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The Role of Saturated Vapor Pressure of Cavitations in the process of oil supply

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ABSTRACT

Recently the steady tendency to magnification of bulks of haul, oil and oil products was outlined. Thus, for problem solution on magnification of bulk of anoil pumping and oil products, developments new or optimisation of applied technologies of haul of oil and oil products taking into account their rheological behaviour and operating characteristics of pipe lines are indispensable. Vapour pressure testing is an important safety check in the transport, storage and blending of crude oil. In article the general information about cavitation is resulted and at present and conditions known at present and consequences of its occurrence, as hydraulic phenomenon are listed. It is noticed, that despite negative influence cavitations' the phenomena can be used it for the useful purposes and also application of these effects in meso is shown and micro spaces with new nano objects expands the list of possible perspective technologies. Under laboratory conditions were analysis physical - chemical features oils Azerbaijan with small content paraffin on borders cavitations' the zones which results are resulted in the table.The carried out researches show that having applied cavitations' technologies to oils and to mineral oils, it is possible to improve them rheological characteristics and quality indicators. On the basis of the resulted facts, perspectives of application cavitations' technologies affirms at transport and oil refining.
Keywords: cavitations zone, rheological characteristics, pressure of saturated steam, critical temperature, paraffin hydrocarbons, oil transport, oil refining.

INTRODUCTION

Now in connection with an exhaustion of natural stocks of oil and a rise in prices on liquid motor fuel interest to highly effective technologies of oil refining and alternative not oil raw materials constantly grows. As one of ways of an intensification, physical and chemical processes at reception of propellants from oil, biooil and vegetable oils quite often esteem cavitation. Really, at collapse of the cavitation vials there are local pulsations temperatures and pressure to several thousand °C and 10000 bar accordingly. Oil - the high-molecular, heterogeneous liquid which molecules at atmospheric pressure and normal temperature are difficult focused. Thus, energetically favourable balance of intermolecular and external forces is reached. At the appendix to oil of external pressure in some honeycombs of atmospheres of a molecule are polarised, counteracting external forces, keeping balance of system. If external pressure sharply to remove, internal forces will start to break off macromolecules on smaller components, thus the density decreases. It is very important for the true vapour pressure (TVP) and Reidvapour pressure (RVP) of crude oil to be tested when dealing with its production and storage. The vapour pressure indicates how the crude oil will perform during handling, highlights conditions under which bubbles are likely to build and shows where pressure build-ups of escaping light ends could happen. As such, vapour pressure measurement prevents costly damage to pipelines or vessels transporting crude oil. It also provides guidance on how transportation facilities need to be built to survive a worst-case scenario. Pipeline operators determine TVP and bubble point before transporting the crude to a distribution point. With wellhead crude, gas has to be removed to meet pipeline, storage and tanker specifications.

Excess gas can be separated or flared to regulate the vapour pressure and prevent any damage to the transportation medium. If the vapour pressure of the crude case is too high, two main safety issues can arise. The first is pumping cavitation during transfer operations and the second is vapour pressure in the pipeline, or in a vessel, which could rise because of temperature changes. Once the transportation medium is exposed to direct sunlight, the vapour pressure of the crude oil rises and, in the worst case scenario, causes damage. Hence, it is advisable for operators to be equipped with a vapour pressure analyser, to prevent costly damage and to provide evidence that the released crude is delivered according to specifications. The exact definition of TVP and bubble point is a topic of wide discussion in the engineering community. First, it is worth mentioning that the bubble point refers to a temperature, whereas the bubble point vapour pressure refersto a pressure. According to the International Maritime Organisation, the TVP and bubble point pressure(BPP) are equal: The TVP or bubble point vapour pressure is the equilibrium vapour pressure of a mixture when the gas/liquid ratio is effectively zero. It is the highest vapour pressure which is possible at any specified temperature. As the temperature of a petroleum mixture increases, its TVP also increases. Ifthe TVP exceeds atmospheric pressure, the liquid commences to boil. In this definition, TVP is essentially the total vapour pressure (P_{tot}) of the crude oil minus the vapour pressure of air and the dissolved gases in the sample (P_{gas}).

