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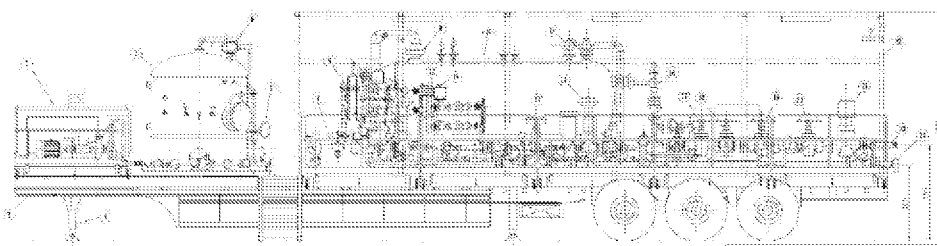
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(54) Title: PORTABLE SYSTEM FOR CRUDE OIL PRIMARY PROCESSING FOCUSED ON OIL WELLS



[Fig. 1]

(57) Abstract: The invention of a mobile package for primary oil processing is designed to prevent the burning of oil and to preserve the environment, taking into account the concerns of the Ministry of Petroleum to prevent the burning of oil in wells. This device includes various equipment required for processing oil at the wellhead, such as separators, desanders, descalers, surge tanks, oil transfer pumps, data collection systems, laboratories, chemical injection pumps, air supply units, nitrogen generator capsules, power generators, etc. It is deployed at the wellhead for various drilling, production, and maintenance operations. The impure and contaminated oil is purified and refined after passing through this device and is pumped to factories and operating stations through pipelines. In the absence of this device, contaminated oil from drilling, production, and maintenance operations must be burned, which leads to environmental problems and significant economic losses for the country.



Description

Title of Invention: Portable System for Crude Oil Primary Processing Focused on Oil Wells

[0001] The mobile package for primary oil processing has been developed as a groundbreaking solution to address the environmental challenges associated with oil burning at wellheads. This innovative device has been designed closely with the Ministry of Petroleum to align with their objectives. It includes a comprehensive array of essential processing equipment such as separators, decanters, descalers, surge tanks, oil transfer pumps, data collection systems, laboratories, chemical injection pumps, air supply units, nitrogen generator capsules, and power generators. Its strategic deployment at wellheads provides crucial support for a variety of drilling, production, and maintenance operations.

[0002] Using this device, impure and contaminated oil undergoes a sophisticated purification and refinement process, resulting in high-quality refined oil that can be efficiently transported to factories and operating stations through pipelines. The implementation of this solution effectively mitigates the negative environmental impact and significant economic losses associated with the traditional method of burning contaminated oil from drilling, production, and maintenance operations.

Technical Field

[0003] C10M 101/02

Background Art

[0004] WO2003031012A1

[0005] Modular oil refinery

[0006] A complete, large-capacity process refinery composed of multiple, self-contained, interconnected, modular refining units (300) is disclosed. The modular refining units (300) are smaller operational units than traditional build-in-place refineries and require less real estate. The modular refining units (300) are composed of portable equipment modules that may be skid mounted for ease of transportation and placement. Equipment modules may be connected in-line on the ground or stacked vertically to accommodate distillation processes. Large-capacity refinery capability is achieved by using the modular refining units (300) that alternatively also allow for greater process flexibility.

[0007] It is a crude oil refining system that consists of installing portable equipment near the well that performs the refining process. In fact, this system is fixed and in this sense, it is different from our claimed invention which is completely portable.

[0008] CN204417243

[0009] SEWAGE TREATMENT DEVICE FOR OIL REFINERY

[0010] The utility model discloses a sewage treatment device for an oil refinery. The device comprises a sewage treatment device body, wherein a sewage box, a coagulation box, a settling box, a purification box and a cleaning water box are sequentially arranged in the sewage treatment device body from top to bottom. The sewage treatment device for the oil refinery disclosed by the utility model is simple, novel and compact in structure, small in occupied area, convenient to use, low in manufacturing cost, good in sewage purification treatment effect and suitable for treating sewage of various oil refineries. The device can be used for treating sewage generated in the oil refining process and the sewage reaches the requirement for water use, so that the sewage is recycled, the cost for oil refining production and processing is lowered, the water sources are saved, and protection of the ecological environment is facilitated.

