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О нас

Губкинский университет предлагает новый сервис – ежеквартальный обзор актуальных научных публикаций, патентов, мероприятий по актуальным направлениям топливно-энергетического комплекса (ТЭК). Дайджест готовится преимущественно силами студенческих активов Губкинского университета при поддержке управления стратегического развития.

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Содержание:

Параметры составления дайджестов 4
I. Производство / Production 5
1.1. Подготовка газа / Gas Pretreatment 5
1.1.1 Патенты / Patents 5
1.2. Технологии сжижения / Liquefaction Technology 7
1.2.1. Статьи / Articles 7
1.2.2. Патенты / Patents 9
1.3. Оборудование / Equipment 14
1.3.1. Статьи / Articles 14
1.3.2. Патенты / Patents 15
1.3.3. Материалы конференций / Conference Papers 18
II. Хранение / Storage 19
2.1. Резервуары / Containment Systems 19
2.1.1 Патенты / Patents 19
2.2. Отгрузочные операции / Discharge Operations 21
2.2.1 Патенты / Patents 21
III. Регазификация / Regasification 23
3.1. Статьи / Articles 23
IV.Инфраструктурные решения / Infrastructure Solutions 26
4.1. Статьи / Articles 26
4.2. Материалы конференций / Conference Papers 27
V. Морские технологии / Offshore Technology 28
5.1. Статьи / Articles 28
5.2. Патенты / Patents 29
5.3. Материалы конференций / Conference Papers 29
VI. Безопасность / Safety 30
6.1. Статьи / Articles 30
6.2. Патенты / Patents 31

Параметры составления дайджестов

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1. Energy;
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3. Applied energy;
4. Journal of thermal science;
5. LNG Industry;
6. Морские интеллектуальные технологии;
7. Актуальные вопросы пожарной безопасности.

Матералы конференций:

1. SPE Nigeria Annual International Conference and Exhibition, Virtual, August 2020

I. Производство / Production

1.1. Подготовка газа / Gas Pretreatment

1.1.1. Патенты / Patents

1. УСТАНОВКА НИЗКОТЕМПЕРАТУРНОЙ ДЕФЛЕГМАЦИИ С РЕКТИФИКАЦИЕЙ НТДР ДЛЯ КОМПЛЕКСНОЙ ПОДГОТОВКИ ГАЗА И ВЫРАБОТКИ СПГ. LOW-TEMPERATURE DEPHLEGMATION UNIT WITH RECTIFICATION LTDR FOR COMPLEX GAS TREATMENT AND PRODUCTION OF LNG

Автор: Курочкин А.В.
Номер публикации: RU 2730289 C2
Дата публикации: 21.08.2020
Аннотация:

Предложена установка низкотемпературной дефлегмации с ректификацией НТДР для комплексной подготовки газа и выработки СПГ, включающая входной сепаратор, блок низкотемпературной конденсации с редуцирующими устройствами, содержащий первый и второй рекуперационные теплообменники, дефлегматор с теплообменной секцией, соединенный линией подачи газа дефлегмации, оснащенной редуцирующим устройством, с низкотемпературным сепаратором, оснащенным линией вывода подготовленного природного газа, а также блок стабилизации конденсата, где в качестве низкотемпературного сепаратора установлен деметанизатор с линией подачи деметанизированного конденсата и линией вывода подготовленного природного газа, оснащенной первым рекуперационным теплообменником, по меньшей мере одно из редуцирующих устройств выполнено в виде детандера, на линии подачи газа дефлегмации после редуцирующего устройства расположен сепаратор, соединенный с деметанизатором линией подачи остатка сепарации, на которой расположена теплообменная секция дефлегматора, а с блоком получения СПГ - линией подачи газа сепарации, к которой примыкает линия подачи его части в линию подачи остатка сепарации, при этом линии вывода конденсатов из входного сепаратора и дефлегматора с редуцирующими устройствами, а также линия подачи первой части деметанизированного конденсата, нагретого во втором рекуперационном теплообменнике, соединены с деметанизатором, а на линии подачи второй его части в качестве блока стабилизации установлен узел дебутанизации, оснащенный линиями вывода продуктов, кроме того, блок получения СПГ включает последовательно расположенные на линии подачи газа сепарации узел очистки от углекислоты, первый рекуперационный теплообменник, первый компрессор, холодильник с линиями ввода/вывода внешнего хладоагента, узел осушки, первый и второй рекуперационные теплообменники, детандер и сепаратор с линией вывода СПГ и линией подачи обратного газа в линию вывода подготовленного природного газа, на которой расположены второй рекуперационный теплообменник и второй компрессор, а первый и второй компрессоры соединены с детандером блока получения СПГ и по меньшей мере с одним из детандеров блока низкотемпературной конденсации посредством кинематической или электрической связи. Технический результат - получение СПГ за счет дополнения установки блоком получения СПГ, компрессоры которого соединены с по меньшей мере одним из детандеров, а также повышение выхода углеводородов C2+ за счет охлаждения дефлегматора редуцированным газом дефлегмации и исключения образования факельных газов.

Author: Kurochkin A.V.
Publication number: RU 2730289 C2
Publication date: 21.08.2020
Abstract:

FIELD: heat exchange.

SUBSTANCE: low-temperature dephlegmation apparatus with rectification LTDR for complex gas treatment and LNG generation, including an inlet separator, a low-temperature condensation unit with reducing devices, comprising first and second recuperative heat exchangers, a refluxer with a heat exchange section, connected by dephlegmation gas supply line equipped with reducing device, with low-temperature separator equipped with prepared natural gas discharge line, and condensate stabilization unit, where the low-temperature separator is a demethanizer with a demethanized condensate feed line and a prepared natural gas discharge line equipped with the first recuperative heat exchanger, at least one of reducing devices is made in the form of an expander, on the dephlegmation gas supply line after the reducing device there is a separator connected to the demethanizer by a residue separation supply line, on which there is a heat exchange section of the refluxer, and with the LNG production unit—by the separation gas supply line, to which the supply line of its part adjoins the separation residue supply line, wherein condensate discharge lines from inlet separator and dephlegmator with reducing devices, as well as demethanised condensate first part supply line, heated in the second recuperative heat exchanger, are connected to the demethanizer, and on the supply line of its second part as the stabilization unit a debutanization unit is installed, equipped with products output lines, further, the LNG production unit includes, in series on the separation gas supply line, a carbon dioxide purification unit, a first recovery heat exchanger, a first compressor, a cooler with external coolant inlet/outlet lines, a drying unit, first and second recuperative heat exchangers, an expander and a separator with an LNG outlet line and a return gas supply line to the prepared natural gas discharge line, on which the second recuperative heat exchanger and the second compressor are located, and first and second compressors are connected to LNG producing unit expander and to at least one of expanders of low-temperature condensation unit by means of kinematic or electric connection.

EFFECT: technical result is obtaining LNG due to addition of installation by LNG production unit, which compressors are connected to at least one of expanders, as well as high output of C2+ hydrocarbons by cooling the dephlegmator with reduced dephlegmation gas and avoiding formation of flare gases.

1.2. Технологии сжижения / Liquefaction Technology

1.2.1. Статьи / Articles

1. A NOVEL PROPANE PRE-COOLED MIXED REFRIGERANT PROCESS FOR COPRODUCTION OF LNG AND HIGH PURITY ETHANE

Authors: Ting He, Wensheng Lin
Journal: Energy, volume: 202
DOI: 10.1016/j.energy.2020.117784
Abstract:

For high ethane-containing natural gas, such as shale gas, separation and purification of ethane during liquefaction can improve economic benefits. A novel process of propane pre-cooled mixed refrigerant natural gas liquefaction integrated with cryogenic distillation for ethane separation is introduced and analyzed, which produce both liquefied natural gas (LNG) and liquefied ethane at the same time. The chemical engineering software HYSYS is used to simulate the process, and the liquefaction operation parameters of the system are optimized by genetic algorithm to reduce energy consumption. The results show that the proposed process can effectively achieve ethane separation, with the purity of ethane product over 99.5% and ethane recovery rate higher than 99.5%. As the ethane content in the feed gas increases, the specific power consumption and exergy efficiency of the system decrease slightly. When ethane content is in the range of 10%–40%, the optimized specific energy consumption is around 0.44 kWh/Nm3(natural gas), and the exergy efficiency is around 47%.