MATERIALS
The resulting value is the absolute vapour pressure (P_{abs} or P_{liquid}) of the liquid, commonly referred to asTVP, as measured by ASTM D2879 and GOST 1756. The ASTM D2879method should be used only for single-component substances. Crudeoil in general is a multi-component liquid and thus requires a different form of analysis. The equation TVP = BPP at a vapour-to-liquid ratio (V/L ratio) of0/1 addresses the common practical problems for crude oil transportation. In floating roof tanks, the roof is placed directly on the liquid crudeoil, while in pipelines the liquid crude oil is pressurized. In both cases, the V/L ratio is effectively zero and the TVP measurement gives a precise indication of the bubble point pressure at a specified temperature. In some cases, the equation is not sufficient. In multi-component mixtures, bubbles tend to build whenever the vapour pressure of the liquid exceeds the environmental pressure, independent of whether the V/L ratio is 0/1 or100/1. Three factors have an influence on the bubble point: pressure, volume and temperature. A more accurate definition takes different temperatures and V/L ratios into account when determining the bubble point: in a multi-component mixture, the bubble point is the temperature at which the first bubbles appear at a fixed V/L ratio. One of the major risks when transporting crude oil is pumping cavitation. Cavitation happens when the TVP or bubble point vapour pressure at a V/L ratio near 0/1 is reached and usually has drastic effects. In a pumping system, the crude oil is accelerated, generating areas of low pressure. When the surrounding pressure is lower than the vapour pressure of the crude oil, bubbles build, grow, then collapse, generating high pressure and high temperatures at the bubble surface. Near a fixed surface, for instance in a pumping system, the collapse ofhe cavitation bubble will generate a shock wave directed to a nearby surface, which can damage the transportation system or the pump. For correctly dimensioning new pipelines and pumping systems, andfor writing standard operating procedures, it is important to knowthe vapour pressure of the crude oil.

To prevent bubble building and pumping cavitation in an installed transportation system, it is necessary to ensure that the pressure in the transportation system is higher than the vapour pressure of the crude for any expected condition. If the vapour pressure is too high, pressure, volume or temperatures have to be modified. The pressure in the transportation system can be increased to exceed the vapour pressure of the crude oil. Also, the vapour pressure of the crude oil can be reduced, for instance by the separation or burning of excess gases, which reduces the volume. As athird option, the temperature for transportation and thus the vapour pressure of the crude oil can be reduced. Lord and Ruddin suggest oil degasification or oil cooling to reduce the vapour pressure: The degasification program removes gas from oil in selected caverns, which reduces its bubble point pressure and gas-oil ratio, which in turn significantly increases the predict tedmargin of system performance ender the safety criteria. Crude oil producers face a complex problem here: when crude oil is extracted, it is not homogenous. The vapour pressure of the crude can change during oil production. Also, the presence of various amounts of natural gas in the crude changes the V/L ratio considerably and increases the vapour pressure dramatically. Plus, highly viscous crude oil needs to be transported a high temperature to guarantee a flow in the pumping system and in the pipeline. Temperature changes in turn affect the vapour pressure. Depending on the amount of light ends delivered with the crude oil, the vapour pressure of the crude oil will be significantly higher for 60°Ccompared to the vapour pressure at37.8°C. Most vapour pressure testers measure crude oil only at 37.8°C(100°F) and a V/L ratio of 4/1. But crudes can sometimes be transported at 85°C and at a V/L ratio close to0/1. Under these extreme conditions, some volatiles might begin to dissolve even in "dead" crude

oil and produce a gaseous mixture, causing a non-linear pressure increase. This risk cannot before seen if the vapour pressure is measured at 37.8°C and a V/L ratio of 4/1 only. For adequate risk management regarding the bubble point, it is thus important to measure the vapour pressure at different temperatures and at a V/L ratio of 0/1. Only a vapour pressure analyser that can monitor vapour pressure at different temperatures and V/L ratios will allow the operator to regulate their transportation system immediately. Another potential problem when transporting crude oil is anunexpected pressure increase in the pipeline or the tanker. Whereas "dead" crude oil is mostly unproblematic when transported, "live" crude oil contains volatiles. Volatiles such as natural gases increase the vapour pressure of the crude case. When the transportation medium for live crude — a pipeline or a tanker — is exposed to direct sunlight and heats up, the vapour pressure can increase considerably. The vapour pressure of live crude oil filled at 20°C can more than double if the temperature of the live crude oil is increased to 50°C.The absolute pressure increase from temperature fluctuations is even higher if the live crude oil is transported at a very low V/L ratio. In Russia, it is necessary to test the vapour pressure of crude oil at a V/L of 0.02/1 to simulate the conditions in a tanker or a pipeline. Typically, 98% of a tanker's volume is filled with crude oil. The testing of vapour pressure at different temperatures and V/L ratios answers many questions that arise from crude oil transportation: How much will the vapour pressure rise if the crude oil at a V/L of0.02/1 (98% filled with liquid) is transported at 50°C rather than37.8°C because the tanker is exposed to sunlight? Do control personnel need to reduce the vapour pressure prior to shipment or storage?Is it necessary for specific crude cases containing volatiles to fill atanker up to only 90% to preventdamage to the tanker or air pollution by excessive out gassing ?Is the vapour pressure low enoughthat it is possible to blend in some natural gas prior to shipment without risking damage?

