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Введение

Нефтяная промышленность Томской области достигла значительного уровня добычи нефти и в последующем будет не только удерживать, но и повышать его. Однако восполнение сырьевой базы осуществляется низкими темпами. В настоящее время вероятность открытия новых крупных высокодебитных месторождений нефти и газа, таких как Советское, Первомайское, Северное, Стрежевское, Лугинецкое и т.д. на территории Томской области очень невелика. В таких условиях крайне важной и необходимой задачей является оптимизация добычи нефти на месторождении А. и избежание остановок работы скважин.

В процессе добычи и транспортировки нефти могут создаваться условия, при которых размеры ассоциатов тяжелых компонентов становятся критическими, и, теряя устойчивость, они выпадают в виде твердой фазы, образуя отложения.

Образование отложений на поверхности технологического оборудования может приводить к существенным осложнениям процесса добычи, транспорта и хранения нефти. Необходимость борьбы с отложениями приводит к большим материальным затратам и повышению себестоимости добываемой нефти.

Решение, позволяющее полностью устранить процесс отложения тяжелых фракций на стенках оборудования, стало бы огромным достижением в отрасли. Однако все такие задачи очень непросты и требуют тщательного изучения физико-химических свойств нефтей, в частности асфальтенов и смол.

Одним из способов регулирования фазовых переходов асфальтенов и дисперсного состояния нефтяных систем является применение присадок поверхностного действия. Диспергирующие присадки на основе сукцинимидов переводят асфальтеновые отложения в суспендированное

состояние и удерживают мелкодисперсные частицы в растворе, препятствуя укрупнению и оседанию.

Цель данной работы: анализ устойчивости нефтяных дисперсных систем и факторы, влияющие на нее, методом фотонной корреляционной спектроскопии

Задачи:

– ознакомиться с современными представлениями о нефтяных дисперсных системах и их свойствах;

– рассмотреть нефть в рамках коллоидно-химического подхода;

– провести обзор современных методов изучения структуры и свойств нефтяных асфальтенов;

– исследовать кинетику процесса агрегации нефтяных асфальтенов в модельной системе асфальтены–толуол–гептан и в нефти.

– оценить влияние диспергирующих присадок на агрегацию асфальтенов

– просчитать экономический эффект применения диспергирующих присадок на одну обрабатываемую скважину.

Аннотация

В первой части дипломного проекта рассматриваются общие сведения о месторождении, его расположение и характеристика, геолого-геофизическая изученность и геологическое строение района, представлена оценка запасов нефти данного месторождения. Исходя из геолого-физической изученности строения района возникает проблема высокого содержания асфальтенов, смол и парафинов в нефти.

Современную сырьевую базу лицензионного участка недр А. составляют запасы нефти, свободного и растворенного газа, конденсата категорий C_1, и C_2. Арчинское месторождение мелкое по запасам. Промышленная нефтегазоносность связана с пластами $М_{1-10}$ палеозойского возраста и горизонтом $Ю_1$ верхней юры.

Добыча нефти на месторождении ведется из залежи пластов $М_{1-10}$ начиная с 1999г. Нефти А. месторождения содержат асфальтены, смолы и парафины. На скважинах это приводит к полной остановке добычи и выходу из строя оборудования. Для решения этой проблемы осуществляют горячую обработку скважины теплоносителем.

Во второй части дипломного проекта рассматриваются общие представления об асфальтенах, смолах и парафинах, их характерные особенности, методика борьбы и их применение на месторождениях, а также методы исследования дисперсных систем, в частности метод фотонной корреляционной спектроскопии. Данный метод анализа рассеянного света является бесконтактным экспресс-методом с высокой чувствительностью и точностью, позволяющий проводить измерение размеров частиц в непрозрачных средах, таких как нефть. Также преимущество данного метода, заключается в дешевизне среди остальных методов исследования размеров частиц.

В третьей части дипломного проекта рассматривается методика применения угла обратного рассеивания для исследования нефтяных

дисперсных систем. Важнейшей особенностью которой является поиск оптимального угла смещателя. Также рассматривается эффективность действия диспергирующей присадки С5-А на агрегацию асфальтенов в нефтяных дисперсных системах и в нефти А. месторождения с помощью метода угла обратного рассеивания.