2. SENSITIVITY ANALYSIS OF EFFECTS OF DESIGN PARAMETERS AND DECISION VARIABLES ON OPTIMIZATION OF NATURAL GAS LIQUEFACTION PROCESS

Authors: Tak K., Choi J., Ryu JH, Moon I.
Journal: Energy, volume: 206
DOI: 10.1016/j.energy.2020.118132
Abstract:

Liquefied natural gas (LNG) plants require large amounts of energy to liquefy natural gas (NG). Therefore, many optimization studies have been conducted to minimize this energy consumption. Such studies have usually focused on optimization approaches to overcome the high nonlinearity of NG liquefaction process models. By contrast, decision variables and design bases have barely been investigated.
In this study, an NG liquefaction process is modeled to perform sensitivity analysis of the design parameters and decision variables to determine their effects on the optimal operating conditions and process efficiency. A base case optimization is performed to investigate the convergence rate. Among 120 optimization runs, 57.5% are converged and 15.4% of the converged results show less than 0.1% difference in specific work compared to the best result. The effects of 11 decision variables and four design parameters are studied to obtain sensitivities. Among the decision variables, methane fraction and outlet temperature of a hot stream in an LNG heat exchanger strongly influence process efficiency. When changing the values of the design parameters within the ranges mentioned in the literature, specific work can vary from 724 kJ/kg LNG to 1509 kJ/kg LNG. Irreversibility in the coolers are the major reason to this variation. (C) 2020 Elsevier Ltd. All rights reserved.

3. NATURAL GAS LIQUEFACTION USING THE HIGH-PRESSURE POTENTIAL IN THE GAS TRANSMISSION SYSTEM

Authors: Krzysztof Pajączeka, Wojciech Kostowskia, Wojciech Staneka
Journal: Energy, volume: 202
DOI: 10.1016/j.energy.2020.117726
Abstract:

This article concerns natural gas liquefaction using high-pressure potential, which is available in pressure letdown stations. The article proposes an integration of a pressure letdown station with a natural gas liquefaction line which enables partial exergy recovery and decreasing natural resources consumption to produce LNG. Exergy recovery is carried out by a replacement of the pressure reduction valve by a turboexpander, which can recover exergy from high-pressure natural gas flowing through a pressure reduction stage. The recovered energy may be used to drive a natural gas liquefaction unit, coupled with the reduction station. A case study concerning an existing pressure letdown station includes two chosen model of a turboexpanders with low and high internal efficiency and several natural gas liquefaction units possible to integrate. The varying size of the liquefaction unit corresponds to a different degree of utilization of energy generated in the expander. Turboexpander produces electric power supplying the liquefaction unit, however, it requires the use of additional energy to heat the gas before the reduction stage, which increases the thermoecologic cost of natural gas transferred to distribution network. Energy, exergy and thermoecological cost analysis was carried out for three system design configurations and for six sizes of the liquefaction line with different turboexpander efficiency. The first configuration included a basic configuration with the pressure letdown station and the liquefaction unit, the second configuration also included an integration with a waste heat source (ICE exhaust gases), and the third configuration used multi-stage expansion. Energy efficiency of the integrated expansion-liquefaction system varies from 35.40% to 66.64%, while its exergy efficiency ranges from 15.75% to 46.33% depending on the size of the liquefaction unit and the gas liquefaction method. It was proved that it is possible to reduce thermo-ecological cost of LNG by 8.2%. Reducing raw material consumption needed for LNG production increases natural gas thermo-ecological cost by only 1%. A preliminary economic analysis based on prices of energy carriers was done. It was found that the boundary price was estimated at 0.0246 €/kWh for one of chosen systems.

1.2.2. Патенты / Patents

4. УСТАНОВКА ДЛЯ ПРОИЗВОДСТВА СЖИЖЕННОГО ПРИРОДНОГО ГАЗА

Автор: Курочкин А.В.
Номер публикации: 0002746774
Дата публикации: 18.09.2020
Аннотация:

Предложена установка для производства сжиженного природного газа (СПГ), включающая блоки осушки и очистки газа, предварительный и основной теплообменники, сепаратор, первый и второй детандеры и компрессор, соединенные между собой, где установка оснащена компрессионной холодильной машиной, на линии продукционного газа последовательно расположены компрессор, первая секция предварительного теплообменника, блок очистки, вторая секция предварительного теплообменника, основной теплообменник, первый детандер и сепаратор, оснащенный линией вывода СПГ и линией обратного газа с основным теплообменником, на линии технологического газа расположены испаритель холодильной машины, второй детандер и соединение с линией обратного газа, а на образованной этими линиями линии газа низкого давления расположен предварительный теплообменник. Технический результат - увеличение выхода СПГ за счет установки на линии технологического газа перед детандером испарителя компрессионной холодильной машины, компрессор которой соединен детандерами.

5. СПОСОБ ПРОИЗВОДСТВА СЖИЖЕННОГО ПРИРОДНОГО ГАЗА ИЗ МЕСТОРОЖДЕНИЙ С АНОМАЛЬНО ВЫСОКИМИ ТЕРМОБАРИЧЕСКИМИ УСЛОВИЯМИ. METHOD FOR LIQUEFIED NATURAL GAS PRODUCTION FROM DEPOSITS WITH ABNORMALLY HIGH THERMOBARIC CONDITIONS

Авторы: Запорожец Е.П., Шостак Н.А., Гафурова Э.С.
Номер публикации: 0002746774
Дата публикации: 25.08.2020
Аннотация:

Изобретение относится к области газовой промышленности, конкретно к технологиям производства сжиженного природного газа (СПГ) из месторождений с аномально высокими термобарическими условиями - давление порядка 150,0 МПа, температура более 100°С. Способ производства сжиженного природного газа (СПГ) включает подачу исходного высоконапорного природного паза, очистку его от воды, газообразных примесей и тяжелых углеводородов (С3+выше), расширение высоконапорного газа, в результате которого получают охлажденный поток смеси, от которой отделяют жидкую фазу. Вначале изоэнтальпийно расширяют одно- или многократно исходный высоконапорный природный газ с получением из него смеси трех фаз: газообразной, жидкой и твердой, содержащей гидраты и лед. Затем фазы отделяют друг от друга. Жидкую фазу, содержащую в основном метан - целевой продукт, подают потребителю и/или на хранение. Гидраты и лед переводят в жидкую воду и газ, которые используют на технологические нужды производства СПГ. Техническим результатом изобретения является уменьшение материальных, энергетических затрат на производство СПГ и повышение его товарной кондиции.

Authors: Zaporozhets E.P., Shostak N.A., Gafurova E.S.
Publication number: 0002746774
Publication date: 25.08.2020
Abstract:

FIELD: oil, gas and coke-chemical industries.
SUBSTANCE: invention relates to gas industry, specifically to production of liquefied natural gas (LNG) from deposits with abnormally high thermobaric conditions - pressure of about 150.0 MPa, temperature of more than 100 °C. Method of producing liquefied natural gas (LNG) comprises feeding high-pressure natural slug, cleaning it from water, gaseous impurities and heavy hydrocarbons (C3+higher), expansion of high-pressure gas, as a result of which a cooled flow of mixture is obtained, from which liquid phase is separated. At first, one- or multiple-time initial high-pressure natural gas is isenthalpically expanded to produce a mixture of three phases: gaseous, liquid and solid, containing hydrates and ice. Then the phases are separated from each other. Liquid phase containing mainly methane - end product is supplied to consumer and/or for storage. Hydrates and ice are converted into liquid water and gas, which are used for technological needs of LNG production.
EFFECT: technical result of invention is reduction of material, power costs for LNG production and increase of its marketable condition.