[0011] It is an invention in the field of separating water from oil, this process is carried out in a specified way. This system is a fixed station and differs from the stated invention in terms of performance and application. Also, this system is fixed and its main task is to separate water from oil, which is different from our claimed invention patent.

[0012] CN209821687

[0013] INTELLIGENT PORTABLE OIL STORAGE TANK BODY HEATING AND CLEANING DEVICE

[0014] The utility model discloses an intelligent portable oil storage tank body heating and cleaning device. Center pillar comprising a hollow, beneficial effects are that: the method is suitable for large-scale production; the heating cleaning device has the advantages that 1, the folding type automatic contraction mechanical principle is adopted; small volume after folding, the water can enter the tank body through the tank body opening; then, the inner part of the tank body is opened into an umbrella shape; placing on the surface of crude oil in a colloidal state; the explosion-proof junction box is connected with an external electrical system for heating; comprehensive information such as the liquid level and the temperature of crude oil is monitored in real time for full-automatic intelligent adjustment; when crude oil becomes strong in fluidity after being heated, the crude oil can be discharged through the discharge port in the bottom of the tank body, after work is stopped, the heating cable mounting plate is automatically folded and taken out of the oil tank port, and the device can also be used in other heating places and is convenient to carry and use; 2, the device can work repeatedly, and a one-to-one or many-to-one working mode is also adopted, so that the energy consumption is reduced, and the labor intensity and the danger of workers can also be reduced.

[0015] This mentioned invention is similar to our claimed patent only because both of them are portable but their main focus is different. The mentioned device is about cleaning and heating while our design is based on processing the crude oil.

[0016] CN214190015

[0017] MOVABLE PORTABLE PLATFORM FOR SHUTTLE TANKER BOW
LOADING SYSTEM

[0018] A movable and portable platform for a shuttle tanker bow loading system is characterized by comprising a platform base and a movable platform, the platform base is arranged on a deck, a rail allowing the movable platform to be placed and slide front and back is arranged at the upper end of the platform base, and pulleys matched with the rail are arranged on the left side and the right side of the lower end of the movable platform; detachable handrails are arranged on the left side, the right side and the rear side of the upper end of the movable platform. The device is simple and reasonable in structure, convenient to operate and safe and reliable to use, solves the technical problems that crude oil is difficult to transmit on the sea, is inconvenient and the like, is suitable for shuttling oil tankers, realizes emergency transmission of supply and acceptance of the crude oil when the two parties are in the state of motion on the sea, and has good maneuverability.

[0019] This mentioned device and our claimed patent function based on crude oil and both of them are portable but this one is only for sea and can operate along side the shuttle tank while our invention process the crude oil directly from any well It settles on.

[0020] CN116185088

[0021] PLC-BASED INTELLIGENT DRAINAGE MONITORING SYSTEM FOR
CRUDE OIL STORAGE TANK

[0022] The invention discloses an intelligent drainage monitoring system for a crude oil storage tank based on a PLC. The intelligent drainage monitoring system comprises a control module, a numerical control straight-through valve, a water content monitoring sensor, a double-medium liquid level measuring instrument, a water cutting buffer tank, a numerical control switch, a water oil content standard-exceeding monitoring sensor, a two-position three-way valve and an oil scavenging pump. The control module is used for monitoring the numerical control straight-through valve, the water content monitoring sensor, the double-medium liquid level measuring instrument, the water cutting buffer tank, the numerical control switch, the in-water oil content standard exceeding monitoring sensor, the two-position three-way valve and the oil scavenging pump and conducting visualization processing on monitoring data. The oil content in water discharged by the storage tank can be monitored in real time, the liquid level of the water cutting tank can be monitored in real time, and the device is suitable for crude oil dehydration engineering of a large floating roof tank.

