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«ХАЛЫҚ» ЖҚ

Х А Б А Р Л А Р Ы

ИЗВЕСТИЯ

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

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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»!

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.

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DIGITALIZATION OF THE ASTRAKHAN-MANGYSHLAK MAIN WATER PIPELINE

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Abstract. The Astrakhan-Mangyshlak main water pipeline is important for water supply to the population and industrial enterprises of the Atyrau and Mangyshlak regions. Digitalization of the water pipeline is carried out to create a database of the SmartTranWater software package. The database is created to model and optimize the water supply system and determine energy-saving modes of operation of pumping units and volumes of water transportation. The database consists of digital profiles of working sections of the main water pipeline, identification of parameters of the linear part of sections, and creation of digital objects at the water pipeline stations. Regression analysis of the machine learning method was used to identify the initial data. The following initial data were updated: profiles of sections, location of water pumping stations in the main water pipeline, characteristics of pumps, hydraulic parameters of pipelines, nodes of sections, water withdrawals, and looping of pipelines. For each section, a linear pipeline

part was built with the introduction of pipe elevations depending on the kilometrage. All pipeline nodes were taken as three object types: section nodes, withdrawal nodes, and pipe-looping nodes. Pumping units in stations are stored as a station-related objects, which are linked by rotor type and electric motor type. For each operating pumping unit, depending on the pumping mode and the pumped water, the values of the created heads and power consumption were determined.

Keywords: digitalization, main water pipeline, SmartTranWater software package, database, identification

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«АСТРАХАН-МАҢҒЫШЛАҚ» МАГИСТРАЛДЫ СУ ҚҰБЫРЫН ЦИФРЛАНДЫРУ

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Аннотация. Астрахань-Маңғышлақ магистралдық су құбырының Атырау және Маңғышлақ облыстарының халқы мен өнеркәсіптік кәсіпорындарын сумен қамтамасыз етуде маңызы зор. SmartTranWater бағдарламалық жасақтамасының дерекқорын құру үшін құбырды цифрландыру жүргізілді. Деректер базасы сумен жабдықтау жүйесін модельдеу және оңтайландыру, сонымен бірге сорғы қондырғы жұмысының энергия үнемдеу режимдерін және суды тасымалдау көлемдерін анықтау үшін құрылған. Деректер базасы магистральдық су құбырының жұмыс учаскелерінің цифрлық профильдерінен, сызықтық бөлігінің параметрлерін идентификациялаудан, су өткізгіш станциялардағы цифрлық объектілерді құрудан тұрады. Бастапқы деректерді анықтау үшін машиналық оқыту әдісінің регрессиялық талдауы қолданылды. Мына бастапқы деректер жаңартылды: учаске профильдері, магистральдық су өткізгіштің су айдау станцияларының орналасуы, сорғы сипаттамалары, құбырдың гидравликалық параметрлері, учаске түйіндері, жолай су тартулар, қосымша құбырлар. Құбырдың әрбір учаскесі үшін километраж бойынша құбырдың биіктіктерін енгізумен сызықтық бөлік салынды. Барлық құбыр тораптары үш нысан бойынша алынды: секция түйіндері, су тарту түйіндері және қосымша құбыр түйіндері. Станциялардағы сорғы қондырғылары ротор түрі мен қозғалтқыш түрі бойынша байланысқан станцияға тән объектілер ретінде сақталады. Әрбір жұмыс істеп тұрған сорғы үшін айдау режиміне және айдалатын суға байланысты өндірілетін қысым мен қуат тұтыну анықталды.

Түйін сөздер: цифрландыру, магистралдық су құбыры, SmartTranWater бағдарламалық жасақтамасы, деректер базасы, идентификация

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ЦИФРОВИЗАЦИЯ МАГИСТРАЛЬНОГО ВОДОВОДА «АСТРАХАНЬ-МАНГЫШЛАК»