6. СПОСОБ ПРОИЗВОДСТВА СЖИЖЕННОГО ПРИРОДНОГО ГАЗА НА ГАЗОРАСПРЕДЕЛИТЕЛЬНОЙ СТАНЦИИ. LIQUEFIED NATURAL GAS PRODUCTION METHOD AT GAS DISTRIBUTION STATION

Автор: Белоусов Ю.В
Номер публикации: 0002730757
Дата публикации: 25.08.2020
Аннотация:

Изобретение относится к производству сжиженного природного газа (СПГ) на газораспределительной станции (ГРС) магистрального газопровода. Прямой поток природного газа высокого давления разделяют на технологический и продукционный потоки, расширяют технологический поток газа и возвращают его обратным потоком с охлаждением продукционного потока газа. Дросселируют продукционный поток газа после его охлаждения, разделяют парожидкостную смесь на паровую и жидкостную фазы с последующим направлением в обратный поток несконденсировавшегося природного газа. Сжимают обратный поток, охлаждают и возвращают в цикл. Отбирают дополнительный поток природного газа из магистрального трубопровода, осушают в блоке осушки, очищают в блоке очистки и делят на два потока. Первый соединяют с прямым потоком перед разделением на технологический и продукционный потоки, а второй охлаждают, расширяют в детандере и соединяют с обратным потоком перед его нагревом. Часть потока нагревают посредством подогревателя газа и направляют на регенерацию адсорбента осушки и очистки. Часть обратного потока газа перед компрессором направляют для обеспечения работы подогревателей газа. Технический результат изобретения - повышение энергетической эффективности процесса производства сжиженного природного газа на ГРС.

Author: Belousov Yu.V.
Publication number: 0002730757
Publication date: 25.08.2020
Abstract:

FIELD: oil, gas and coke-chemical industries.

SUBSTANCE: invention relates to production of liquefied natural gas (LNG) at gas-distributing station (GDS) of main gas pipeline. Direct flow of natural gas of high pressure is divided into process and production streams, expanding process flow of gas and returning it by return flow with cooling of production gas flow. Production gas flow is throttled after its cooling, vapour-liquid mixture is divided into steam and liquid phases with further direction into reverse flow of uncondensed natural gas. Inverse flow is compressed, cooled and returned to cycle. Additional natural gas flow is extracted from the main pipeline, dried in the unit, cleaned in the cleaning unit and divided into two flows. First one is connected with the direct flow before separation into process and production flows, and the second one is cooled, expanded in the expander and connected to the return flow before its heating. Part of the stream is heated by means of a gas heater and directed for regeneration of adsorbent drying and cleaning. Portion of the back flow of gas ahead of the compressor is directed to provide operation of the gas heaters.

EFFECT: technical result of invention is increase of energy efficiency of process of liquefied natural gas production on GDS.

7. СИСТЕМА ПРОИЗВОДСТВА СЖИЖЕННОГО ПРИРОДНОГО ГАЗА, ОБОРУДОВАННАЯ РЕКОНДЕНСАТОРОМ. LIQUEFIED NATURAL GAS PRODUCTION SYSTEM EQUIPPED WITH RECONDENSATOR

Авторы: Хиросе Кендзи, Жоли Лоик, Нагата Дайсуке, Томита Синдзи
Номер публикации: 0002728305
Дата публикации: 29.07.2020
Аннотация:

Изобретение относится к сжижению природного газа (СПГ). Система производства СПГ содержит сжижитель (14), который охлаждает и сжижает природный газ с помощью хладагента, подаваемого из холодильной установки, резервуар (16) для хранения СПГ, линию (L6) для перемещения сжиженного природного газа из резервуара (16) для СПГ, транспортер (18) СПГ, с помощью которого транспортируется сжиженный природный газ, проходящий по линии (L6) перемещения, реконденсатор (17), который реконденсирует отпарной газ, генерируемый под действием тепла, передаваемого сжиженному природному газу, с помощью хладагента, подаваемого из холодильной установки (15), и линию (A4) возврата, которая подает сжиженный природный газ, который был сжижен, в резервуар (16) для СПГ из реконденсатора (17). Техническим результатом является обеспечение возможности реконденсировать отпарной газ (ОГ) без применения компрессора ОГ и вне зависимости от стадии сжижения СПГ.

Authors: Khirose Kendzi, Zholi Loik, Nagata Dajsuke, Tomita Sindzi
Publication number: 0002728305
Publication date: 29.07.2020
Abstract:

FIELD: oil, gas and coke-chemical industries.

SUBSTANCE: invention relates to liquefaction of natural gas (LNG). LNG production system includes liquefier (14), which cools and liquefies natural gas by means of coolant supplied from refrigerating unit, storage tank (16) for LNG storage, line (L6) for movement of liquefied natural gas from LNG tank (16), LNG carrier (18), by means of which liquefied natural gas passing through line (L6) is transported, recondenser (17), which recondenses the stripping gas generated by the heat transferred to the liquefied natural gas, by means of a coolant supplied from refrigeration unit (15), and return line (A4), which supplies liquefied natural gas which has been liquefied, into LNG tank (16) from recondensator (17).

EFFECT: technical result is enabling possibility of recondensing of the gas without using the exhaust gas compressor and regardless of the LNG liquefaction stage.

8. AN APPARATUS FOR PREPARING NITROGEN-DEPLETED LIQUEFIED NATURAL GAS PRODUCT

Authors: Mark Julian Roberts, Chen Fei, Christopher Michael Ott, Annemarie Ott Weist
Publication number: 211400511
Publication date: 01.09.2020
Abstract:

The utility model relates to a device for preparing a lean nitrogen liquefied natural gas (LNG) product, which comprises a main heat exchanger, a first heat exchanger, a second heat exchanger, a thirdheat exchanger, a fourth heat exchanger, a fifth heat exchanger and a sixth heat exchanger, a refrigeration system; a first separation system in fluid flow communication with the primary heat exchanger for receiving, expanding, partially evaporating and separating a first liquefied natural gas (LNG) stream, or a liquefied natural gas (LNG) stream formed from a portion of the first LNG stream, toform a bottom stream and a top stream; and a storage tank in fluid flow communication with the circulation flow, where the bottom flow is in fluid flow communication with a first set of channels in acooling beam of a primary heat exchanger operatively configured to cool the bottom flow to form a subcooled liquefied natural gas (LNG) flow.

9. METHODS FOR REMOVAL OF MOISTURE FROM LNG REFRIGERANT

Authors: Daryl A. Kenefake, Jeffrey Tatarzyn, Waleed H. Amhed
Publication number: 20200240687
Publication date: 30.07.2020
Abstract:

Methods and systems for removing moisture from refrigerant that use a desiccant-based moisture removal unit can be used in the production of liquid natural gas (LNG). For example, a method can include: compressing a refrigerant; conveying at least a portion of the refrigerant to a moisture removal unit comprising a desiccant to form dehydrated refrigerant; cooling and condensing the dehydrated refrigerant to provide a cooled dehydrated liquid refrigerant; conveying the cooled dehydrated refrigerant to a heat exchanger; and passing a LNG stream rich in methane through the heat exchanger to cool at least part of the LNG stream by indirect heat exchange with the cooled dehydrated refrigerant.