- [0023] Both this invention and our claimed patent are PLC-based but this device is not portable. The main function for this device is for storage tanks, while our design works for processing crude oil directly extracted from oil wells.
- [0024] US20160177195
- [0025] SYSTEM FOR PURIFYING CRUDE OILS
- [0026] The invention relates to removing contaminants from oil using solid sorbents that are comprised primarily of carbon and preferably of coke particles. The coke particles have an affinity for contaminants in oil and are sized to be filtered from oil without plugging. Most contaminants have such a small size that they tend to plug up filters. As the contaminants agglomerate onto the solid sorbent, the resulting particles form a filter cake on conventional.
- [0027] filter materials in such a way as to allow the oil to pass on through without significant pressure drop or delay.
- [0028] This mentioned system is about purifying the extracted crude oil while our patent is a wholesome system in which the purifying is only part of its process because It includes the processing of crude oil from the begging until the end and also adds chemicals to It while being programmed on PLC system.
- [0029] US20060272503
- [0030] MICRO PROCESSING SYSTEM FOR MULTI-PHASE FLOW
- [0031] A system for processing of multi-phase fluid, comprising a plurality of portable proximately arranged modules disposed over and spaced from a working pad where each module contains at least one separate processing element of a system for producing degassed and dehydrated crude oil and having a plurality of fluid carrying pipes interconnecting the processing elements in the said modules, including quick connect/disconnect joints in the pipe disposed between the said modules.
- [0032] This system is an elaborated one and It works not only the crude oil but water and gas, on the other hand, our claimed system is a general perocessor for crude oil. The mentioned system produces dehydrated and degassed crude oil but our device processes the crud oil and adds substances to It.

Summary of Invention

- [0033] A portable crude oil primary processing system with two trailers that performs the operation on any well and prevents the burning of crude oil with impurities. The system includes various equipment and sections required. The crude oil fluid enters the choke, and the Pressure and temperature of the fluid are received by sensors and sent to the data analysis center. The fluid then passes through a series of filters to remove solid particles, enters the separator, and is regulated through valves. The fluid goes into the surge tank to remove turbulence and is then pumped towards the destination

with intended pressure. The controls and sensors are programmed by the PLC system, which also manages a chemical package to balance the pH of the fluid.

Technical Problem

[0034] when the oil comes out is the issue of environmental pollution that it creates for the environment when the oil flows in the wells under repair, in the early days or temporarily. It has a lot of impurities sand particles and various acidic and mineral substances that make the extracted oil unusable in exploitation units and cannot be pumped, so in these cases, the output oil is burned to cause less damage to the environment. but the burning itself creates a kind of heavy pollution in the air, which causes respiratory and environmental damage. In this invention, it has been tried that the oil that is extracted in the initial moments is purified by the invented package and transferred to the transmission pipeline using a pump located on the package. This method solves both environmental problems and prevents the waste of tens of thousands of barrels of crude oil.

Solution of Problem

[0035] In this system, after settling in the right place, the crude oil fluid enters the choke, the crude oil pressure reaches a constant pressure, and its pressure and temperature are received by the sensors and sent to the analysis center. Crude oil enters a series of filters in the form of a three-phase fluid, and its solid particles are filtered, it enters the separator, where according to the nature of the three-phase fluid and the necessity of the operation, the circulation time of the fluid is checked and they are fully controllable by the sensors that are received on the water, gas, and oil outlets and by the control valves, then it enters the surge tank, where the turbulences are taken and the oil fluid is cool down. After that, the pumps pump the fluid with the desired layer towards the destination. In this system, the controls and sensors are programmed by the PLC system, and when the volume of the surge tank drops, the pumps are automatically turned off. There is also a package called a chemical package that is controlled through the PLC system and adds a series of substances to the fluid to balance the pH of the fluid.

Advantage Effects of the Invention

- [0036] • Reducing the number of trailers to 2 trailers.
- [0037] • Fast-moving and high-speed processing compared to similar samples.
- [0038] • Processing operations can be implemented at a higher speed on the settling site.

Brief Description of Drawings

- [0039] [Fig.1] Shows a general view of the trailer number 1
- [0040] 1- Oil transfer pumping unit
- [0041] 2- The whole collection of oil processing equipment

