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CONTENTS

NEWS OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC
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DEVELOPMENT AND MODELING OF A RESOURCE-SAVING PROCESS FOR METHANOL EXTRACTION BY THE EXAMPLE OF X OILFIELD

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Abstract. In the oil and gas industry, methanol is widely used as a hydrate inhibitor to prevent gas hydrate formation during production, treatment, and transportation processes. However, the continuous purchase and delivery of methanol contribute to high operational costs. This study evaluates the technical and economic feasibility of methanol recovery at the gas treatment unit (GTU) of the "X" field in Western Kazakhstan. A comparative analysis of different methanol regeneration technologies—rectification, high-gravity separation (HiGee), and membrane separation—was conducted. The rectification method was identified as the most viable, providing high methanol purity (≥95% wt.), reliability, and automation. Process modeling of the new methanol recovery unit (MRU) was performed using Aspen HYSYS 14.0, applying the Peng-Robinson-Stryjek-Vera (PRSV) equation of state to accurately simulate phase behavior. Two operational scenarios were considered: B_1 (50 m³/day MWS with 1.50% methanol) and B_2 (8 m³/day MWS with 1.31% methanol). The required process equipment, including heat exchangers, evaporators, and stripping columns, was determined. The Aspen Process Economic Analyzer (APEA) was used for capital cost estimation. Results indicate that methanol regeneration is technically feasible but economically unviable due to low methanol concentrations in the MWS. The estimated annual recovery volume is 570 t/year (B_1) and 356 t/year (B_2), while the majority of methanol is lost with gas and condensate. Economic analysis suggests profitability only with significant methanol content in MWS or higher methanol market prices.

These findings provide valuable insights for optimizing methanol recovery processes and cost efficiency in oil and gas operations.

Keywords: Methanol regeneration, rectification, ASPEN/HYSYS, Complex gas treatment unit (CGTU), methanol recovery unit (MRU), hydrate inhibition

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Х МҰНАЙ КЕНІНІҢ МЫСАЛЫ БОЙЫНША МЕТАНОЛДЫ ӨНДІРУ ҮШІН РЕСУРС ҮНЕМДЕУ ПРОЦЕСІН ӘЗІРЛЕУ ЖӘНЕ МОДЕЛЬДЕУ

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Аннотация. Мұнай-газ саласында метанол, әсіресе, газды өңдеу, дайындау және тасымалдау кезінде тежегіш қызметінде яғни, гидраттардың түзілуін болдырмауда өте кеңінен қолданылады. Алайда, метанолды тұрақты сатып алу мен жеткізу жоғары операциялық шығындарға әкеледі. Бұл зерттеуде Батыс Қазақстандағы “X” кен орнының газ өңдеу қондырғысында (ГКДҚ) метанолды регенерациялаудың техникалық мүмкіндігі мен экономикалық тиімділігі қарастырылады. Зерттеуде метанолды қалпына келтірудің әртүрлі әдістері (ректификация, жоғары гравитациялық бөлу (HiGee), мембраналық бөлу) талданып, қарастырылған. Ректификация әдісі ≥95% масс. тазалықты, сенімділікті және автоматтандыруды қамтамасыз ететін ең тиімді әдіс ретінде таңдалды. Aspen HYSYS 14.0 бағдарламасында Пенг-Робинсон-Стрижек-Вера (PRSV) күй теңдеуін қолдана отырып, жаңа метанолды қалпына келтіру қондырғысының (МҚҚ) процесін модельдеу жүргізілді. Екі жұмыс барысы қарастырылды: B_1 (50 м³/тәулік, MCE-де метанол концентрациясы 1,50%) және B_2 (8 м³/тәулік, MCE-де метанол концентрациясы 1,31%). Негізгі жабдықтар (жылуалмастырғыштар, буландырғыштар, дегазация және ректификация бағандары) тізімі анықталды. Капитал шығындарын бағалауда Aspen Process Economic Analyzer (APEA) қолданылды. Зерттеу нәтижелері метанолды қалпына келтіру техникалық жағынан мүмкін болғанмен, экономикалық тұрғыдан тиімсіз екенін көрсетті. Жылдық метанол шығымы 570 т/жыл (B_1) және 356 т/жыл (B_2) құраса, ал метанолдың негізгі бөлігі газ және конденсатпен бірге жоғалады. Экономикалық тиімділік тек MBC-дағы жоғары метанол концентрациясында немесе метанолдың нарықтық бағасы өскенде болуы мүмкін. Бұл зерттеу мұнай-газ саласында метанолды қалпына келтіру процестерін оңтайландыруда және пайдалану шығындарын азайтуда өте маңызды.