10. AN APPARATUS AND SYSTEM FOR PRODUCING LNG PRODUCTS AND RECOVERING REFRIGERATION FROM FLASH GAS

Authors: Chen Fei, Christopher Michael Ott, Annemarie Ott Weist, Mark Julian Roberts
Publication number: 211041576
Publication date: 17.07.2020
Abstract:

Apparatus and systems for producing LNG products and recovering refrigeration from flash gases are described herein. The methods and systems use an apparatus to separate a flash gas from a liquefied natural gas (LNG) stream to produce an LNG product and recover refrigeration from the flash gas. The apparatus includes a housing enclosure surrounding a heat exchange zone and a separation zone, the heat exchange zone including a coil wound heat exchanger. The heat exchange zone is located above the separation zone and is in fluid flow communication with the separation zone. The flash gas is separated from the LNG product in the separation zone and flows upward from the separation zone into the heat exchange zone where refrigeration is recovered from the separated flash gas.

1.3. Оборудование / Equipment

1.3.1. Статьи / Articles

1. IMPACT OF NEGATIVE FACTORS ON PERFORMANCE OF CRYOGENIC UNIT OF LNG GAS-TURBINE ENGINE FUEL SYSTEM

Authors: Arkharov, I. A., Navasardyan, E. S., Krotov, A. S., Samokhvalov, Ya. V.
Journal: Chemical and petroleum engineering, volume: 56, number: 5-6, pp.: 351-359
DOI: 10.1007/s10556-020-00780-1
Abstract:

LNG gas-turbine engines have several advantages over diesel engines: capacity to develop higher power with smaller weight and size, lower fuel price, environment friendliness, etc. At the same time, this type of engines is characterized by low efficiency at insufficient load and high idle-run fuel consumption. A part of the energy losses under these conditions occurs in the cryogenic unit of the LNG gas-turbine engine fuel system. Schematic diagrams and characteristic features of the cryogenic unit of the LNG gas-turbine engine are presented. Schemes of LNG delivery with vapor-pressurization, sparging of the tank with an external noncondensing gas, and use of pumps are described. The impact on the fuel system performance of such factors as fuel delivery mode, LNG flow return, restraining temperature of the delivered LNG, variation of LNG composition, etc. are investigated. The criteria of efficiency of the system in start, main, and idle modes are calculated by mathematical modeling method.

1.3.2. Патенты / Patents

2. УСТАНОВКА ДЛЯ РЕДУЦИРОВАНИЯ ГАЗА И ПОЛУЧЕНИЯ СЖИЖЕННОГО ПРИРОДНОГО ГАЗА

Автор: Курочкин А.В.
Номер публикации: 0002746775
Дата публикации: 18.09.2020
Аннотация:

Предложена установка для редуцирования газа и получения сжиженного природного газа (СПГ), включающая блоки осушки и очистки газа, предварительный и основной теплообменники, сепаратор, первый и второй детандеры и компрессор, соединенные между собой, где в качестве компрессора установлен компрессор холодильной машины, линия осушенного природного газа высокого давления разделена на по меньшей мере одну линию вспомогательного газа, линии основного и вспомогательного технологического газа и линию продукционного газа, на которой последовательно расположены первая секция предварительного теплообменника, блок очистки, вторая секция предварительного теплообменника, основной теплообменник, первый детандер и сепаратор, оснащенный линией вывода СПГ и линией обратного газа с основным теплообменником, на линии основного технологического газа расположены первый испаритель холодильной машины, соединение с линией вспомогательного технологического газа, оснащенной вспомогательным холодильником, второй детандер и соединение с линией обратного газа, а на образованной этими линиями линии газа низкого давления расположен предварительный теплообменник, при этом вспомогательный холодильник расположен также на по меньшей мере одной линии вспомогательного газа, оснащенной вспомогательным детандером и вторым испарителем холодильной машины. Технический результат - увеличение выхода СПГ за счет снижения температуры продукционного газа путем установки испарителя компрессионной холодильной машины на линии технологического газа и возможность отбора газа несколькими потребителями при разных давлениях за счет установки вспомогательных линий отбора газа.

3. УСТАНОВКА НИЗКОТЕМПЕРАТУРНОГО ФРАКЦИОНИРОВАНИЯ ДЛЯ ДЕЭТАНИЗАЦИИ МАГИСТРАЛЬНОГО ГАЗА С ВЫРАБОТКОЙ СПГ. LOW-TEMPERATURE FRACTIONATION UNIT FOR DEETHANIZATION OF MAIN GAS WITH GENERATION OF LNG

Автор: Курочкин А.В.
Номер публикации: 0002731709
Дата публикации: 08.09.2020
Аннотация:

Изобретение относится к оборудованию для получения газа низкого давления и сжиженных углеводородных газов за счет использования перепада давления между магистральным и распределительным трубопроводами природного газа. Предложена установка, включающая рекуперативный теплообменник, фракционирующую колонну с верхней и нижней теплообменными секциями, редуцирующие устройства, блок фракционирования, теплообменник и сепаратор. При работе установки газ высокого давления осушают и разделяют на два потока, первый поток подают в нижнюю теплообменную секцию колонны в качестве теплоносителя, смешивают со вторым потоком, охлажденным в теплообменнике, и направляют в среднюю часть колонны, с низа которой деметанизированный конденсат подают в блок фракционирования, из которого выводят фракции углеводородов С2+ в заданном ассортименте, при этом в блок фракционирования в качестве хладагента вводят/выводят часть газа низкого давления или часть деэтанизированного газа. Деэтанизированный газ, выводимый с верха колонны, охлаждают в теплообменнике, редуцируют и разделяют в сепараторе на СПГ и газ низкого давления, который в качестве хладагента подают в теплообменник, верхнюю теплообменную секцию, рекуперативный теплообменник и выводят. Технический результат - выработка СПГ, увеличение выхода углеводородов С2+ и исключение использования сторонних источников низкотемпературного холода.

Author: Kurochkin A.V.
Publication number: 0002731709
Publication date: 08.09.2020
Abstract:

FIELD: gas industry.

SUBSTANCE: invention relates to equipment for production of low-pressure gas and liquefied hydrocarbon gases due to use of differential pressure between main and distributing pipelines of natural gas. Disclosed is an apparatus which includes a recuperative heat exchanger, a fractionating tower with upper and lower heat exchange sections, reducing devices, a fractionation unit, a heat exchanger and a separator. During operation of the plant, high-pressure gas is dried and separated into two streams, the first flow is fed into the lower heat exchange section of the column as the heat carrier, mixed with the second flow cooled in the heat exchanger, and directed to the middle part of the column, from the bottom of which the demethanized condensate is fed into a fractionation unit, from which hydrocarbon C2+ fractions are withdrawn in a given range, note here that part of low-pressure gas or part of de-ethanized gas is added to fractionator as cooling agent. De-ethanized gas coming from the top of the column is cooled in a heat exchanger, reduced and separated in a separator into LNG and low pressure gas, which is supplied as a cooling agent into a heat exchanger, an upper heat exchange section, a recuperative heat exchanger and discharged.

EFFECT: production of LNG, high output of hydrocarbons C2+ and elimination of use of external sources of low-temperature cold.