It is essential to continuously monitor vapour pressure, TVP and BPP at different V/L ratios to help operations regulate their transportation system immediately. The Minivap On-line vapour pressure process analyzer from Grabner Instruments can measure TVP or BPP at different temperatures in the range of 20–60°Cand to simulate TVP for even higher temperatures. It also enables measurement of a V/L ratio down to0.02/1 in a pressure range of 0–1000kPa.The analyser incorporates the ASTM D 6377 method, which is the latest standard for the vapour pressure determination of crude oil without sample preparation. This method replaces the 80-year-oldplusASTM D323 and is used to measure TVP or BPP in the analyser.

With the vapour pressure process analyser's sample conditioning system, the pressurized crude oil is transferred directly to the measuring chamber and the vapour pressure is measured against a vacuum by a single expansion of a built-in piston. A three-point expansion sequence is performed at different V/L ratios, then a curve fit is performed for assessing the TVP at a V/L of 0/1.The Minivap On-line also incorporate the triple expansion method for vapour pressure measurement according to ASTM D6378, which hallows for direct measurement of the total vapour pressure (Ptot) of the sample, and the vapour pressure of both the liquid (Pabs or Pliquid) andthe gases (Pgas) in the sample. Based on the fact that the vapour pressure of liquids remains constant and that all components such as dissolved air follow the ideal gas equation, $(pV)/T$ = constant, an expansion is performed in three steps at a constant temperature. Three total pressure values are determined, and from these the partial pressure of the air, the solubilityfactor of the liquid and the absolute vapour pressure of the liquid are calculated. Results for theTVP (Ptot) of the sample, the pressureof the liquid (Pabs or Pliquid) and the pressure of the gas (Pgas) are available every five to seven minutes. The precision of this measurement is ASTM Round Robin proven and significantly better than that of classical vapour pressure test methods. An analyser that can be used to measure both TVP and RVPE will repay its cost in a short time. Usually, suppliers and refiners agree over the maximum vapour pressure limits of crude oil delivered to a plant or terminal. This is necessary to ensure safety for transportation and storage, and to guarantee that the refiner receives crude of a certain quality. In this process, crude oil blending is a means of increasing the sales price or facilitating the processing of crude oil. By blending lower-grade crude oil with higher grade crude oil or natural gas to reach, but not exceed, target specifications, the price valuation of crude scan be increased significantly. Profits are earned if target specifications are reached by blending the minimum amount of high-grade crude oil with low-cost hydrocarbons. The addition of these hydrocarbons is limited by the maximum RVP. Depending on the RVP prior to blending, typically ratios of 1–5%hydrocarbons are blended into the crude. The highest accuracy in vapour pressure tests according to standards is the ultimate goal of every blending facility because it increases the possible blending ratio. The precision of the Minivap Online allows for close C_4 blending to RVP limits and the highest profit generation. With a measurement method that fully complies with the strictest ASTM, EN and IP standards, as well as US EPA regulations for vapour pressure testing of crude oil, gasoline and LPG, no further testing in the laboratory needs to be done to certify the accuracy of the measurement [1,2,3, 4].