- [0042] 3- Turbulent tank (surge tank)
- [0043] 4- supporting base
- [0044] 5- Surge tank gas control output pressure valve
- [0045] 6- Relief valve
- [0046] 7- Separator oil output pipeline
- [0047] 8- Oil level measuring device
- [0048] 9- Separator gas exhaust nozzle.
- [0049] 10- Three-phase separator tank to separate oil
- [0050] 11- Transmitter and water level control device
- [0051] 12- Transmitter and water level control device
- [0052] 13- Oil flow control valve
- [0053] 14- Separator outlet gas flow control valve
- [0054] 15- Two Separator relief valves
- [0055] 16- Crude oil inlet pipeline and gate valve
- [0056] 17- Crude oil inlet ball valve to the separator
- [0057] 18 - Crude oil output pipeline and ball valve of the device
- [0058] 20- Crude oil output pipeline and ball valve of the device
- [0059] 21- Emergency shut-off valve
- [0060] 22- structure
- [0061] 23- structure
- [0062] 24- structure
- [0063] [Fig.2] presents an upper view of the trailer number 1
- [0064] 25- Oil gravel and sand trap tank
- [0065] 26- Straightness of the oil inlet line
- [0066] 27- Unilateral outlet valve
- [0067] 28- Oil return pipeline
- [0068] 29- Outage patch
- [0069] 30- Floor connection
- [0070] 31- Floor connection
- [0071] 32- High-pressure gas flow control valve
- [0072] 33- Crude oil output pipeline
- [0073] 34- Bypass path of high-pressure gas flow control valve separated from the oil
- [0074] 35- A device for measuring the flow rate of high-pressure gas
- [0075] 36- Flanged valve
- [0076] 37- Bypass route
- [0077] 38- High-pressure gas outlet pipeline
- [0078] 39- Low-pressure gas outlet pipeline
- [0079] 40- Oil inlet pipeline

- [0080] 41- The separated water from the oil outlet pipeline
- [0081] 42- Pumped high-pressure oil outlet pipeline
- [0082] 43- Unilateral valve for high-pressure outlet gas path
- [0083] 44- High-pressure gas flow
- [0084] 45- Water flow control valve separated from the oil
- [0085] 46- Outage patch
- [0086] [Fig.3] relates to the separator
- [0087] 47- Crude oil inlet nozzle to the separator
- [0088] 48- Nozzle for installation of pressure relief
- [0089] 49- High-pressure gas outlet nozzle
- [0090] 50- Manhole repair emergency door
- [0091] 51- Oil outlet nozzle
- [0092] 52- Water separated from the oil outlet
- [0093] 53- Supporting bases
- [0094] [Fig, 4] presents the control circuit

Description of Embodiments

- [0095] [Fig.1] displays a great view of the number 1 trailer and all the parts installed in it:
- [0096] 1- a pumping unit that transfers the crude oil (plunger pump booster with a charging pump)
- [0097] 2- Refers to trailer number 2 on which the whole collection of oil processing tools are placed.
- [0098] 3- The surge tank separates residual gases with oil in atmospheric pressure and stores oil for pumping with a diameter of 2.2, 3 meters in height, and a capacity of 65 barrels.
- [0099] 4- The base that supports the trailer when it settles on a well.
- [0100] 5- The valve that controls the pressure of the surge tank's produced gas.
- [0101] 6- Surge tank's safety valve: 3 inches.
- [0102] 7- Separator oil output pipeline: 3 inches and pressure class 600.
- [0103] 8- Oil level measuring device in the high-pressure separator tank (site glass): 32 inches in length.
- [0104] 9- Separator gas exhaust nozzle: size 4 inches and pressure class 600.
- [0105] 10- Three-phase separator tank to separate oil from gas and water along with crude oil entering from the oil well: diameter of 48 inches and a length of 3 meters, with a capacity of 3,000 to 14,000 barrels per day, and a pressure of 1,440 feet.
- [0106] 11- Transmitter and water level control device in the high-pressure separator tank: 32 inches in length.
- [0107] 12- The transmitter and oil level control device in the high-pressure separator tank: 24 inches in length.