4. NOVEL EVAPORATOR FOR EVAPORATING N2 IN LNG PRODUCT

Authors: Jia Xuewen, Han Ze, Li Jingyuan
Publication number: 211462088
Publication date: 11.09.2020
Abstract:

The utility model discloses a novel evaporator for evaporating N2 in an LNG product. The liquid level meter comprises a channel I, a channel II, a liquid level meter upper connector, a liquid level meter lower connector, a refrigerant inlet pipe, a refrigerant outlet pipe and an LNG outlet. The refrigerant inlet pipe is connected with a channel II; the liquid level meter upper interface is connected with a channel I; the refrigerant outlet pipe is connected with a channel II; a refrigerant outlet pipe is connected with a channel II, an LNG outlet is connected with a channel I, a liquidometer lower connector is connected with the channel I, a steel-aluminum connector is arranged at the joint of the channel II and the channel I for transition, an aluminum plate-fin heat exchanger is arrangedin the channel II, the working temperature of the channel I ranges from-110 DEG C to-90 DEG C, and the working temperature of the channel II ranges from-110 DEG C to-90 DEG C; according to the utility model, the device is used, according to the method, the content of nitrogen in the LNG is controlled to be very low, so that gas evaporation is reduced in the transportation process, the safety of the LNG in the transportation process is guaranteed, meanwhile, the heat value of the LNG is increased, the storage safety of the LNG is improved, and meanwhile, the pollution of emission of hydrocarbon substances evaporated from the LNG to the atmosphere is also reduced.

5. NOVEL LNG LARGE-VOLUME GAS CYLINDER

Authors: Cui Wentian, Lian Zhao, Zheng Liping
Publication number: 111637360
Publication date: 08.09.2020
Abstract:

The invention discloses a novel LNG large-volume gas cylinder which comprises a base. A cylinder body is placed at the top of the base, and ribbon assemblies are placed on the two sides of the top ofthe cylinder body. The bottoms of the ribbon assemblies are in threaded connection with the base through bolts. The left side of the cylinder body communicates with a pipeline system, and the end, away from the cylinder body, of the pipeline system communicates with an engine. The volume of the cylinder body is 1640 L, and the surface of the cylinder body is fixedly connected with a caution label.The novel LNG large-volume gas cylinder is easy to demount and mount, simple in structure and low in weight, and a protection cover is hinged to a front sealing head of the cylinder body; according to the novel design of the cylinder body, 1640 L of liquefied natural gas can be contained, that is, when a heavy truck carries out long-distance transportation, the problem that drivers are worried that when natural gas fuel is about to be used up, certain drivers are afraid to turn on air conditioners for cooling in summer due to worry out the insufficient fuel can be effectively solved; an according to the novel LNG large-volume gas cylinder, the worries of the drivers can be effectively solved, and great convenience is brought to use by a user.

1.3.3. Материалы конференций / Conference Papers

6. DEVELOPMENTS IN GAS-TO-LIQUIDS TECHNOLOGY PLANT OPTIMISATION FOR EFFICIENT UTILISATION OF FLARED NATURAL GAS IN THE NIGER DELTA

Author: Stanley Ekwueme; Chinedu Izuwa; Jude Odo; Ubanozie Obibuike; Nnaemeka Ohia; Ngozi Nwogu
Conference: SPE Nigeria Annual International Conference and Exhibition, Virtual, August 2020
Abstract:

Research show that among GTL units, the syngas unit is the most costly. This is due to its high energy consumption, construction cost and complexity of configuration. Autothermal reforming (ATR) method which uses oxygen has been traditionally used in commercial GTL plants. This method is noted with high cost and high CO2 emissions. To optimize GTL plant, it is crucial to provide an alternative method that will reduce the total cost of the process, yield higher volumes of GTL liquids at minimal emissions. A new method is provided in this work. The method uses CO2 instead of O2 in a steam/CO2 reforming process as alternative to the autothermal reforming. The GTL plant is configured to utilize the CO2 in the raw natural gas stream and in the effluent (flue) gas, additional CO2 is gotten from natural gas processing onsite. The new GTL method is more cost effective, has potential for higher yields of desirable GTL products than the ATR syngas GTL method due to better H2/CO ratio.

II. Хранение / Storage

2.1. Резервуары / Containment Systems

2.1.1 Патенты / Patents

1. LNG STORAGE TANK CONVENIENT TO TAKE

Author: Shu Changzheng
Publication number: 211475484
Publication date: 11.09.2020
Abstract:

The utility model discloses an LNG storage tank convenient to take. The stirring tank comprises an outer tank body, an inner tank body, a feeding hole and a clamping block, an air blower is arranged on the right side of the outer tank body; a first ventilation pipe is arranged on the left side of the air blower; a cooling chamber is arranged on the left side of the first ventilation pipe; a condenser is arranged in the cooling chamber; a second ventilation pipe is arranged above the cooling chamber; the cooling chamber is arranged on the right side of the outer tank body, air outlets are formed in the two sides of the lower portion of the second ventilation pipe and penetrate through the upper portion of the outer tank body, the inner tank body is arranged in the outer tank body, a discharging pipe is arranged on the lower portion of the inner tank body, and a threaded cover is arranged at the tail end of the left side of the discharging pipe. According to the LNG storage tank convenient to take, the air blower and the condenser are arranged, wind power generated by the air blower is blown into the cooling chamber through the first ventilation pipe, the condenser can refrigerate the wind power generated by the air blower, and cold air is blown into the outer tank body through the air outlet to refrigerate the inner tank body.

2. LNG STORAGE TANK CONVENIENT TO MOVE

Author: Shu Changzheng
Publication number: 211423974
Publication date: 04.09.2020
Abstract:

The utility model discloses an LNG storage tank convenient to move. The storage tank comprises an LNG storage tank body, a second fixing base, a clamping rod and a pulley. A first fixing base is arranged in the middle of the lower side of the LNG storage tank body. The supporting base is arranged on the lower side of the first fixing base. The supporting base is connected with a buffer block through a first reset spring. The second fixing bases are arranged at the two ends of the lower side of the LNG storage tank body. The clamping rod penetrates through the rotating block, the movable block is arranged in a second fixing base, the second fixing base is connected with the movable block through a second reset spring, the sliding block is arranged on the inner side of the sliding groove, the pulley is arranged in the rotating block, and third reset springs are arranged on the upper side and the lower side of the two ends of the rotating shaft. According to the LNG storage tank convenient to move, the rotating shaft performs telescopic motion with the rotating block through the third reset spring, so that the LNG storage tank main body is conveniently buffered, and meanwhile, theinfluence of vibration on the LNG storage tank main body is reduced.

3. LNG STORAGE TANK IS USED FOR STORING GAS IN DIFFERENT QUALITIES

Authors: Chen Ruiying, Jiang Xiaxue, Chen Feng, Peng Yanjian, An Dongyu, Sun Yajuan, Lyu Mengyun
Publication number: 211010763
Publication date: 14.07.2020
Abstract:

The utility model discloses an LNG (Liquefied Natural Gas) storage tank for storing different gas qualities. The LNG storage tank comprises an outer tank, an inner tank, a cold insulation layer and apipeline system. The inner tank is arranged in the outer tank; the cold insulation layer is arranged between the outer tank and the inner tank; the inner tank is divided into a lean group molecular tank and a rich group molecular tank through a nickel steel plate; the pipeline system comprises a discharging pipeline, an outward conveying pipeline and a BOG pipeline. Discharging pipelines are respectively arranged in the lean group molecular tank and the rich group molecular tank, and outward conveying pipelines are respectively arranged in the lean group molecular tank and the rich group molecular tank; the output pipeline is used for outputting the LNG through a low-pressure pump; the BOG pipeline penetrates through the tops of the outer tank and the inner tank, so that a gas phase spacebetween the lean group molecular tank and the rich group molecular tank is communicated. According to the utility model, lean components and rich components are separately stored, so that compared with the traditional type, the storage device has the advantages of being safer and more convenient.