Cavitation is the formation, growth, and implosive collapse of gas or vapor-filled bubbles in liquids. The formation and collapse of these bubbles can have substantial chemical and physical effects on the liquids themselves.While the chemical effects of acoustic cavitation, sonochemistry and sonoluminescence have been extensively investigated in recent years, little information is available about the chemical consequences of hydro dynamic cavitation created during turbulent flow of liquids. The invention relates generally to the controlled formation of cavitation bubbles that serve as autonomous chemical mini-reactors and use the energy released during implosion of these bubbles to rapidly alter complex hydrocarbon mixtures. More particularly, the invention relates to modification of conventional and non-conventional oil by a flow-through hydrodynamic cavitation and utilizes cavitation bubble energy for improving homogeny, viscosity, API (American Petroleum Institute) gravity and other physical properties. This invention may find applications in the oil/fuel industry and synthetic chemistry Moreover, the present invention relates to a method that subjects petroleum, liquefied shale oil and complex mixtures of hydrocarbons to flow-through hydrodynamic cavitation for a period of time sufficient for alteration of chemical composition, conversion of compounds, obtaining upgraded product with higher yield of distillate fuels. Oil is a naturally occurring non-renewable source of energy. Similar to other fossil fuels, such as coal and natural gas, it formed from the fossilized remains of plants and animals. Over millions of years, the decay has been translocating into the Earth's crust, where it transformed into oil under heat and pressure. Oil is a non-uniform fluid and consists of heavy compounds dispersed in light crude, ranging from straight and branched chain and cyclic saturated and unsaturated hydrocarbons to complex aromatics and asphalt (bitumen). Bitumen is usually called the hydrocarbon content of heavy oils and tar sand deposits. It is black, highly viscous, sticky, and soluble in carbon disulfide.

Asphalt is a colloid, with asphaltenes as the dispersed phase and maltenes as the continuous phase. Asphaltenes consist of condensed aromatics with side chains up to C_{30}, hetero-aromatics with sulfur in benzothiophene rings, nitrogen in pyrrole and pyridine rings, poly functional molecules with sulphur, nitrogen and oxygen in the chemical groups such as, for example, thiol, amino and keto, hydroxyl, and carboxylic, correspondingly, and porphyrin-complexes of nickel and vanadium. Maltenes are soluble in n-alkanes (pentane or heptane). They contain straight or branched chain saturated hydrocarbons (saturates), cyclic saturated hydrocarbons (cycloalkanes or naphthenes), resins (smaller analogs of asphaltenes), heteroaromatics of oxygen, nitrogen and/or sulfur (first acidaffins), and straight and branched chain and/or cyclic unsaturated hydrocarbons (olefins, second acidaffins).Petroleum heavy crudes and residues are suspensions of asphaltene colloids stabilized by resins [5, 6, 7]. The smallest colloid particles that are 2-4 nm in diameter form clusters (asphaltene micelles) with a size of 10-30 nm. Further aggregation leads to the formation of flocs and macrostructures. Thus, conventional and non-conventional oil are non-Newtonian fluids. Although the mechanical behavior of fluids is characterized by a constant viscosity, this approach inadequately describes non-Newtonian fluids. The relation between the shear stress and the strain rate of such fluids is nonlinear and often time-dependent. Although a constant coefficient of viscosity cannot be defined for a non-Newtonian fluid, it is possible to define a ratio between shear stress and rate of strain, a shear-dependent viscosity, especially for fluids with no time-dependent behavior. Non-Newtonian fluids are studied by measuring rheological properties and the continuum mechanics calculations. Since hydrocarbons of different molecular weights and structures boil at different temperatures, crude oil is traditionally separated into fractions via fractional distillation, which has become the main refining technique [8, 9,10]. The residual heaviest fraction obtained by fractional distillation is called refined bitumen. It boils at 525° C. Oil fractionation is conducted at elevated temperatures and pressures in the presence of hydrogen or steam and zeolite catalysts, which require continuous regeneration. Fluid catalytic cracking (FCC) is the most efficient process for oil upgrading in industrial practice, but high temperature (400-500° C.) and pressure (up to 100 atm) are both required. The harsh conditions and safety considerations place constraints and limitations on refinery's material. These methods are expensive and energy consuming. Because FCC does not open the aromatic structures, bitumen-derived heavy vacuum distillate or vacuum gas oil (VGO) are poor feed stocks. At the present time, upgrading of bitumen, which is composed primarily of highly condensed polycyclic aromatics and exhibits high heterogeneity and stability, is extremely costly. To increase yield of gasoline, multi-ring aromatic compounds are to be saturated to single-ring aromatics in a feed pretreater. Hydrogen added after this step lowers both gasoline yield and octane number. Distillate fuels such as gasoline, turbo-jet fuel, and diesel fuel are used in internal combustion engines to convert chemical energy and heat into mechanical energy. Gasoline is a fuel designed for the Otto-cycle 4-stroke engine. It contains hydrocarbons with a carbon number ranging from 4 to 10 (C_4-C_{10}). Other distillate fuels include diesel, kerosene, turbo-jet fuel, and heating oil. Diesel has a lower boiling point than gasoline and is less costly in production. Instead of spark plugs, the diesel engine relies on compression and the heating of air to cause ignition. However, high levels of contaminants in engine exhaust gas require diesel fuel to undergo