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Аннотация. Магистральный водовод Астрахань-Мангышлак имеет важное значение для обеспечения водой населения и промышленных предприятий Атырауской и Мангышлакской областей. Цифровизация водовода проводится для создания базы данных программного обеспечения SmartTranWater. База данных создается для моделирования и оптимизации системы водоснабжения, а также для определения энергосберегающих режимов работы насосных агрегатов и объемов транспортировки воды. База данных состоит из цифровых профилей рабочих участков магистрального водовода, идентификации параметров линейной части участков, создании цифровых объектов на станциях водовода. Для идентификации исходных данных использован регрессионный анализ метода машинного обучения. Проведена актуализация исходных данных: профилей участков, расположения водонасосных станций магистрального водовода, характеристик насосов, гидравлических параметров трубопровода, узлов участков, отборов, лупинга трубопроводов. Для каждого участка трубопровода была построена линейная часть с введением высотных отметок трубы в зависимости от километража. Все узлы трубопроводов были взяты как три типа объекта: узлы участков, узлы отборов и узлы лупинга труб. Насосные агрегаты на станциях хранятся как объекты, относящиеся к станции, и которые связаны типом ротора и типом электродвигателей. Для каждого работающего насосного агрегата в зависимости от режима перекачки и прокачиваемой воды были определены значения создаваемых напоров и потребляемой мощности.

Түйін сөздер: цифрландыру, магистральный водовод, программное обеспечение SmartTranWater, база данных, идентификация

Introduction

The Astrakhan-Mangyshlak main water pipeline (MWP) was put into operation in 1988 (Ivleva et al., 2002; Myrzakhmetov et al., 2012). The maximum technical capacity of the water pipeline is 94 thous. m^3/day at the section Kigach – WPS-8 (Kulsary) and 73 thous. m^3/day at the section WPS-8 - Mangyshlak. The main consumers of the water pipeline are oil producers Tengizchevroil LLP, North Caspian Operating Company N.V., Karazhanbasmunai JSC, Mangistaymunaigas JSC, Ozenmunaigas JSC, etc. MWP provides water supply to utilities, which bring it to drinking quality for the settlements of Akkistau village (8 thous. people), Beineu village (47 thous. people), Kulsary city (70 thous. people), Zhanaozen city (120 thous. people). In total, 173 consumers use the service of water supply under MWP, including 23 oil and gas producers and 36 industrial enterprises, 20 public utilities and budgetary organizations, and 94 agricultural enterprises.

The volume of water supply through the MWP is more than 25 million m^3 per year. The water pipeline has several pumping stations and many associated pumping units for supplying enterprises, which leads to changes in water volumes as well as the hydraulic resistance of the water pipeline.

Modeling and optimization of the water distribution system along the water pipeline are important for the sustainable water supply of industrial enterprises and settlements

(Waite, 2010; Fayomi et al., 2017; Savic, 2018; Awe et al., 2019; Kenzhaliyev et al., 2020; Walski et al., 2003). Determination of energy-saving modes of pumping unit operation is necessary for the efficiency of water pipeline operation (Lejano, 2006; Trifunovic, 2006; Dongre, 2016; Swamee & Sharma, 2008; Mala-Jetmarova et al., 2017).

Figure 1 shows the scheme of the Astrakhan-Mangyshlak MWP with a total length of 1945.1 km. The diameters of the pipelines vary in sections from 377 mm to 1220 mm. The water pipeline starts from the Kigach head treatment plant (HTP), the water pipeline route skirts the Caspian Sea, passes through the territory of Atyrau and Mangyshlak regions, has several intermediate water-bearing stations and withdrawal points for water supply of oil and gas and industrial enterprises, as well as settlements. The pipeline is laid at a depth of 1.5 m, the water pipeline profile at the section of the state Kigach HTP - WPS 8 has a height below the sea level from –15.2 to –24.5 m, at the section of the WPS 8 (water pumping station) - Aktau HOPS (head oil pumping station), the height varies from –15.2 m to +255.0 m, and at the section of the WPS 8 — Kalamkas HOPS from –15.2 m to 226.2 m. The height difference in the profiles of the sections causes static pressure and additional load on the operation of pump units.

The presence of numerous water withdrawals changes the current flow rate and the hydraulic resistance of the pipeline. At the sections of the water pipeline, the capacity is high: from 73,000 to 94,000 m³/day, so there is a turbulent mode of water flow. The roughness of the pipe and the presence of mechanical deposits lead to the fact that the hydraulic resistance obeys the law of turbulent flow with a quadratic dependence on speed (Colebrook, 1939; Colebrook & White, 1937; Idel'chik, 1992; Altshul, 1982; Sheriyev et al., 2016).