Түйін сөздер: Метанолды регенерациялау, ректификациялау, ASPEN/HYSYS, газды кешенді өңдеу қондырғысы (CGTU), метанолды қалпына келтіру қондырғысы (MRU), гидратты тежеу

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РАЗРАБОТКА И МОДЕЛИРОВАНИЕ РЕСУРСОСБЕРЕГАЮЩЕГО ПРОЦЕССА ИЗВЛЕЧЕНИЯ МЕТАНОЛА НА ПРИМЕРЕ НЕФТЯНОГО МЕСТОРОЖДЕНИЯ X

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Аннотация. В нефтегазовой отрасли метанол широко применяется как ингибитор гидратообразования при добыче, подготовке и транспортировке газа. Однако постоянные закупки и доставка метанола приводят к значительным эксплуатационным затратам. В данной работе исследуется техническая и экономическая целесообразность регенерации метанола на установке комплексной подготовки газа (УКПГ) месторождения «Х» в Западном Казахстане. Был проведен сравнительный анализ технологий регенерации метанола: ректификация, высокогравитационный метод (HiGee) и мембранное разделение. Оптимальной технологией была признана ректификация, обеспечивающая высокую чистоту метанола (≥95% мас.), надежность и автоматизацию. Моделирование процесса новой установки регенерации метанола (УРМ) выполнено в Aspen HYSYS 14.0 с применением уравнения состояния Пенга-Робинсона-Стрижека-Веры (PRSV).

Рассмотрены два сценария: B_1 (50 м³/сут. ВМС с 1,50% метанола) и B_2 (8 м³/сут. ВМС с 1,31% метанола). Определен перечень оборудования (теплообменники, испарители, колонны дегазации и ректификации). Для оценки капитальных затрат использован Aspen Process Economic Analyzer (APEA).
Результаты показали, что регенерация метанола технически возможна, но экономически нецелесообразна из-за низкой концентрации метанола в водно-метанольном растворе. Годовой выход метанола составит 570 т/год (B_1) и 356 т/год (B_2), а при этом основная часть метанола уносится с газом и конденсатом. Экономическая эффективность возможна только при высокой концентрации метанола в ВМС или значительном росте рыночной цены метанола. Данные исследования важны для оптимизации процессов регенерации метанола и сокращения эксплуатационных затрат в нефтегазовой отрасли.

Ключевые слова: регенерация метанола, ректификация, ASPEN/HYSYS, установка комплексной подготовки газа (УКПГ), установка регенерации метанола (УРМ), ингибирование гидратообразования

Introduction. In oil and gas production, treatment and transportation technologies, gas hydrates because serious problems associated with disruption of these operating processes. The traditional and basic method of combating hydrate formation in the oil and gas industry is the use of a hydrate formation inhibitor - methanol. Methanol is most widely used due to its higher inhibitory ability, which is expressed in the maximum decrease in equilibrium temperature in comparison with other thermodynamic inhibitors at the same concentration in an aqueous solution (Heidaryan, 2010: 323; Hosseini, 2021: 5811; Satenov, 2024: 99; Tavakoli, 2016: 92; Zhang, 2023: 125824).

In order to optimize operating costs, by reducing the volume of methanol purchases and its delivery to the point of use, methanol regeneration units are integrated into the gas treatment process, while the economic efficiency and feasibility of methanol regeneration is determined for each individual case, considering the influence of various conditions and factors in the conditions present at a particular enterprise.

The purpose of studying the methanol regeneration process is to determine the technical feasibility and economic feasibility of regenerating methanol from methanol-water solution (MWS) released during the preparation of well fluid at the process units of the “X” field located in Western Kazakhstan. In order to determine the technical feasibility of methanol recovery, it is necessary to review existing recovery technologies and determine the most suitable technology. It is necessary to determine the quality of the initial MWS, as well as the volume of purified methanol yield. Assess capital costs for the construction of a new MRU and assess economic efficiency.