additional purification by filtration, driving its cost up. As with FCC, the methods for upgrading oil and complex hydrocarbon mixtures are performed at high temperature and pressure in the presence of catalysts that must be constantly regenerated. These methods are highly expensive and energy consuming. It has been reported that elevated pressure and increased temperature supplied by acoustic and hydrodynamic cavitation activate many processes and accelerate a number of chemical reactions [11, 12]. The formation of bubbles in a fluid is easy to observe, when its temperature approaches the boiling point. An increase in the hydrostatic pressure of a fluid will suppress the formation of bubbles. If the fluid is subjected to a sound wave treatment or passes through a hydrodynamic cavitation reactor at a proper velocity, cavitation bubbles form as a result of a decrease in fluid pressure. The concentration of cavitation bubbles reaches hundreds in a cubic centimeter of the cavitated fluid. Once the bubbles are created, they can remain stationary restricting the flow and taking up space normally occupied by the fluid. This causes a resistance to the flow and increases the pressure. If the bubbles move and relocate into a high pressure zone, they will implode within 10^{-8}-10^{-6} seconds, resulting in a drastic increase in both pressure (1000 atm) and temperature (5000° C.), and formation of local jet streams with the velocities of 100 m/s and higher [13,14].

RESULTS AND DISCUSSION
The sudden collapse releases a significant amount of energy in the form of shock wave, vigorous shearing forces, and localized heating, which either initiate chemical reactions and processes or dissipate into the surrounding fluid. These activate gas phase molecules located in the bubbles and in the surrounding liquid and initiate chemical reactions. In some cases, cavitation bubble implosion is accompanied by emission of ultraviolet and/or visible light making it possible for photochemical reactions to proceed.The formation of large molecular matrices, arrays and pseudo-polymeric systems play an important role in oil processing, resulting in its high surface tension and viscosity, and non-Newtonian behavior. Any disruption of these large molecular associations, particles, agglomerates or pseudo-polymeric interactions leads to alteration of oil properties.The cavitation phenomenon is categorized by the dimensionless cavitation number C_v, which can be mathematically represented as(1):On the possibility of transporting cavitation was as follows
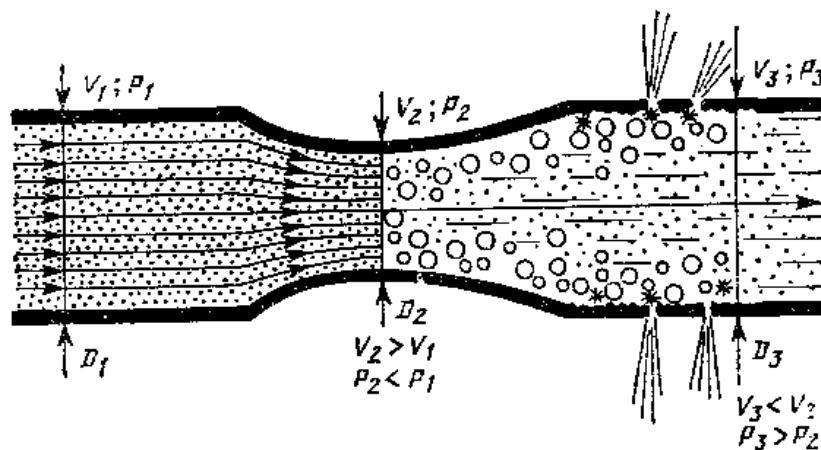
$C_v=(P - P_v)/0,5 \, \rho V^2$ (1)

Fig. 1 Cavitation processes in pipeline

If $V_2 = V_{kr}$, then $P = P_{r.v.p.}$
Where P is the recovered pressure downstream of a constriction, P_v is the vapor pressure of the fluid, V is the average velocity of the fluid at the constriction, and ρ is the fluid density. The cavitation number, at which cavitation starts, is called cavitation inception number C_{vi}. Ideally, the cavitation starts at $C_{vi}=1$, and there are significant cavitational effects at $C_v$less thanfig.1 [9].
The basic problem in cavitation is erosion fig. 2. Now precisely conditions at which there is considerable cavitation an erosion are not known, but is doubtless that it amplifies with growth of speed of a liquid concerning considered knots of units and mechanisms.
The majority of materials treated to action cavitation, possesses an initial stage during which erosion is absent. The incubatory is followed by the period of fast increase in erosive damages, and then the period concerning a stable condition when speed of erosion is almost constant.