- [0108] 13- Oil flow control valve for the separator outlet: 3 inches class 600
- [0109] 14- Separator outlet gas flow control valve: 3 inches class 600
- [0110] 15- Two Separator relief valves: Size 2 inches by and 3 inches class 600
- [0111] 16 - Crude oil inlet pipeline and gate valve to Separator: 3 inches class 600
- [0112] 17- Crude oil inlet ball valve to the separator: 3 inches class 600
- [0113] 18- Crude oil output pipeline and ball valve of the device: 3 inches class 600
- [0114] 19- Crude oil multi-way inlet's gate valve; 3 inches class 10000
- [0115] 20- Adjustable pressure relief valve related to multi-way crude oil inlet: 3 inches class 10000
- [0116] 21- Emergency shut-off valve related to multi-way crude oil inlet: 3 inches class 10000
- [0117] 22-structure
- [0118] 23-structure
- [0119] 24-structure
- [0120] [Fig.2] shows an upper angle of the trailer number 1 and the section settled on it:
- [0121] 25- Medium-pressure oil gravel and sand trap tank
- [0122] 26- Straightness of the oil inlet line to the pump for pumping: 3 inches class 150
- [0123] 27- Unilateral outlet valve of the bypass path of the surge tank: 3 inches class 300
- [0124] 28- Oil return pipeline after pumping: 3 inches class 300
- [0125] 29- Outage patch
- [0126] 30-Floor connection
- [0127] 31-Access staircase
- [0128] 32- High-pressure gas flow control valve separated from oil: 3 inches class 600
- [0129] 33- Outage patch
- [0130] 34- Bypass path of high-pressure gas flow control valve separated from oil 2 inches class 600. 35- A device for measuring the flow rate of high-pressure gas separated from oil 3 inches class 600
- [0131] 36- Flanged valve: class 600
- [0132] 37- Bypass route (emergency)
- [0133] 38- High-pressure gas outlet pipeline separated from oil 3 inches class 600
- [0134] 39- Low-pressure gas outlet pipeline from the surge tank and relief valve.
- [0135] 40-oil inlet pipeline 3 inches class 600
- [0136] 41 the separated water from oil outlet pipeline 2 inches class 600
- [0137] 42- Pumped high-pressure oil outlet pipeline, 3 inches class 600
- [0138] 43- Unilateral valve for high-pressure outlet gas path, 3 inches class 600.
- [0139] 44- High-pressure gas flow
- [0140] 45- Water flow control valve separated from the oil: 2 inchES class 600
- [0141] 46- Outage patch

- [0142] [Fig.3] displays the separator of the crude oil and its various parts:
- [0143] 47- Crude oil inlet nozzle to the separator: 3 inches class 600
- [0144] 48- Nozzle for installation of pressure relief (safety) valve (PSV) equipment: 2 inches class 600
- [0145] 49- High-pressure gas outlet nozzle: 4 inches class 600
- [0146] 50- Manhole repair emergency door: 20 inches
- [0147] 51- Oil outlet nozzle: 3 inches class 600
- [0148] 52- Water separated from the oil outlet: 2 inches class 600
- [0149] 53- Supporting bases of the separator
- [0150] [Fig.4] shows the control circuit of the whole system which manages the devices and sensors.

Examples

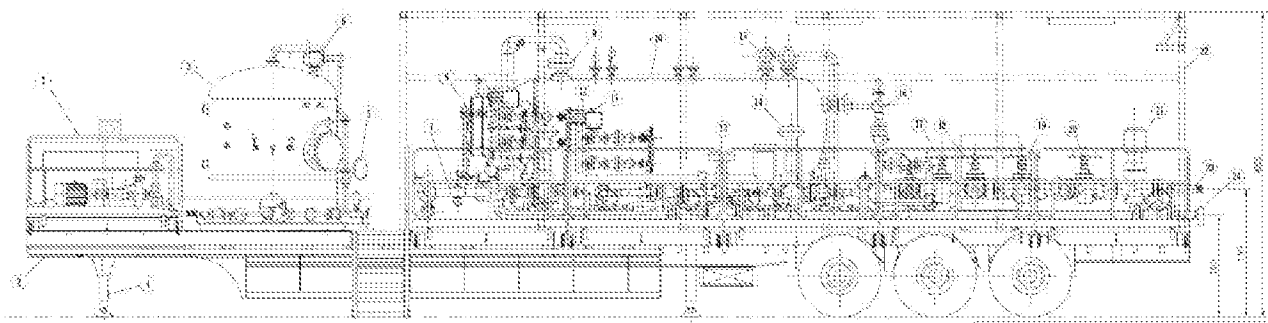
- [0151] The invention relates to a fluid processing system for handling crude oil from oil wells. This crude oil typically exists in a 3-phase state, consisting of oil, gas, and water. The system is specifically engineered to efficiently separate and process these different phases, enabling the extraction of valuable components such as oil and gas.