Materials and methods of research. Currently, there are various methods that allow methanol to be regenerated and returned to the process chain. A study was conducted of the advantages and disadvantages of various methanol regeneration methods, including the following technologies:

- rectification (Bayazitova, 2023: 01024; Hajavi, 2016: 1201; Udugama, 2020: 1);
- high gravity method (HiGee Unit) (Pyka, 2023 a: 13274; Pyka, 2023 б: 5984; Wang, 2024: 3641);
- method using water-selective membranes (Divakar, 2022: 44495; Fan, 2018: 012050; Teplyakov, 2022: 1176, Toth, 2015: 123; US4759850A, 1988;).

Based on the results of the analysis and processing of the data obtained, the following points should be noted:

- from a technical point of view, the rectification method is a well-proven and simple technology;
- it is characterized by a high degree of separation of components and many offers on the market for various conditions, taking into account the characteristics of the raw materials;
- when using the rectification method, the concentration of methanol at the outlet from the MRU is achieved (at least 95 % wt.);
- the rectification method is characterized by high reliability, maintainability and automation of modern units (Bayazitova, 2023: 01024; Hajavi, 2016: 1201; Udugama, 2020: 1);
- for the high gravity method (HiGee Unit) there is no information about the use of technology on an industrial scale, which makes it impossible to use this method in the conditions of a CGTU (Pyka, 2023 a: 13274; Pyka, 2023 б: 5984; Wang, 2024: 3641);
- other technologies are characterized by a low concentration of the product at the outlet (70 % methanol), for example, the method using water-selective membranes (Pyka, 2023 a: 13274; Pyka, 2023 б: 5984; Wang, 2024: 3641).

Based on the above results of the analysis, the best practicable technology for methanol regeneration is the MWS rectification process using additional equipment for purification from mechanical impurities, salts, and H_2S.

This conclusion is due to the following factors:

- well-proven technology;
- many offers on the market for various conditions, taking into account the characteristics of raw materials;
- the concentration of methanol at the outlet from the MRU is achieved (at least 95 % wt.);
- high reliability, maintainability and automation of modern units.

The existing operating process of the CGTU at field X is represented by four process lines (PL). PL-1, 2, 3 have an identical set of process equipment. The flow diagram of the operating process of PL-1, 2, 3 is shown in Fig. 1.

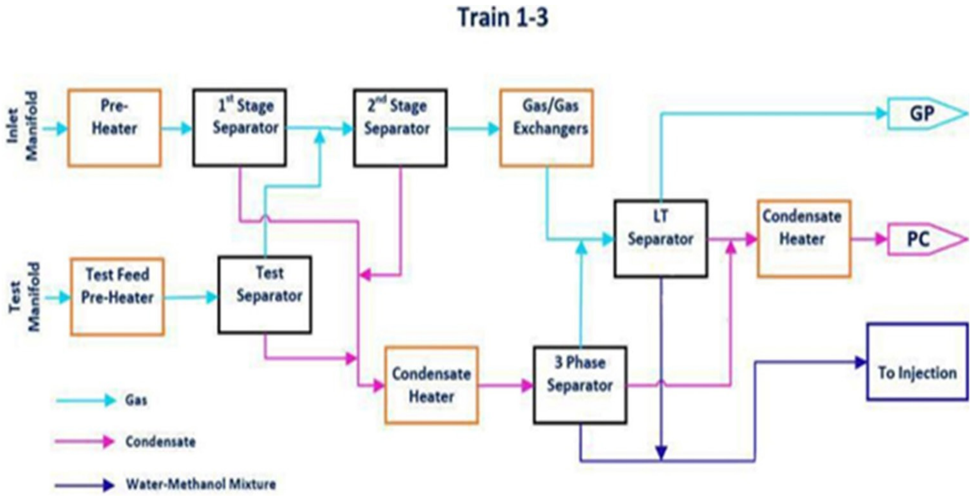

Figure 1. Block diagram of the operating process of process lines 1-3

4 Line has a minor difference, namely the presence of an additional separator, which acts as the third separation stage (3rd Stage Separator), and an additional heat exchanger (Gas/Gas Exchanger).

The block diagram of the operating process of PL-4 is shown in Fig. 2.

Currently, the total volume of methanol injected into the operating process from the CGTU, together with reservoir water, is sent for injection wells (Figure 1,2).

The goal of this process modeling was to obtain the final methanol product at the outlet of the new MRU with a purity of at least 95 % wt. and hydrogen sulfide content not more than 1 ppm.