Fig. 1. Scheme of the Astrakhan-Mangyshlak main water pipeline

Updating the working sections of the main water pipeline.

According to the technological scheme tank farms have the following stations: Kigach HTP, WPS-5, WPS-8 and Karazhanbas WPS. In this regard, MWP has the following sections: Kigach HTP – WPS-5; WPS-5 – WPS-8; WPS-8 – Aktau HOPS; WPS-8 – Kalamkas OPS; WPS-8 – Karazhanbas HOPS; Karazhanbas WPS – Kalamkas HOPS.

The sections of the Beineu — Uzen DN700 partially operating water pipeline were considered in the form of water withdrawal taps at 652 km and 832 km.

To update the initial data, the following information was used (Zhapbasbayev et al., 2021; Besimbayeva et al., 2023; Bekibayev et al., 2023; Beisembetov et al., 2020; Sangulova et al., 2022; Bekibayev et al., 2022): pipeline profiles; pipe parameters; list and location of stations on the linear part; list and location of measuring units on the linear part; list and location of various taps on the linear part; list and location of pump units in stations. passport characteristics of pumps and electric motors; physical water parameters (including rheological properties); water pipeline setting and protection maps; electric power tariffs.

The last two types of data are used only when calculating the optimal pumping mode: values of setting and protection maps serve as one of the criteria of safe pumping, and values of tariffs are used to find the mode with a minimum amount of financial expenses for the operation of pump units and preheating furnaces. The other types of data are necessary to perform a correct hydraulic calculation of the SmartTranWater SP.

Identification of the linear part of the sections

The following characteristics were used as pipe parameters: outer and inner diameter of the pipe, depth of burial, equivalent pipe roughness, thickness of insulation material, and thermal conductivity of steel and insulation material. The value of equivalent pipe roughness was taken as 1.5 mm, which corresponds to the average roughness value of steel welded pipes after a long service life with a significant amount of corrosion. Subsequently, when analyzing historical data, the roughness values in the formula of the hydraulic resistance coefficient of Altschul (Waite, 2010 & Fayomi et al., 2003) were changed for some pipes. Values of thermal conductivity of steel and insulating material of pipes were taken at 45.318 W/(mK) and 0.036 W/(mK), respectively. The other parameters of the pipes are given in Table 1. The value of the inner diameter of the pipe was calculated from the thickness of the pipe wall. For the pipelines, where a detailed description of the wall thickness in relation to the pipe kilometer was available, the average inner diameter of the pipe section between the stations was calculated.

For each pipeline, its linear part was constructed. For each pipeline section between stations its profile was attached, i.e. elevation of the pipe depending on the kilometrage. The locations of nodes on the linear part were taken from the passports of water pipelines.

Table 1. Parameters of pipes of water pipeline sections

Name of the site	Outer diameter of the pipe, mm	Inner diameter of the pipe, mm	Local resistance coefficient	Roughness of the pipe, mm
Kigach HTP – WPS-5	1220	1200	1.1	1.5
WPS-5 – WPS-8	1220	1200	1.1	1.5
WPS-8 – 832 km	1220	1196	1.1	1.5

832 km – 973 km	1020	1000	1.1	1.5
973 km – 999 km	720	702	1.1	1.5
999 km – 1041 km (Zhetybai)	720	702	1.1	1.5
1041 km (Zhetybai) – 1086 km (OHS-112)	530	514	1.1	1.5
1086 km (OHS-112) – Aktau HOPS	377	359	1.1	1.5
832 km (numbering of the Astrakhan–Mangyshlak water pipeline) – 26 km (numbering of the Say-Utes –Buzachi water pipeline)	1020	1000	1.1	1.5
26 km – 39 km	530	514	1.1	1.5
39 km – Karazhanbas WPS	1020	1000	1.1	1.5
Karazhanbas WPS – Kalamkas HOPS	420	402	1.1	1.5

All pipeline nodes are considered as objects of 3 types:

Section nodes. Each pipeline segment (respectively its profile) is stored in the SmartTranWater database as pipe sections between section nodes. In other words, the site nodes serve as vertices of the pipeline graph, in which the edges are a particular section of pipe (segment).