3.2.2. Отгрузочные операции / Discharge Operations

2.2.1 Патенты / Patents

1. LIQUEFIED NATURAL GAS LNG UNLOADING SYSTEM

Authors: Song Xudong, Liu Hang, He Leng, Hu Min, Liu Jinlong, Chen Yuci, Gong Fangzhou, Dang Huaiqiang, Li Yuyu, Chen Xiaodan, Wang Minjuan
Publication number: 211232396
Publication date: 11.08.2020
Abstract:

The utility model provides a liquefied natural gas (LNG) unloading system. The LNG unloading system comprises an LNG tank car, an LNG unloading device and a control device, the LNG unloading arm is connected with the LNG tank car; an LNG storage tank; the LNG low-temperature pump is connected with the LNG storage tank; the BOG recovery system is connected with the LNG unloading arm; the air temperature gasifier is connected with the BOG recovery system; compared with the prior art, the LNG low-temperature pump is characterized in that the LNG low-temperature pump directly pumps LNG in the LNGtank car through the LNG unloading arm and is connected with the LNG storage tank, and the LNG in the tank car is directly conveyed to the LNG storage tank to be stored. On the premise that the safetyrisk is reduced, the problem that an existing LNG unloading system is too complex in operation is solved, BOG is fully recycled, and the maintenance cost of the LNG receiving device is reduced.

2. СУДНО ДЛЯ ТРАНСПОРТИРОВКИ СЖИЖЕННОГО ПРИРОДНОГО ГАЗА И СПОСОБ ЕГО СТРОИТЕЛЬСТВА. SHIP FOR TRANSPORTATION OF LIQUEFIED NATURAL GAS AND METHOD OF ITS CONSTRUCTION

Авторы: Александров А.В., Крыжевич Г.Б., Шапошников В.М.
Номер публикации: 0002727768
Дата публикации: 23.07.2020
Аннотация:

Изобретение относится к области транспортного судостроения, средствам морской транспортировки и хранения сжиженного природного газа (СПГ) и касается вопроса создания судна-газовоза и грузовой емкости для транспортировки и хранения СПГ. Предложено судно для транспортировки СПГ, включающее установленные на корпусе с помощью податливых опор емкости для хранения и транспортировки СПГ, содержащие термоизолированные оболочки, состоящие из нескольких слоев, по меньшей мере два из которых являются металлическими и герметичными, причем один из них находится в контакте со сжиженным газом и подкреплен набором и переборками, причем металлические герметичные слои выполнены из соединенных сваркой полых алюминиевых панелей с образованием многослойной оболочки, при этом многослойная оболочка образует совместно с соединенными с ней набором и переборками прочную конструкцию емкости, а между корпусом судна и прочной конструкцией емкости расположена многослойная теплоизоляция из легкодеформируемых элементов с полыми областями. Также предложен способ строительства судна-газовоза с грузовыми емкостями для СПГ. Технический результат заключается в повышении прочности и эксплуатационной надежности грузовой емкости для транспортировки и хранения СПГ, уменьшении вероятности нарушения ее герметичности, сокращении продолжительности строительства судна-газовоза и затрат на него.

Authors: Aleksandrov A.V., Kryzhevich G.B., Shaposhnikov V. M.
Publication number: 0002727768
Publication date: 23.07.2020
Abstract:

FIELD: shipbuilding.
SUBSTANCE: invention relates to the field of transport shipbuilding, means of marine transportation and storage of liquefied natural gas (LNG) and concerns creation of a gas carrier vessel and cargo container for transportation and storage of LNG. Disclosed is a vessel for LNG transportation, comprising LNG storage and transportation containers installed on housing by means of pliable supports, comprising heat insulated shells consisting of several layers, at least two of which are metal and sealed, wherein one of them is in contact with liquefied gas and is supported by the set and bulkheads, wherein the metal sealed layers are made of hollow aluminum panels welded together to form a multilayer shell, wherein the multilayer shell together with the set and bulkheads connected to it form a strong container structure, and between ship hull and strong vessel structure is multilayer heat insulation from easily deformed elements with hollow areas. Also disclosed is a method of constructing a gas carrier vessel with cargo tanks for LNG.
EFFECT: technical result consists in improvement of strength and operational reliability of cargo container for transportation and storage of LNG, reduced probability of its leakage, reduced duration of construction of vessel and cost of gas carrier.

3. LNG LIQUEFIED NATURAL GAS TRANSMISSION CONNECTING DEVICE

Authors: Xiao Guisheng, Zhang Limin, Li Zhu, Wang Zhong
Publication number: 210978878
Publication date: 10.07.2020

Abstract:

The utility model relates to the technical field of liquefied natural gas transmission. The utility model further discloses an LNG liquefied natural gas transmission connecting device. Gas conveying pipe, one end of the gas conveying pipe is fixedly connected with a spray head; the outer wall of the spray head is fixedly connected with a first sealing ring; the front surface of the first sealing ring is fixedly connected with a first non-slip mat; a base is fixedly connected to the outer wall of the air conveying pipe, a grip is fixedly connected to the top of the base, a second anti-skid padis fixedly connected to the outer wall of the air conveying pipe, a first anti-skid groove is formed in the top of the second anti-skid pad, and a buffer pad is movably connected to the inner wall ofthe air conveying pipe. The utility model discloses an LNG liquefied natural gas transmission connecting device. According to the LNG liquefied natural gas transmission connecting device, the purposeof being convenient to open and close can be achieved, the problem that a common LNG liquefied natural gas transmission connecting device is difficult to open and close is solved, a worker can rapidlyopen and close the gas transmission connecting device, and therefore the working efficiency of the worker is improved, and the practicability of the gas transmission connecting device is improved.

III. Регазификация / Regasification

3.1. Статьи / Articles

1. ENERGY INTEGRATION OF LNG LIGHT HYDROCARBON RECOVERY AND AIR SEPARATION: PROCESS DESIGN AND TECHNIC-ECONOMIC ANALYSIS

Authors: Ruihang Zhanga, Chufan Wub, Wuwenjie Songb, Chun Denga, Minbo Yangc
Journal: Energy, volume: 207
DOI: 10.1016/j.energy.2020.118328
Abstract:

Liquefied natural gas (LNG) regasification process releases much cold energy, and LNG contains light hydrocarbon with high added value. The utilization of LNG cold energy and recovery of light hydrocarbon has been a research hotspot. In this paper, an energy integrated process of air separation and light hydrocarbon recovery driven by LNG cold energy is proposed. HYSYS is used to model and simulate the energy integrated process. For technical and economic analysis, cold energy utilization ratio (CUR), ethane recovery ratio (ERR) and partial annualized cost (PAC) are selected as the optimization objectives. Sensitivity analysis is conducted to investigate the influence trend of nine process parameters on optimization objectives. Next, a multi-objective model is introduced, and a genetic algorithm is used in multi-objective optimization. Finally, a compromised optimization scenario is determined based on three optimization objectives. The optimal key process conditions are determined: the temperature of stream L2 (outlet stream of air separation unit) is −129.6 °C, the temperature of stream L3 (outlet stream of demethanizer condenser) is −106.8 °C, and the vapor fraction of stream L4 (feed stream of demethanizer) is 0.6430. Results show that the CUR reaches 67.05%, ERR is 99.76%, and PAC is 3.144 × 107 USD/year.