Industrial Applicability

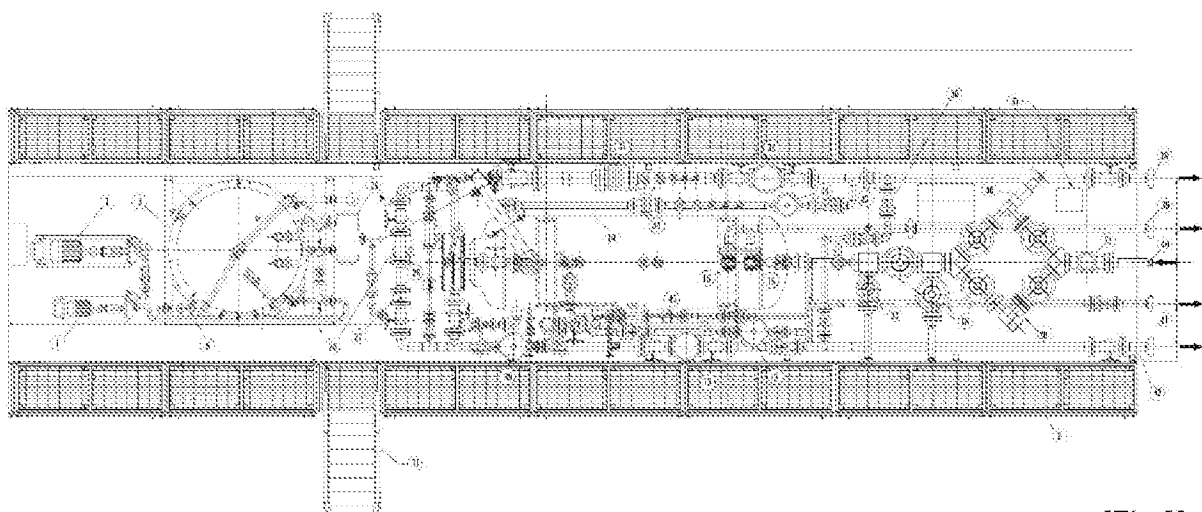
- [0152] This invention will be very widely used in processing crude oil output from oil wells in different regions because this patent has a smaller volume than similar samples and the number of trailers used in the process is two.

Claims

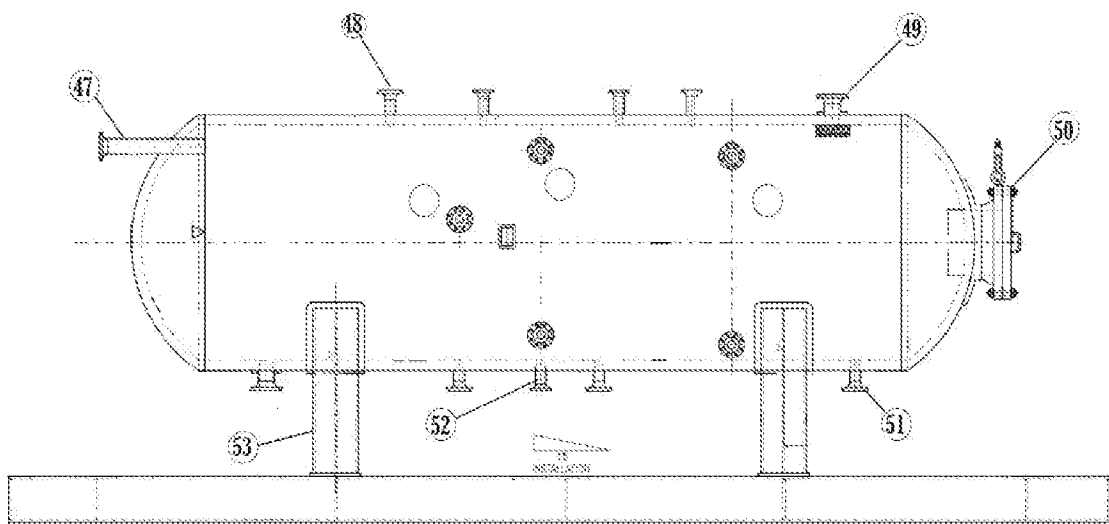
- [Claim 1] A portable crude oil primary processing system with two trailers that performs the operation on any well and prevents the burning of crude oil with impurities which includes various equipment and sections required.
- [Claim 2] According to claim 1, the crude oil fluid enters the choke after settling in place until the crude oil reaches a constant pressure.
- [Claim 3] According to claim 2, the Pressure and temperature of crude oil are received by the sensors and sent to the data analysis center.
- [Claim 4] According to claim 3, Crude oil enters a series of filters as a three-phase fluid and its solid particles are filtered.
- [Claim 5] According to claim 4, the fluid enters into the separator and there, according to the nature of the three-phase fluid and the operation's necessity, the fluid's circulation time is checked.
- [Claim 6] According to claim 5, the oil fluid is received by sensors on the water, gas, and oil outlets which are under the control through valves regulation.
- [Claim 7] According to claim 6, fluid enters the surge tank, where the turbulence is removed and the oil fluid becomes quiet.
- [Claim 8] According to claim 7, then the pumps pump the fluid with the intended pressure towards the destination.
- [Claim 9] According to claim 8, in this system, the controls and sensors are programmed by the PLC system, and when the volume of the surge tank drops, then the pumps are automatically turned off.
- [Claim 10] According to claim 9, the PLC system also controls a package called chemical package and adds a series of substances to the fluid to balance the pH of the fluid.