At last when the surface is already strongly corroded and covered by bowls, speed of erosion decreases. In practice the greatest interest the incubatory period and the period the great ester present speeds of erosion. If duration incubatory the period exceeds service life of any component of the car danger of erosion of this component is absent.

Unfortunately, till now we yet in a condition to predict duration of the incubatory period for concrete parts mechanisms. However, defining speed of erosion of various materials, it is possible to estimate relative resistance of these materials of erosion fig. 3.

In aggressive liquids of damage occur especially quickly as a result of double influence as cavitation erosion, and corrosion. Erosion destroys a surface of a material and promotes removal from it protective oxygen films, creating thereby perfect conditions for corrosion.
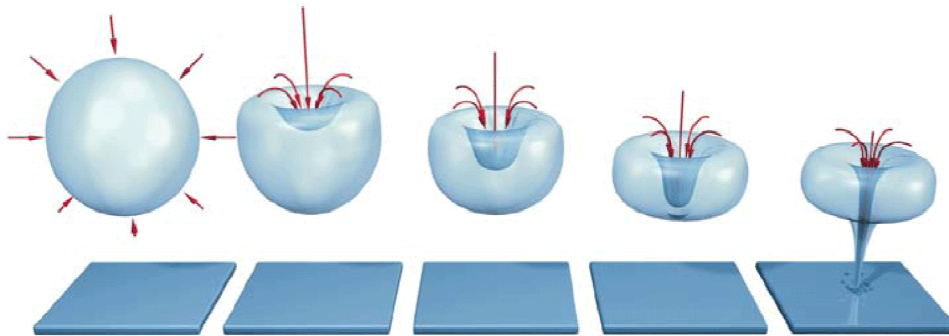

Fig. 2 Kernels and occurrence cavitation

Another important term is the processing ratio, which is the number of cavitation events in a unit of flow. Similar to conventional cracking, cavitation causes homolytic fission of carbon-carbon bonds.
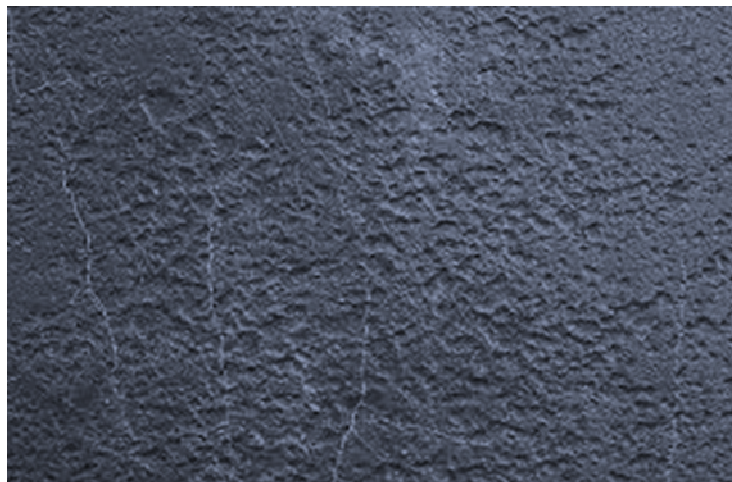
Fig. 3Cavitationerosion in mechanism

Alkyl chains and side chains of aromatic ring structures in heavy oil break, resulting in the absence of hydrogen in the formation of unsaturated hydrocarbons (olefins or alkenes).

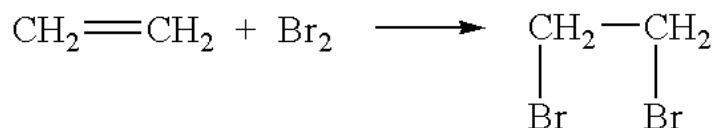$$CH_2\!\!=\!\!CH_2 \; + \; Br_2 \longrightarrow \underset{\underset{Br}{\mid}}{CH_2}\!\!-\!\!\underset{\underset{Br}{\mid}}{CH_2}$$
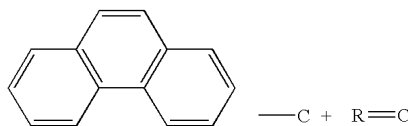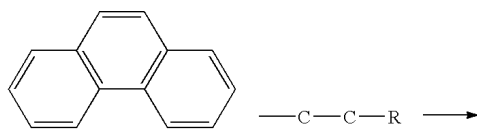
When olefins react with liquid bromine their double bonds break, a bromine atom attaches to each carbon and, as a result, bromine loses its red-brown color.