For the scenario designated as Base Case-1, or B_1 for short, a methanol concentration of 1.50 % wt. was assumed and MWS consumption equal to 50 m^3/day. For the alternative scenario, designated as B_2, the methanol concentration in the MWS was assumed to be 1.31 % wt. with a MWS flow rate of 8 m^3/day. Indicators for the scenarios were established during the study of data on laboratory analyzes of MWS flows on four process lines of the CGTU for the X field. Process modeling using the Aspen HYSYS program, designed to study the processes of preparing oil and gas raw materials, allows us to evaluate the effectiveness of methanol regeneration technologies (Halager, 2021: 108640; Mazumder, 2020: 2198).

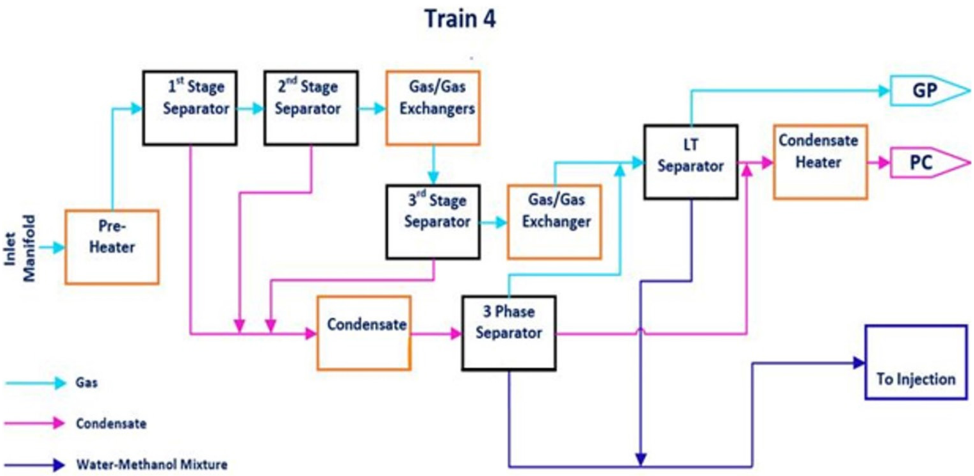

Figure 2. Block diagram of the operating process of process line 4

When process modeling a new MRU in the Aspen HYSYS program to characterize the MWS at the inlet to the new unit, the compositions of hydrocarbons, TSS and salts for both options were specified as follows (Table 1).

Table. 1. Composition and properties of hydrocarbons and MWS

Hydrocarbons composition	Mole fractions
Methane	0.0420
Ethane	0.0420
Propane	0.0699
iso-Butane	0.0420
n-Butane	0.0420
iso-Pentane	0.0559
n-Pentane	0.0559
n-Hexane	0.0629
n-Heptane	0.0559
n-Octane	0.0559
n-Nonane	0.0559
n-Decane	0.0699
n-Undecane	0.0699
n-Dodecane	0.0699
n-Tridecane	0.0699
n-Tetradecane	0.0699
n-Pentadecane	0.0699
Total	1.0000

The Aspen HYSYS software library allows you to create and define hypothetical components. Therefore, in our case, due to the fact that a hypothetical component is present in the MWS – a solid constituent, the properties of the component were set. Kaolin with a molecular weight of 258 and a density of 2600.0 kg/m^3 was chosen as a hypothetical component. Process modeling of a new MRU at the CGTU of the "X" field in Aspen Hysys V.14 software for two options was carried out based on the rectification method according to the conclusions outlined above. In the Aspen Hysys software package, the Peng-Robinson equation of state as modified by Stryjek and Vera (PRSV) was used as a thermodynamic package, which more accurately predicts the phase behavior of hydrocarbon systems, especially systems consisting of dissimilar components (AACE International Recommended Practice, 2020; Stryjek, 1986: 323).

Results.

1. *Modeling the new MRU.*

When process modeling the new MRU, the need to remove such undesirable components as hydrocarbons, salts, TSS and H_2S from the input stream of the MRU was considered. The design of the new MRU was supplemented with the following equipment: a three-phase separator with a filter-coalescer for removing hydrocarbons, a hydrocyclone for removing TSS, an evaporator for removing salts, a stripping column for removing H_2S.

The operating parameters of the stripping column for two options are shown in Figure 3.