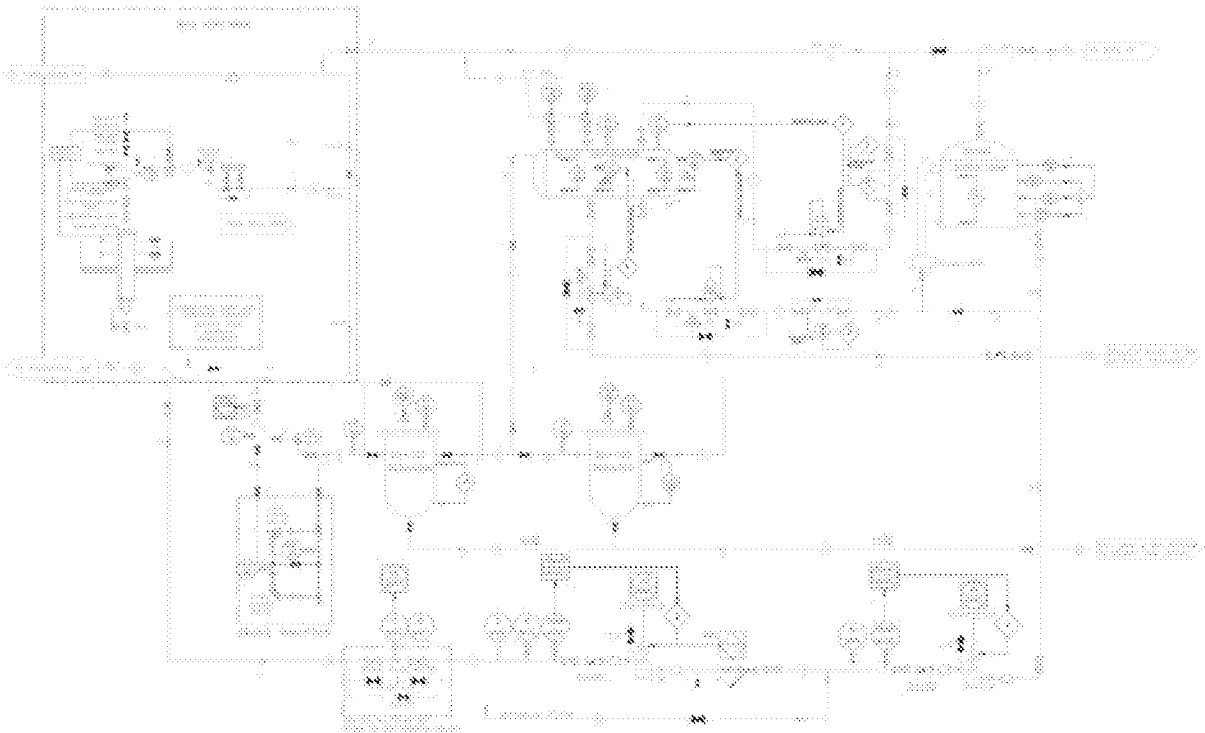
[Fig. 1]



[Fig. 2]



[Fig. 3]



[Fig. 4]

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2024/056677

A. CLASSIFICATION OF SUBJECT MATTER
C10G1/04, C10G31/09 Version=2024.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C10G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

PatSeer

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US3953298A (VAL VERDE CORP; 27 Apr 1976) Abstract ; figures	1-10

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search

12-09-2024

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