In MWP, section nodes include the following objects:

Water pumping stations: Kigach HTP, WPS-5, WPS-8, WPS-667, Karazhanbas WPS. Nodes connecting several pipelines: 832 km (split of the pipeline into 2 directions: to the Beineu - Uzen DN700 water pipeline and to Aktau HOPS), 833 km (split of the pipeline into 2 directions: to Karazhanbas WPS and to Aktau HOPS). Pipeline diameter change stations: 832 km (transition of DN1220 to DN1020), 973 km (transition of DN1020 to DN1000), 1041 km (transition of DN720 to DN530), 1086 km (transition of DN530 to DN377), 26 km (transition of DN1020 to DN530), 39 km (transition of DN530 to DN1020);

Pressure regulation nodes: 547 km, 652 km, 833 km, 973 km, 999 km, 1041 km, 1086 km. Terminal nodes. These may include either end stations with reservoirs (WPS-5, WPS-8, Karazhanbas WPS), or end users (Aktau HOPS, Kalamkas WPS).

In SmartTranWater DB, the site nodes can be linked to the readings of pressure and flow sensors at the inlet and outlet of the node, and ground temperatures, and the objects of pumps and control valves can be added to them.

For better understanding the nodes of 547 km, 652 km, 833 km, 1041 km, 1086 km in working sections have the following names: division to Oporny OHS, division to Beineu OPS, division to Say-Utes OHS, division to Zhetybai OPS, division to OHS-112.

Thus, the above site nodes divide the water pipeline into the following segments:

Kigach HTP – WPS-5; WPS-5 – WPS-8; WPS-8 – 547 km (branching of Oporny OHS); 547 km (branching of Oporny OHS) – 652 km (branching of Beineu OPS); 652 km (branching of Beineu OPS) – WPS-667; WPS-667 – 832 km; 832 km – 833 km (branching of Sai-Utes OHS); 833 km (branching of Sai-Utes OHS) – 973 km; 973 km – 999 km; 999 km – 1041 km (branching of Zhetybai OPS); 1041 km (branching of Zhetybai OPS) - 1086 km (branching of OHS-112); 1086 km (diversion to OHS-112)

– Aktau HOPS 833 km (branching of Sai-Utes OHS) – 26 km; 26 km – 39 km; 39 km – Karazhanbas WPS; Karazhanbas WPS – Kalamkas HOPS.

Each segment conditionally has a constant value of the internal and external diameter of the pipe, depth of occurrence, and insulation parameters.

Withdrawal nodes. Each withdrawal node refers to a specific pipe segment. In the SmartTranWater DB, the volume of water withdrawn from the pipeline can be specified for each withdrawal node. Readings of pressure and flow sensors of withdrawn water at the tapping point can be linked to the withdrawal nodes.

Pipe looping nodes. Each looping node refers to a specific pipe segment. In the SmartTranWater DB, the location and number of looping nodes can be changed to calculate different pumping modes. In the water pipeline, the following nodes belong to the looping pipes: 207 km (segment Kigach HTP – WPS-5); from 207 km to 300 km (WPS-5) the looping is given; 335 km, 389 km, 431 km (segment WPS-5 – WPS-8); from 300 (WPS-5) to 335 km and from 389 to 431 km the looping is given.

Node parameters are stored in SmartTranWater DB tables depending on the node type. Each operating section of the water pipeline is stored as a chain of segments, i.e. sections of pipes between the nodes of the section. In the case of looping, a segment may contain two or more pipes.

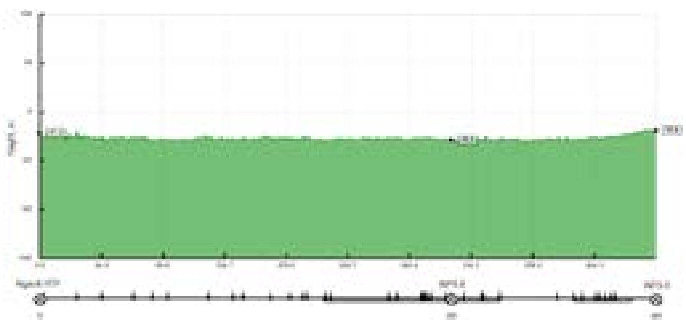
Figure 2 shows diagrams of the built 3 working sections of the water pipeline, and their profiles, which are displayed in the interface of the SmartTranWater DB. Circles with crosses represent pumping stations, taps, and connection nodes of several pipes displayed as a circle with a short line branching.