В четвертой части проведен расчет экономической эффективности применения диспергирующей присадки на одну обрабатываемую скважину. Также произведен сравнительный анализ мероприятий по борьбе с АСПО между обработкой теплоносителем (нефть, газоконденсат) и обработкой ингибитором образования асфальтенов диспергирующей присадкой. Компания получает прибыль за счет двух факторов: дополнительная добыча нефти и уменьшение расходов по сравнению с действующим методом борьбы с АСПО на нефтяном месторождении. Проведенные расчеты показали экономическую эффективность применения диспергирующей присадки..

В пятой части дипломного проекта рассмотрена социальная ответственность оператора добычи нефти и газа. Описаны виды вредного воздействия на окружающую среду. Проведен анализ всех опасных и вредных факторов рабочей зоны. Описана чрезвычайная ситуация

Social responsibility

Operator's work site is on a multiple well-platform, which involves operating in the open air under any weather conditions all year round. Oil production being a continuous process, the operators work night shifts.

Dangerous Production Factor (DPF) is the factor that can lead to a trauma or to other sudden sharp deterioration.

Harmful Production Factor (HPF) is the factor that can cause a disease or decrease in working capacity.

DPFs include the following factors:

– electric current of a certain force;

– hot items;

– falling from height both a man and equipment and tools;

– the equipment working under high pressure, etc.

– the examples of HPFs are:

– hard weather conditions;

– dust and gas pollution;

– noise, infra-and ultrasound, vibration;

– electromagnetic fields, laser and ionizing radiation, etc.

According to GOST 12.0.003-74, all the dangerous and harmful production factors are subdivided into physical, chemical, biological and psycho-physiological ones.

Analysis of harmful production factors

Harmful substances

In production, workers can be affected by harmful gases and vapors of oil, which is caused by violations of tightness of flange connections, the mechanical degradation of Christmas tree due to corrosion or valve wear.

Threshold limit values of substance according to GOST 12.1.005-88 are as follows: nitrogen dioxide – 2 mg/m^3, benzene – 10 mg/m^3 carbon oxide – 20 mg/m^3.

Noise in a workplace

If there is a noise source, it should be managed and control as well. The limits for noise exposure are presented in Table 1. The noise level with CPS pumps and other equipment working is measured. If it is necessary, collective or individual measures on noise decrease are to be taken.

Table 1 – Maximum permissible levels of sound pressure

№p	Work place	The sound pressure levels									Levels of a sound and equivalent levels
		31.5	63	125	250	500	1000	2000	4000	8000	(in dB)
2	Performing	107	95	87	82	78	75	73	71	69	80

Meteorological conditions

At work on the open areas given the region are specified:

(When operating on open platforms, the following weather parameters should be taken into account:)

– season when the production is carried out;

– meteorological parameters of air typical for the area (minimum and maximum temperatures, wind speed, relative humidity, pressure). Weather code depends on climatic regions, difficulty of operations and shift duration.

There are no limits to manage these parameters. However, some particular measures are taken to eliminate negative impact on health and wellbeing of workers.

Light pattern

The assessment of illumination of a working zone is necessary for providing standard working conditions in rooms and the open areas and is carried out according to the SanPiN 2.2.1/2.1.1.1278-03. Real illumination in a workplace can be taken from the passport of the production room, materials of certification of jobs under the terms of work, is measured by means of the light meter, or defined by the calculation stated in methodical instructions. The actual and required

parameters of systems of natural and artificial lighting are brought in the table. If necessary engineering actions for reconstruction of system of lighting are developed.

Analysis of dangerous production factors

Mechanical dangers

Mechanical dangers can arise at any object capable to cause to the person a trauma as a result of unprovoked contact of an object or its parts with the person. The dangerous zone is a space in which action on the working dangerous or harmful production factor is possible.

Mechanical dangers at the enterprises represent moving cars and mechanisms, the unprotected mobile elements of the production equipment, the moving products; preparations, materials, the collapsing designs, sharp edges, shaving, tools and the equipment, and also falling of objects from height.