The discoloration of bromine is used as a test for a carbon-carbon double bond concentration, ASTM D1159-07 and GOST 2070-82. Standard test method for bromine (iodine) numbers of petroleum distillates and commercial aliphatic olefins by electrometric titration [10]. The steady tendency was observed recently to increase in crude oil production and transportation of so-called abnormal oils with the high paraffin content and high set point and, accordingly, abnormal flow properties and consistency curves which disobey Newton's law under normal conditions. High-paraffin crude oil pumping through long-distance pipelines and their transportation in tanks, in tankers is complicated, due to their abnormal viscosity and static shear stress under the ambient temperatures as well as due to asphaltene-resin-paraffin deposits which they form on the internal surface of pipes, tanks, tankers and other equipment.The results of an experimental research of oil viscosity fluctuation under the cavitation are of significant interest.Cavitation - is fracturing of liquid continuity as a result of local pressure decay. The cavitation effect is accompanied by micro explosions, ultrasound, as well as mechanical cuts and impacts under the effect of hundreds of the cutting pairs moving towards each other with high linear speed. The rate of speed is several tens of meters per second that gives the chance to cut dispersible agents on the smallest micro particles. Oil does not possess the viscosity following the laws of Newton, Poiseuille, and Stokes as the long randomly located molecules of paraffin and resin form some flexible lattice where the solution is placed. Therefore the system resists to shear forces. Cavitation breaks off a continuous chain, destroying connections between separate parts of molecules. These connections are comparatively small; therefore insignificant influence of acoustic waves is required. The research analysis shows, that under long-term big intensity cavitation C-C connections in paraffin molecules break which leads to changes of physical and chemical structure, reduction of molecular weight and crystallization temperature. During cavitation process the energy released at implosion of cavitation bubbles, is used for bond opening between atoms of the big molecules of hydrocarbon compounds. Dissociation energy of connections widely changes in hydrocarbons, approximately from 40 upto 400 kJ/mol. Bonding strengths of C-C-H is less, than C-H, the hydrogen atom is easier teared off in the middle of a molecule of normal paraffin, than from the end. Energy of C-C connections rupture in molecules of nor-mal paraffin also decreases to the middle of a carbon chain; long hydrocarbonic molecules automatically break off in the center.Our researches have shown that cavitation zones improve rheology of the Azerbaijan oil. Results of an experimental research are shown in the table. Experiments were spent on the device of the cavitation affecting installed on a line of the pipeline which is the hollow cylindrical case of a variable section which are switching on a smooth contraction, providing origination of cavitation. The working part of a water tunnel serves for reception of high speeds of a stream at which pressure drops to value of pressure of saturated steams. Cavitation here originates as on the examinee the sample placed in this part of a pipe, and on walls of the pipe. Essential advantage of the given method in comparison with others is that

condition that here we deal with a true hydrodynamic cavitation. Irreversible change of viscosity, saturated vapor pressure, iodine value, fractional structure and oil density takes place in one pass through cavitation zones. As a result of cavitation oil undergoes a process of micro cracking, it destructs molecules. For studying micro cracking process, we realized oil distillation under atmospheric conditions. Apparently from the table the initial boiling point in the received light fractions decreases, the volume percent at 350°C fractions raises. The increase in iodine number in these fractions proves that under the cavitation oil undergoes the process of micro cracking. The share of paraffin hydrocarbons, and share resinous decreases and aspaltens hydrocarbons increases. Thus, if the mass fraction of paraffin hydrocarbons in a stream as it is known, it is not so dependent on share resinous decreases and aspaltens hydrocarbons the quantity aspaltens-gams-paraffins adjourment decreases. Without looking change of parametres of oil, its elementary composition not changes. This is given by the grounds, at a hydrodynamic cavitation in oil there are phase transformations. At phase the transformation, each phase separates from competitive a boundary at which intersection chemical and physical characteristics of oil fractions almost instantly change. Change of such factors by cavitation application at a pipeline transport is one of ways of struggle with, aspaltens- gams- paraffins adjourment. The basic deficiency of this device is intensive cavitation deterioration of its working surfaces oscillating cavitation vials, which bulk occurrence on these surfaces. The working part of a water tunnel serves for reception of high speeds of a stream. However erosion begins in 16-24 hour after the beginning of tests, and speed of a stream is necessary for its origination above 40 km/s. After cavitation zones in pipes there is a water hammer. On the basis of the made observations and studying of character of affecting of cavitation on oil, it is possible to draw a leading-out that cavitation leads to destruction of parrafins and on the molecular

Table. Resulted in oil property change in cavitation zone.