Creation of facilities at the stations of the working areas

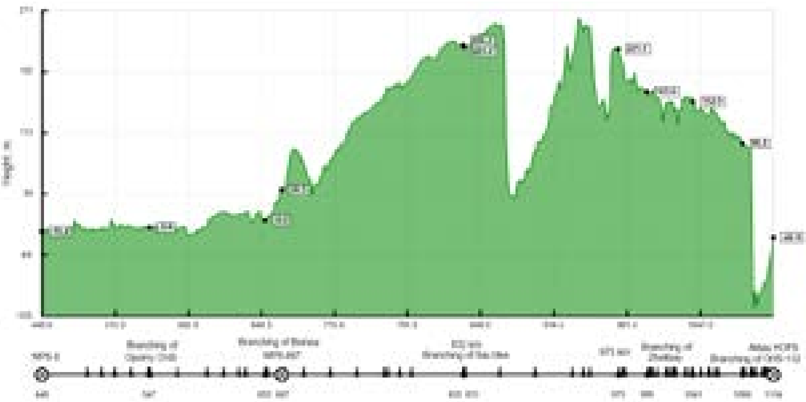
There are pump units in each water pipeline station. In the SmartTranWater database, the pump unit is stored as a station-related object and is associated with two parameters: 1) rotor types; and 2) electric motor types.

Each rotor type contains the following data: dependence of head on water flow rate; dependence of pump efficiency on water flow rate; dependence of allowable gravity reserve on water flow rate; rotor speed at which these dependences are plotted; impeller diameter; the speed of pump at a rated flow rate.

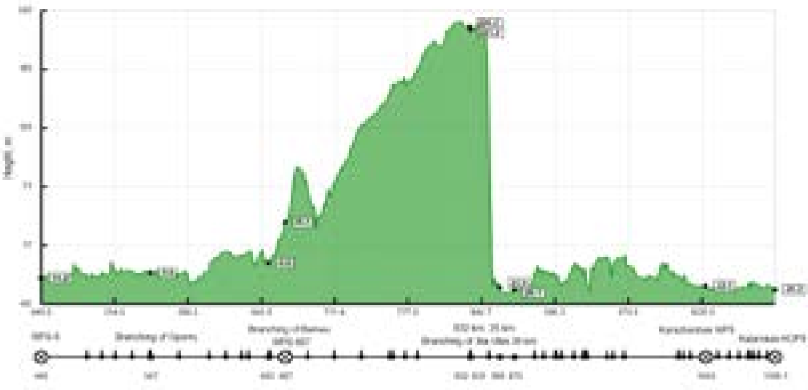
Each electric motor type contains the following data: rated power; rated voltage; efficiency at rated load; rated rotor speed with regard to slip; minimum allowable rotor speed.



a) Working section Kigach HTP - WPS-8



b) Working section WPS-8 - Aktau HOPS



c) Working section of WPS-8 – Kalamkas HOPS

Fig. 2. Profiles of working sections of the main water pipeline

Based on the above parameters in SmartTranWater DB for each operating pump unit depending on the pumping mode and pumped water, the values of created heads, power consumption and conditions of safe operation are calculated.

Dependencies of head, efficiency, and allowable qubit reserve on rotor flow rate were calculated using known similarity relations:

$$\frac{Q_*}{Q_n} = \frac{D_*}{D_n}, \qquad \frac{H_*}{H_n} = \left(\frac{D_*}{D_n}\right)^2, \qquad \frac{\eta_*}{\eta_n} = 1, \qquad \frac{NPSH_*}{NPSH_n} = \left(\frac{D_*}{D_n}\right)^2$$

where D_n, D_* are the nominal and turned impeller diameters; Q_n, Q_* are the flow rates of the nominal and turned pump rotors; H_n, H_* are the heads of the pumps at the flow rates Q_n and Q_* respectively; η_n, η_* are values of the efficiency of pumps at flow rates and respectively; $NPSH_n$, $NPSH_*$ are the allowable positive suction heads for required pumps at flow rates Q_n and Q_* respectively.