Pressure

Excess of the maximum admissible pressure, refusals or failure of the regulating and safety valves. High level of pressure in processing equipment and pipelines can be led to destruction of the equipment and as a result put injuries to workers including not compatible to life. On production apply to prevention of emergence of incidents gages of instrumentation and automated control systems and safety fittings.

Electrical safety

In this section safety requirements imposed to installations, the being sources of dangerous factors are reflected.

Demands to the workers occupied on service of electric equipment are made.

It is known that defeat of the person electric current perhaps only at short circuit of an electric chain through a body of the person, i.e. at a touch of the person to network not less than in two points. At the same time the increased value of tension in an electric chain which short circuit can happen through a body of the

person is a dangerous factor. Depending on conditions of the production environment and to normative documents, the following questions are considered:

a) the choice and justification of category of the room on degree of danger of defeat by electric current;

b) requirements to electric equipment;

c) the analysis of compliance of the real situation on production to the listed requirements;

d) actions for elimination of the found discrepancies;

e) justification of the actions and means of protection working from defeat with electric current.

Main collective methods and means of an electrical protection: insulation of conductive parts (wires) and its continuous monitoring; installation of protective devices; preventive signaling and locks; use of signs of safety and the preventing posters; use of small tension; protective grounding; nulling; protective switch-off. If necessary calculation of protective grounding, nulling, a choice of devices of auto disconnect is made.

Personal fixed insulating electroprotective equipment are capable is long to withstand a working stress of electric sets therefore they allowed to concern current carrying parts energized. In installations to 1000 V are dielectric gloves, the tool isolated handholds, pointers of tension.

Individual additional electroprotective equipment have insufficient electric durability and can't independently protect the person from defeat by current. Their appointment - to strengthen protective action of the fixed isolating assets with which they have to be applied. In installations to 1000 V - the dielectric boats, dielectric rubber rugs isolating supports. In work it is necessary to carry out justification of the choice individual the fixed and the additional isolating electroprotective equipment of these workplace.

Fire and explosion safety

One of the most probable and destructive types of emergency are the fire or explosion in a workplace. Fire safety represents a uniform complex of

organizational, technical, regime and operational actions for warning of the fires and explosions.

When writing the section for buildings and constructions the category of locations is determined by fire danger on NPB 105-03 and a class of zones of a fire and explorations on the joint venture 12.13130.2009. To technical measures - the modern automatic means of a signaling, methods and devices of restriction of spread of fire, automatic stationary systems of suppression of the fires, emergency firefighting equipment. The type, quantity and investment of funds of suppression of the fires determine by the norms given in the joint venture 5.13130.2009.

Working in the oil fields is dangerous

New numbers out this week from the Bureau of Labor Statistics showed the overall rate of fatal work injuries last year was about three out of every 100,000 full-time workers. But for workers in the oil and gas industry, who work long hours with a lot of dangerous equipment, it was more than five times higher.

The BLS report said 142 people in oil and gas sector died last year from work-related injuries, an increase of 27 percent from the year before.

Retzer said well sites are dangerous places, with multiple companies taking heavy equipment down or putting it up. But she said the most fatalities are tied to transportation, particularly incidents where workers drive from one work site to another in light-duty vehicles. Some drive on unsafe rural roads with no seat belts. And they're working long hours, so fatigue is a big issue.

"Every year there's at least one or two incidents where a crew of one or two workers are driving together, and the driver falls asleep at the wheel, and there are multiple deaths," she said.

One solution? Some oil field companies have installed monitors on vehicles to track how workers drive, whether they accelerate too fast, a sign of aggressive driving, or decelerate too quickly, a sign of distraction.

They really can monitor everything that can go on in that vehicle," said Kari Cutting, vice president of the North Dakota Petroleum Council, a trade group.

“And at the end of the day, your supervisor is sitting there with a record of your driving experience of the day.

But Denver attorney Randal Kelly said another problem could be the culture of machismo among oil and gas workers. Low-skilled workers could, at one point, make $100,000 a year. Kelly said some keep quiet about unsafe conditions.