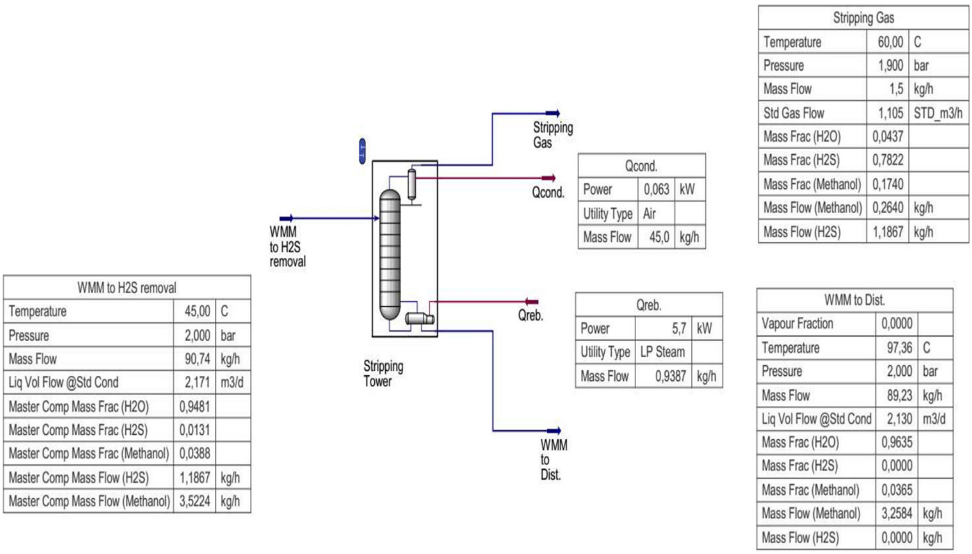

Figure 3. Parameters of the H_2S removal stripping column of the new MRU

The parameters and compositions of the main inlet and outlet streams of the new MRU are given in Table. 2-3.

Table 2. Simulation results for new MRU

Parameter	MWS to the new MRU	TSS	Mixture	Salt from the evaporator for injection	Acid gas	MeOH to the warehouse	Water from the MRU	Parameter
Steam fraction	0.0000	0,0046	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000
Temperature, °C	18.50	19.70	45.00	45.00	130.08	49.34	45.00	45.65
Pressure, bara	78.00	2,70	2.55	2.55	2.40	1.90	1,55	65.00
Molar flow rate, kmol/h	18.36	18.36	0.01	2.64	0.08	0.14	0.12	15.46
Mass flow, kg/h	336.29	336.29	0,88	48,11	2.01	4.62	3.58	279.09
Volumetric flow rate of liquid at st. conventional, m^3/h	0.33	0.33	0.001	0.05	0.002	0.01	0.004	0.27
Liquid density at st. conventional, kg/m^3	1011.02	1011.02	760.10	1013.70	1278.38	793.7	804.87	1016.23

Table 3. Results on the composition of the main flows for option for new MRU

Mass fraction	MWS to the new MRU	TSS	Mixture	Salt from the evaporator for injection	Acid gas	MeOH to the warehouse	Water from the MRU
H_2O	0.9679	0.9679	0.9780	0.5598	0.0291	0,0500	0.9965
Hydrocarbons (C1-C15)	0.0033	0.0033	0.0000	0.0000	0.0549	0.0000	0.0000
Methanol	0.0131	0.0131	0.0128	0.0001	0.0794	0.9500	0.0000
NaCl	0.0017	0.0017	0.0017	0.2200	0.0000	0.0000	0.0018
Na_2SO_4	0.0017	0.0017	0.0017	0.2200	0.0000	0.0000	0.0018
H_2S	0.0121	0.0121	0.0042	0.0000	0.8366	0.0000	0.0000
Kaolin	0.0002	0.0002	0.0016	0.0000	0.0000	0.0000	0.0000
Total	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

2. *Description of process of the methanol regeneration unit (MRU).*

The methanol recovery unit consists of the following main components:

- Input heater;
- Input separator;
- Heat exchanger;
- Evaporator;
- Stripping column for H_2S removal;
- Distillation column;
- Air cooling units;
- Water buffer tank;

 Water pump;
 Methanol storage tanks.

