAL TRANSPORT WITH MINING CONDITIONS OF A QUARRY.....	226
D.M. Chnybayeva, Yu.A. Tsyba, N.K. Almuratova LINEAR MONITORING OF THE MAIN PIPELINE BY MEANS OF WIRELESS DIGITAL TECHNOLOGY.....	240
K.T. Sherov, B.N. Absadykov, M.R. Sikhimbayev, B.B. Togizbayeva, A. Esirkepov INVESTIGATION OF THE STRESS-STRAIN STATE OF COMPONENTS OF A HYDRAULIC IMPACT DEVICE.....	260

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)

Заместитель директор отдела издания научных журналов НАН РК *Р. Жәліқызы*

Редакторы: *М.С. Ахметова, Д.С. Аленов*

Верстка на компьютере *Г.Д.Жадыранова*

Подписано в печать 18.02.2023.

Формат 70x90^{1/16}. Бумага офсетная. Печать – ризограф.

20,0 п.л. Тираж 300. Заказ 1.