It is known that one and the same brand of pumps can have several interchangeable rotors with different head and efficiency characteristics due to differences in diameter and width of impeller blades, diameter of inlet nozzle, etc.

In this regard, SmartTranWater DB can contain several rotor types related to the same pump brand, with the pump type brand and impeller diameter as identifiers.

Figure 3 shows the SmartTranWater DB interface, where you can view and edit pump and motor types and parameters for a particular pump unit.

The nameplate curves for head, efficiency, and power consumption are shown with a blue line, and the actual curves are shown with a green line (see Fig. 3). The actual curves were obtained by analyzing and summarizing experimental data using machine learning regression analysis. The plot of the passport's allowable positive suction head is shown in the purple line. For the passport curves (blue and purple), the solid line type was defined in the pump passport, the dashed line means the possible behavior of the passport curves outside the definition range.

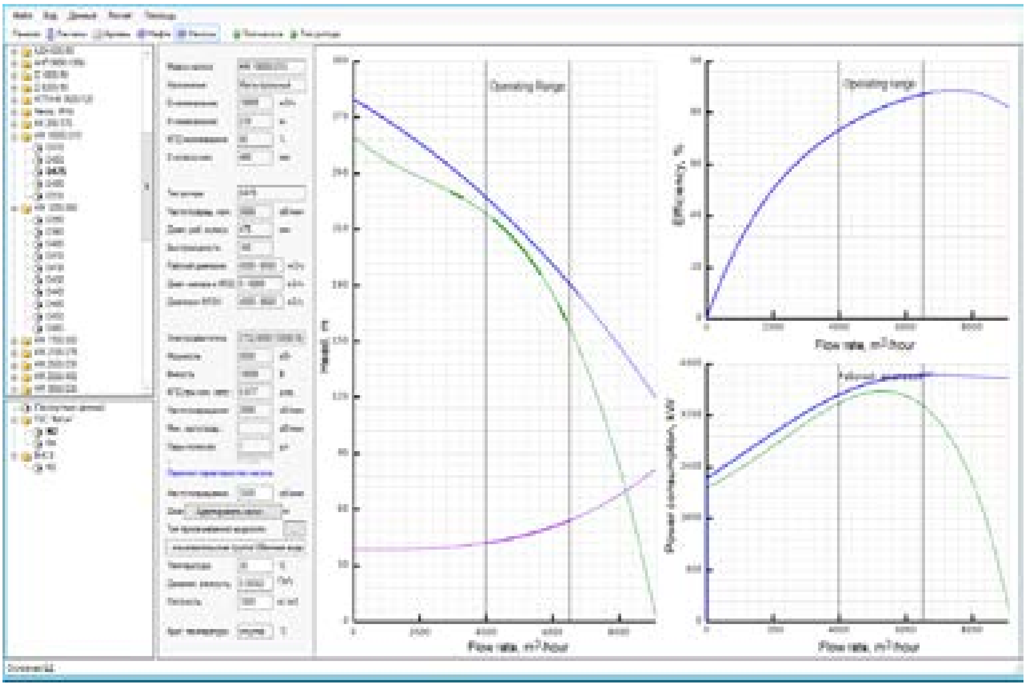


Fig. 3. SmartTranWater database pump and pump unit type library

Conclusion

Digitalization of the initial data was carried out by updating the section profiles, location of water pumping stations of the main water pipeline, characteristics of pumps, hydraulic parameters of the pipeline, section nodes, withdrawals, and looping of pipelines. Machine learning regression analysis was used for initial data identification. Database of section profiles, water pumping stations of the main water pipeline, characteristics of pumps, pipeline parameters, nodes of sections, withdrawals, pipe looping was created.

SmartTranWater database is designed for monitoring, modeling, and optimization of water distribution systems in the Astrakhan-Mangyshlak main water pipeline.

Abbreviations
MWP is main water pipeline;
WPS is water-piping station;
HTP is head treatment plant;
OHS is oil heating station;
HOPS is head oil heating station;
DN is diameter nominal;
DB is data base.

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