The saturated MWS entering the Unit with a pressure of 2.7 bar and temperature of 31.5 °C after the reducing valve is heated to 94.50 °C in the input heat exchanger-heater MWS HEx-1 “steam-liquid”, to improve the separation of MWS from hydrocarbons, enthusiastic from the process lines of the gas treatment plant. Heated in HEx-1, the MWS then enters the V-102 separator-separator, equipped with a coalescer filter for more complete removal of hydrocarbons from the MWS. The pressure in the separator V-102 is maintained at 2.5 - 2.55 bara. The V-102 separator is also used to remove light hydrocarbon gases if they have been captured by the MWS flow. The captured hydrocarbons under their own pressure are periodically discharged into the closed drainage system of the gas treatment plant, and the MWS enters the hydrocyclone to remove total suspended solids (TSS), which are discharged from the bottom of the hydrocyclone.

After the hydrocyclone, the MWS passes through the HEx-2 heat exchanger, where its temperature rises to 105 °C before entering the evaporator. A tube bundle is installed inside the evaporator, into which water steam or another heating medium with a temperature of about 130-135 °C is supplied, which allows the temperature of the MWS to be increased to 130 °C and transferred to the vapor phase. During the evaporation process, salts are removed from the bottom of the evaporator in the form of a brine solution. The MWS vapor stream leaving the evaporator preheats the MWS input stream in HEx-1 and the pre-evaporator stream in HEx-2.

To remove dissolved H_2S from MWS, since this component is extremely undesirable in commercial methanol due to its high toxicity and corrosive properties, a stripping column was installed. It consists of the column itself, as well as:

* the upper part of the column, including a condenser (air cooler or water refrigerator), a reflux tank and a reflux return pump;

* the lower part of the column, which serves as a reboiler for heating the bottom liquid (water vapor can be used as a heating agent).

It is also possible to use hot oil as a heating agent, or directly heat the bottom liquid in a fire heater. These options will require fuel gas.

MWS with a pressure of 2 bara and at a temperature of 45 °C enters the upper part of the stripping column. According to calculations, the temperature of the upper product after the reflux tank will be 71.24 °C at a pressure of 1.9 bar. The temperature of the bottom liquid at the bottom of the column will be 107 °C. H_2S with a small amount of water vapor (about 1.9-2 % wt. process) and a volume of 59.304 Sm3pd (79.2 kg/day) is discharged to a low-pressure flare. Since the volume of gas after the stripping column is negligible, it does not have a significant impact on greenhouse gas emissions.

The MWS from the bottom of the stripping column, having a temperature of 107 °C, enters the middle part of the distillation column. Methanol is regenerated by rectification at a pressure of 1.9 - 2 bara and temperatures of 86 °C (top) and 120 °C (bottom of the column). The top product of the column is methanol with a purity of at least 95 % wt., the bottom product is water (99.99 % wt.) with a methanol concentration of no more than 0.01 % wt. Water from the bottom of the column is sent to the drainage system, and the regenerated methanol, after cooling in the air cooler to 45 °C and passing through the reflux tank, enters the corresponding tank for storing chemical reagents. A portion of the regenerated methanol after the reflux tank is supplied by a reflux pump to the top of the reflux column.

Additional pumps for pumping product methanol into the storage tank and bottom water into the drainage system are not required, since the flow pressure is approximately 1.8 and 1.85 bara accordingly, which is sufficient for pumping. Water from the bottom of the column, being a fairly pure product, can be returned to the recycling cycle.

According to the process simulation, the methanol product meets the specification requirements (Table 4).

Table 4. Methanol Product Specifications for new MRU

Methanol in warehouse	Specification requirements
Temperature, °C	45
Pressure, bara	1.55
% methanol recovery	77.2
Mass flow, kg/h	3.58
Methanol, % wt.	95
Water, % wt.	5
H_2S, % wt.	0

Discussion. The simulation results were used to estimate AACE Class 5 capital costs (AACE International Recommended Practice, 2020).

Aspen Process Economic Analyzer (APEA) will be used to estimate the cost of the methanol recovery plant. APEA uses links to an expert system to automatically transfer Aspen HYSYS process modeling results. APEA, Equipment's sizes in the proprietary built-in process modeling program, can be used to resize equipment and enter values for non-standard equipment or design equipment sizes.

APEA forecasts cash flow and operating costs of competing technologies and process parameters during the preliminary design process, automatically enriching engineering models with the detail needed for economic evaluation and subsequently leading to more informed capital investment decisions.

APEA evaluates alternative manufacturing facilities and locations. Plant locations can be changed (from twenty-two different countries) and APEA's plant relocation technology will automatically validate design and cost parameters including currency exchange rates, labor rates, manufacturing efficiencies, and construction technology.