№	Test (name and detals)	Before suppos. cavitat. zone.	After the suppose. cavit. zone. 1-th day	After the supposed cavit. zone. 5-th day	After the supposed cavit. zone. 10-th day	Method
1	Density: 20°C – d , kq/m³ 15°C – d , kq/m³ Spesific gravity 60/60 ⁰F	863,2	862,6	862,2	861,8	ASTM D1298
2	APİ Gravity, ⁰APİ	29,92	30, 14	30, 23	30,30	ASTM D1250
3	Sulphur , %-mass	0,213	0,213	0,212	0,212	ASTM D4294
4	water, %- mass	0,12	0,12	0,10	0,10	ASTM D4006
5	Kinematic viscosity, cSt 0 ⁰C-d 10 ⁰C-d 20 ⁰C-d 30 ⁰C-d 40 ⁰C-d 50 ⁰C-d	- - 78,55 42,26 31,75 24,52	98,43 86,75 54,53 39,97 28,46 23,39	95,86 85,78 54,14 38,75 26,17 22,98	94,27 85,56 53,75 38,23 24,42 22,19	ASTM D445
6	Reid vapour pressure, Kpa	24,3	26,1	27,5	28,6	ASTM D323
7	Pour point, ⁰C	+3	0	0	-3	ASTM D5853
8	Sediment by extraction, %-mass	0,0086	0,0079	0,0071	0,0058	ASTM D473
9	Conradon carbon residue? In residual 260 ⁰C-, %-mass	3,45	3,27	3,14	3,09	ASTM D189
10	Merkaptan sulphur, ppm	14,0	13,0	13,0	12,0	UOP 163
11	Hydrogen sulphide, ppm	nil	nil	nil	nil	UOP 163
12	Chlorine in crude oil, ppm	1,7	1,5	1,5	1,4	ASTM D4929
13	Chlorine in fr. 204 ⁰C, ppm	7,2	6,8	6,5	6,2	ASTM D4929
14	Total nitrogen, ppm	1134	1123	1114	1112	ASTM D4629
15	Salts, mq/l	34,9	30,7	28,9	25,3	ASTM D3230
16	Asid number, mq KOH/q	0,12	0,12	0,11	0,10	GOST 5985
17	Ash content, %-mass	0,014	0,012	0,011	0,010	ASTM D482
18	Asphalthenes, %-mass	0,27	0,26	0,26	0,25	İP 143
19	Wax content, %-mass	6,59	6,12	5,94	5,43	BP 237/76
20	Brome (Iodine) num. gr. of	2,6	2,9	3,1	3,2	ASTM

21	brome (iodine) in 100 gr. frac. 360 ^{0}C, q/100gr					D1159/1160
	Distillation (at 101,5 kPa), ^{0}C					
	Initial boiling point	61	59	57	55	
	10 % - distilled at	158	141	138	131	GOST 2177
	50 % - distilled at	325	321	319	315	
	Final recovered, % v/v	385	385	385	385	

oil structures, assosits, misels and to decrease of their size that promotes viscosity decrease. But eventually, the shattered corpuscles rebuild intermolecular links that leads to restoration of dynamic viscosity of oil. The working part of a water tunnel serves for reception of high speeds of a stream. However erosion begins in 16-24 hour after the beginning of tests, and speed of a stream is necessary for its origination above 40 km/s. After cavitation zones in pipes there is a water hammer. On the basis of the made observations and studying of character of affecting of cavitation on oil, it is possible to draw a leading-out that cavitation leads to destruction of parrafins and on the molecularoil structures, assosits, misels and to decrease of their size that promotes viscosity decrease. But eventually, the shattered corpuscles rebuild intermolecular links that leads to restoration of dynamic viscosity of oil.

CONCLUSIONS
Experiments showed that after cavitation processes dynamic viscosity of the Azerbaijan oil decreases on 9 %. For oil restoration of initial value of viscosity within 72 hours after processes is characteristic. Change of such factors during pipeline transportation presents a problem for commodity operations Regardless improvement in oil flow propertiesthe long term process leads to the increase of emergency in pipeline systems. It follows that, on the basis of cavitation processes it is possible to establish the general laws of regulation of physical and chemical properties of oil, to use high-paraffin crude oils in pipeline transport technology through improvement flow properties of pumped oil.

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