2. ADVANCED INTEGRATION OF LNG REGASIFICATION POWER PLANT WITH LIQUID AIR ENERGY STORAGE: ENHANCEMENTS IN FLEXIBILITY, SAFETY, AND POWER GENERATION

Authors: Qi M., Park J., Kim J., Lee I., Moon I.
Journal: Applied energy, volume: 269
DOI: 10.1016/j.apenergy.2020.115049
Abstract:

Power plants for regasification of liquefied natural gas (LNG), integrated with liquid air energy storage (LAES), have benefits in terms of power generation flexibility to match the electricity demand profiles and increased operating profits from electricity arbitrage. However, issues with the flexibility and safety of this integration still remain. In addition, further improvements in power generation were identified from the use of high-grade LNG cold energy in LAES. Thus, this paper proposes a novel and advanced integration (denoted as LNG-LAES) for enhancements in flexibility, safety, and power generation. LNG is re-gasified in two different manners: it flows into a parallel two-stage regenerative Rankine cycle for conventional power generation during peak times or transfers high-grade cold energy to LAES for energy storage during off-peak times. Pressures of LNG vaporization and liquid air storage are minimized to 7 and 0.15 MPa to achieve an inherently safer design. The process assessment is performed considering possible demand and marketing scenarios, in which the LNG-LAES process exhibits the best performance in terms of power generation and economic benefits. In the base-case, the specific daily net power output increases up to 94.8 kJ/kg(LNG) and the electrical round trip efficiency of LAES achieves 129.2%. Moreover, the LNG-LAES process has design flexibility that the amount of LNG cold energy utilized in LAES can be varied at the design stage to maximize the operating profit corresponding to a specific electricity market scenario. The analyzes demonstrate that the proposed LNG-LAES process is both technically feasible and economically preferable for industrial applications.

3. INTEGRATION OF LNG REGASIFICATION PROCESS IN NATURAL GAS-FIRED POWER SYSTEM WITH OXY-FUEL COMBUSTION

Authors: Liu R., Xiong YQ, Ke LY, Liang JC, Chen DJ, Zhao ZX, Li YJ
Journal: Journal of thermal science
DOI: 10.1007/s11630-020-1326-y
Abstract:

Oxy-fuel combustion power systems can utilize the cold energy released during the liquefied natural gas (LNG) regasification to reduce the power consumption of CO2 capture, but the specific LNG cold energy consumption of CO2 capture is still too large. To recover more CO2 with the limited LNG cold energy at a low energy cost, a novel natural gas-fired oxy-fuel power system with the cascade utilization of LNG cold energy is proposed in this work, where the LNG cold energy could be sequentially utilized in the air separation unit and the CO2 recovery process. The new system is evaluated with the Aspen Plus software. The results show that the net electrical efficiency and the specific primary energy consumption for CO2 avoided (SPECCA) of the new system are comparable to those of the chemical looping combustion cycle, and superior to those of the conventional O-2/CO2 cycles. Moreover, the specific LNG needed for CO2 avoided (SLNCC) of the new system is more than 67.2% lower than the existing oxy-fuel power systems utilizing the LNG cold energy. Furthermore, it is found that the O-2 purity of 97.0 mol.% and the CO2 capture ratio of 97.0% are optimal conditions, because the SPECCA, the specific exergy consumption for CO2 avoided (SECCA) and the SLNCC are at the minimum of 1.87 GJ(LHV center dot tCO2)(-1), 2.60 GJ center dot t(CO2)(-1) and 1.88 t(LNG)center dot t(CO2)(-1), respectively. Meanwhile, the net electrical efficiency and the exergy efficiency of the new system reach 51.51% and 49.23%, respectively.

4. ENERGY INTEGRATION OF LNG LIGHT HYDROCARBON RECOVERY AND AIR SEPARATION: PROCESS DESIGN AND TECHNIC-ECONOMIC ANALYSIS

Authors: Zhang RH, Wu CF, Song WWJ, Deng C., Yang MB
Journal: Energy, volume: 207
DOI: 10.1016/j.energy.2020.118328
Abstract:

Liquefied natural gas (LNG) regasification process releases much cold energy, and LNG contains light hydrocarbon with high added value. The utilization of LNG cold energy and recovery of light hydrocarbon has been a research hotspot. In this paper, an energy integrated process of air separation and light hydrocarbon recovery driven by LNG cold energy is proposed. HYSYS is used to model and simulate the energy integrated process. For technical and economic analysis, cold energy utilization ratio (CUR), ethane recovery ratio (ERR) and partial annualized cost (PAC) are selected as the optimization objectives. Sensitivity analysis is conducted to investigate the influence trend of nine process parameters on optimization objectives. Next, a multi-objective model is introduced, and a genetic algorithm is used in multi-objective optimization. Finally, a compromised optimization scenario is determined based on three optimization objectives. The optimal key process conditions are determined: the temperature of stream L-2 (outlet stream of air separation unit) is -129.6 degrees C, the temperature of stream L-3 (outlet stream of demethanizer condenser) is -106.8 degrees C, and the vapor fraction of stream L-4 (feed stream of demethanizer) is 0.6430. Results show that the CUR reaches 67.05%, ERR is 99.76%, and PAC is 3.144 x 10(7) USD/year. (C) 2020 Elsevier Ltd. All rights reserved.

IV.Инфраструктурные решения / Infrastructure Solutions

4.1. Статьи / Articles

1. THERES LIGHT ON THE HORIZON

Authors: Jane K.G. Kristiansen, Tonje Sunde
Journal: LNG Industry, Jule 2020
Abstract:

Africa represents a large commercial opportunity for LNG, given the size of its population, rising living standards, energy demand outlook, and shift towards cleaner energy sources. It is common knowledge that sub-Saharan Africa suffers from power blackouts, and being a very large and diverse region made up of countries that have different natural resources, policies, and challenges, a ‘quick fix’ could be coined as fantasy, even though the drive and determination demonstrated by local businesses to solve Africa’s energy crisis is strong.South Africa, with a population of approximately 57 million, is pushing to diversify its energy sources away from coal. Notable market trends in this country include urbanisation and sustainability. Populations are shifting from rural to urban areas, putting an extra strain on local governments and their obligation to maintain and upgrade key infrastructure, such as the electricity distribution system. Given the long and inconvenient history of power shortages, LNG has the ability to transform the South African economy, supporting industrialisation, reducing reliance on inefficient, ageing coal plants, and contributing to regional trade.

4.2. Материалы конференций / Conference Papers

2. THE NIGERIA GAS LANDSCAPE: IMPLICATIONS FOR ECONOMIC DEVELOPMENT

Authors: Kaase Gbakon; Lolo Ojaraida
Conference: SPE Nigeria Annual International Conference and Exhibition, Virtual, August 2020
Abstract:

The gas supply system in Nigeria is today skewed to favour exports over domestic utilization, thus leaving unfulfilled what have always been the twin objectives of Nigeria's gas policies–robust foreign exchange earner and stimulation of the national economy. So far as this review has shown, neither of these objectives has been achieved – yet. FG earnings from export oriented NLNG at $43Billion in the last twenty years is about the same quantum that is on average distributed annually to the states via the Federal Allocation Accounts Committee (FAAC). While domestic gas supply is sufficient to generate only 16W of power per Capita – the lowest in a peer comparison of select African countries.

However, it has not always been the case that gas enjoyed a prime focus in the energy policy framework of Nigeria as it does today. Gas is receiving increasingly more attention as noted by deliberate policy actions taken at various times – the enactment of the NLNG fiscal act in 1989, introduction of the Associated Gas Framework Agreement (AGFA) provision in the PPTA in 1998, the incentives for gas utilization projects in the Corporate Income Tax Act (CITA) introduced in 1998 and 1999, Gas Pricing policy of 2008, the National Gas Policy framework of 2016 and more recently the Flare Gas Regulations of 2018 – all targeted at the different components of the gas value chain – upstream production, market sector development, pricing, off-take, and related downstream utilization.

Global increase in natural gas utilization rides on the back of geopolitical dynamics such as climate change action, growth in emerging economies, and increased US shale gas production. Contextualizing Nigeria's gas polices against the wider canvass of geopolitical concerns which include the interplay with Nigeria's energy security suggests that Nigeria will have to take deliberate policy steps – from upstream gas fiscal terms reforms, through to pricing reform, project prioritization, strategic gas portfolio allocation to refocus effort on channelling gas to deliver a "harder domestic punch."