APEA estimates updated supply costs and costs of unit for each piece of equipment based on the plant's location around the world. Cost of the unit is the total cost of all equipment, and plant cost is the total cost of all units (AACE International Recommended Practice, 2020).

The calculation of capital costs was carried out using the ASPEN Process Economic Analyzer (APEA) software package based on modeling the operating process of a new MRU at the X field, and a list of main equipment was determined (see Table 5).

Table 5. Master equipment list

#	Description	Number of units
1	Inlet heater MWS	1
2	MWS heater in front of the evaporator	1
3	Air cooler MWS	1
4	Methanol product air cooler	1
5	Water air cooler	1
6	Stripping column condenser	1
7	Distillation column condenser	1
8	Stripping column reboiler	1
9	Reboiler distillation column	1
10	Water buffer capacity	1
11	Inlet separator MWS	1
12	Evaporator MWS	1
13	Reflux capacity of stripping column	1
14	Reflux tank of distillation column	1
15	Stripping column	1
16	Distillation column	1
17	Water pump	1
18	Stripping column reflux pump	1
19	Distillation column reflux pump	1
20	Methanol storage tank	1
Total		21

Based on the simulation of the operating process, the capital costs for the purchase of a block-modular MRU unit were calculated, including the cost of main equipment, materials and costs for the manufacture of modules.

Annual volume of recovered methanol:
• Basic option B_1 - 570 t/year;
• Alternative option B_2 - 356 t/year.

When determining the total cost of the project, taking into account the average complexity and level of uncertainty at the current stage, based on the norms for calculating capital costs, the following assumptions were made to increase the base estimate:
• General and administrative expenses account for 15 % of the total procurement and construction costs.
• Contingency costs account for 30 % of all cost items.

• An allowance of 40 % is provided for potential unaccounted factors for the items “Equipment” and “Construction and installation work”.

The results of calculating capital costs are presented in Table.6-7.

Table 6. Results of calculating capital costs when implementing the project

Engineering	Total cost for Option 2, USD
Basic Design	626 943
Detailed design	1 507 897
Equipment	4 925 825
Manufacturing costs	1 614 863
Construction and installation works	1 919 150
General and administrative expenses	975 620
TOTAL FOR THE PROJECT	11 570 297

Table 7. Results of economic assessment

Indicators	Option 2
Cumulative volume of methanol production, thousand tons	3.74
Annual methanol production, t	356.00
Total cost of recovered methanol for the calculation period, million US dollars	4.04
OPEX MOD, million US dollars	-1.36
CAPEX MOD, USD million	-12.33
NPV @10, million US dollars	-7.80
Break-even analysis	
CAPEX, USD	1 722 828
Methanol price, USD/t	6 132
Methanol volume, t/g.	3 010

The results of the economic assessment of the project with given forecast operational and macroeconomic parameters, as well as cost assumptions, show the following:

Positive results (NPV≥0) with capital costs of no more than 2.6 million US dollars (base case scenario) and 1.7 million US dollars (alternative scenario);

Positive results (NPV≥0) with a methanol price of at least 5,172 US dollars per ton (base case scenario) and 6,132 US dollars per ton (alternative scenario);

Positive results (NPV≥0) with an annual methanol production volume of at least 3.2 thousand tons (base scenario) and 3 thousand tons (alternative scenario).

Conclusions. According to the results of the study, the construction of a MRU within the existing operating process of the “X” field is not economically feasible due to the low methanol content in the initial MRU.

However, the study allowed us to determine the following:

1. Rectification of MWS is by far the most developed and widespread technology. There are a significant number of companies on the market that have extensive experience in the design and manufacture of MRU using the rectification method.

2. From a technical point of view, the regeneration of methanol in the conditions of the gas treatment unit of the “X” field is quite feasible. A prerequisite for methanol

regeneration is the need for preliminary preparation of MRU with the mandatory removal of hydrocarbons, mechanical impurities and acid gases.

3. The average annual yield of regenerated methanol at the specified volumes of MWS and methanol concentration will be: according to the Basic option - 570 t/year, according to the Alternative option - 356 t/year.

4. The low concentration of methanol in the MWS is due to the existing operating process, which allows only a small amount of methanol to be recovered from the process streams. The main volume of methanol is carried away with gas (about 15–20 %) and condensate (70–75 %).

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