V. Морские технологии / Offshore Technology

5.1. Статьи / Articles

1. СОВЕРШЕНСТВОВАНИЕ КОНСТРУКЦИЙ СУДОВ ДЛЯ ТРАНСПОРТИРОВКИ СЖИЖЕННОГО ПРИРОДНОГО ГАЗА

Автор: Крыжевич Г.Б.
Журнал: Морские интеллектуальные технологии, номер: 3-1 (49), стр.: 84-89
УДК: 621.642
Аннотация:

Представлены результаты разработок, направленных на повышение надежности и экономической эффективности судов для перевозки сжиженного природного газа (СПГ) за счет рационализации конструкции и технологии строительства. Целью данной работы является поиск архитектурно-конструктивных и технологических решений для газовоза с вкладными ёмкостями, обеспечивающих (по сравнению с известными решениями) повышение прочности и надежности грузовой емкости для транспортировки и хранения сжиженного газа, уменьшение вероятности нарушения ее герметичности, сокращение затрат на строительство газовоза и его продолжительности. Для достижения этой цели выполнены следующие работы: • проанализированы различные виды традиционных архитектурно-конструктивных решений для судов-газовозов; • выявлены преимущества и недостатки традиционных решений; • предложены принципиально новые архитектурно-конструктивные решения; • описаны особенности работы предложенных конструкций в составе судна и обоснована их эффективность. Для совершенствования газовозов предложены следующие новые технические решения: • ёмкость для транспортировки и хранения СПГ в виде многослойной термоизолированной оболочки предлагается выполнять из полых алюминиевых панелей, образующих совместно с набором и переборками прочную конструкцию ёмкости с не менее чем двумя герметичными барьерами; • теплоизоляцию емкостей предлагается выполнять из многослойных полых податливых панелей из полимерного композиционного материала (например, из стеклопластика); • установку прочных конструкций емкостей выполнять с деформированием элементов теплоизоляции и с образованием натяга в соединении этих конструкций с теплоизоляцией; • строительство судов-газовозов предлагается осуществлять путем параллельного изготовления корпуса судна, прочных конструкций грузовых емкостей и конструкций теплоизоляции, а затем производить монтаж на корпусе крупных блоков теплоизоляции в отсеках судна, после чего производить вставку прочных конструкций емкостей в отсеки судна.

2. IMPROVING LNG CARRIER COMMERCIAL PERFORMANCE

Authors: Maksym Kulitsa, David Wood
Journal: LNG Industry, Jule 2020
Abstract:

Modern trends in LNG shipping technology have led to the emergence of a new generation of LNG carriers that are not steam-powered. Today, there are several alternative efficient technologies including: dualfuel diesel electric (DFDE, TFDE), main engine gas injection (MEGI), and slow speed diesel (X-DF). These new types of LNG carriers achieve lower unit costs for LNG compared to oldsteam vessels. Charterers typically prefer to hire vessels that consume the least possible LNG as fuel during transport, in order to maximise commercial benefit. Despite welldeveloped technology, there remain areas where additional efficiency improvements can be made.

5.2. Патенты / Patents

3. MARINE STRUCTURE HAVING LNG REGASIFICATION SYSTEM AND MANUFACTURING METHOD THEREOF

Authors: Nam Byung Tak, Oh Hyeong Rim, Park Chae Soo, Hwang Jae Hyun, Bang Jung Hoon
Publication number: 1020200094424
Publication date: 07.08.2020
Abstract:

The present invention relates to a marine structure having an LNG regasification system and a manufacturing method thereof, wherein the marine structure having the LNG regasification system manufactures a regasification boiler generating steam required for regasifying LNG and additional equipment in accordance therewith in one module shape, thereby easily installing the regasification boiler and the additional equipment on the conventionally constructed marine structure and securing structural stability.

5.3. Материалы конференций / Conference Papers

4. THE PROPANE-FUELED SHIP

Author: Darren Grant Monzingo
Conference: SNAME Maritime Convention, Virtual, September 2020
Abstract:

Gaseous fuels have been the subject of intensifying interest from the marine industry over the past decade. Spurred by rapidly changing economic and political landscapes, vessel owners and operators are driven to find new ways to balance operating costs with environmental impact. As we adopt new technologies toward this goal, our knowledge base on gaseous fuels has been dominated by considerations relevant only to LNG. Advances in prime mover technology and changes in domestic energy production have made Propane a viable fuel option for a much broader range of vessel sizes and power outputs. To help level the field, this paper presents a comparison between LNG and Propane as shipboard fuels.

VI. Безопасность / Safety

6.1. Статьи / Articles

1. АНАЛИТИЧЕСКИЙ ОБЗОР СРЕДСТВ ОБЕСПЕЧЕНИЯ ПОЖАРНОЙ БЕЗОПАСНОСТИ ПРИ РАБОТАХ СО СЖИЖЕННЫМИ ГОРЮЧИМИ ГАЗАМИ

Авторы: Чугуев А.П., Мордвинова А.В., Сычев А.Н., Федоринов М.В.
Журнал: Актуальные вопросы пожарной безопасности, номер: 3 (5), стр.: 25-29
УДК: 614.842.6
Аннотация:

Расширение производств сжиженных горючих газов и в значительном объеме сжиженного природного газа, направленное на обеспечение энергобезопасности страны, требует повышения уровня обеспечения пожарной безопасности производства и использования сжиженных горючих газов. В этой связи в целях совершенствования пожарной безопасности в работе проведен анализ данных новых научных исследований, отечественных и зарубежных стандартов по обеспечению безопасности при обращении с сжиженными горючими газами, способных содействовать решению задач предотвращения и ликвидации аварий с пожарами сжиженных горючих газов.

2. BRAINS NOT BRAWN

Author: Teijo Karna
Journal: LNG Industry, September 2020
Abstract:

As in any sector of the petrochemical industry, ensuring the reliable operationof rotating machinery in the LNG industry is not a trivial task. Pumps, inparticular, play an indispensable role in compressing gas to convert it into aliquid for efficient transportation and storage. In addition to pumps, air cooled heatexchangers play a very important role. An average LNG train has 150 - 200 air cooledheat exchangers typically ranging from 22 - 45 kW. They are often difficult to access soremote monitoring is ideal in this application. Monitoring the condition and performance of pump applications in these extreme operating conditions, often in hazardous areas, is a costly and time-consuming activity. Generally based on a preventive maintenance philosophy, condition monitoring requiresmaintenance teams to manually gather data, analyse it, and generate status reports. Thisdata is critical to preventing unplanned downtime and production losses, as it offers an insight into the health ofequipment. Thanks to recent developments, the safety risksassociated with data gathering in hazardous areas have nowbeen greatly reduced with a new generation of wirelesssmart sensors. These sensors enable operators to remotely monitor the health and performance of assets such as motorsand pumps, to help predict incipient failure.

6.2. Патенты / Patents

3. LNG STORAGE TANK ACCIDENT RESCUE SYSTEM

Authors: Yue Lei, Song Yihong, Chen Lijuan
Publication number: 111678038
Publication date: 18.09.2020
Abstract:

The invention provides an LNG storage tank accident rescue system. The system comprises a liquid nitrogen storage tank used for storing liquid nitrogen, a top nitrogen injection device used for controlling top boiling of an LNG storage tank, an external nitrogen spraying device used for controlling external fire of the LNG storage tank, a cofferdam nitrogen spraying device used for controlling liquid leakage of the LNG storage tank and a bottom nitrogen injection device used for controlling bottom boiling of the LNG storage tank. The top nitrogen injection device, the external nitrogen spraying device, the cofferdam nitrogen spraying device and the bottom nitrogen injection device are respectively connected with a liquid nitrogen storage tank. The LNG storage tank accident rescue system can effectively prevent LNG from boiling by using low-temperature liquid nitrogen, has obvious rescue effects on LNG storage tank accidents such as LNG leakage, storage tank ignition and the like, and can prevent the expansion of LNG storage tank accident influences.