“Because if you don't keep this job, how are you going to make even close to this with your skill set?” he said.

Retzer, the epidemiologist, will conduct a survey of 500 oil and gas workers in three states next year to learn more about impediments to safe practices.

Oil prices are down, and there are far fewer workers in the oil patch these days. But Retzer said that could work to her advantage. She said oil field companies and workers may have more time to work with her and think about safety.

Environmental protection

Main types of environmental pollution:

– oil environmental pollution owing to imperfection of technology, emergency floods and non-compliance with nature protection requirements;

– pollution of the atmosphere at combustion of gas in torches and losses via the untight equipment around compressor station, at accidents on gaz and oil pipelines;

– pollution of the environment industrial and household wastes;

– development of negative geological processes in a zone of construction and operation of objects (change of a superficial drain, bogging, flooding, development of ravines, landslides, erosion, activization of cryogenic processes on sites of distribution of breeds, salinization by an exit of Cenomanian waters).

And as a result from the above-marked impacts on the nature:

– abbreviation of areas of rare species of plants, the areas occupied by berry-pickers, herbs and other valuable species of flora;

– violation of the woods in case of arrangement of mobile settlements, temporal roads, industrial sites, etc.;

– abbreviation of fish inventories owing to pollution of a surface water, violations of the hydrological mode in case of construction and operation of fields;

– abbreviation of number of species of wild animals because of poaching and redistribution of habitats of main types, etc.

General measures on environmental protection are:

– abbreviation of losses of oil and gas; increase in tightness and reliability of the oil-field equipment;

– high level of a utilization of oil gas;

– a process optimization of combustion of fuel in case of simultaneous lowering of formation of toxic combustion products.

All lines of collection of oil and trunk oil pipelines shall withstand deformations of the soil during the thawing period. Any damage caused to the environment outside development sections shall be liquidated.

Protection of atmospheric air from pollution

At oil production from well pads the pollutants (P) which consist of emissions through thinnesses of flange connections, locking and adjusting fittings of wells and metering stations (MS), and also omental consolidations are emitted.

Emissions of pollutants on the technical platform

oil treatment plant (OTP) consist of emissions from work of oil and gas separators, pumps and shutoff valves.

One of the main sources of emissions of pollutants are the torch economy intended for combustion of gas during the operation of the equipment.

At well-drilling it is recommended to use the closed tight system of circulation of drilling mud fluid, to apply the tight and closed capacities to storage of oil and fuel , to neutralize and neutralize exhaust gases of internal combustion engines, to utilize associated petroleum gas, to prevent gas-manifestations, to provide automatic shutdown of oil wells at break of the discharge line.

Extensive damage is caused to natural complexes in case of emergencies.

Are the main reasons for accidents:

– low-quality construction;

– mechanical damages;

– corrosion of pipelines;

– change of design decisions in the course of construction.

The main actions for protection of atmospheric air from pollution:

– full sealing of the equipment for collecting and transportation of oil and gas;

– control of seams of welded connections of pipelines;

– protection of the equipment against corrosion;

– utilization of associated gas;

– use of the equipment of factory production;

– the developed action plan at an emergency;

– accident elimination has to be carried out by emergency service.

Purity of atmospheric air is provided by reduction of absolute emissions of gases and neutralization of the emissions containing harmful substances (table 2).

Table 2 – Harmful substances

№	Name of pollutants	In the MAC in air of the inhabited places, mg/m3	Danger class	Parameters of emissions	
				g/sec	t/y
1	Nitrogen dioxide	0.085	2	0.078	1.230
2	Carbon monoxide	5.000	4	0.220	4.88
3	Hydrocarbons	50	4	9.140	298.8
4	Soot	0.15	3	0	2
5	Methanol	1	3	0.041	1.290

On emergency torch installations it is necessary to provide full and smokeless combustion of gases. To provide purification of the dumped gas on a torch from drop oil, to equip a torch with devices for remote ignition of torches.

As fuel it is recommended to use natural gas, process of combustion of fuel should be optimized.

Protection of surface and underground water from pollution and exhaustion

The special negative impact on the chemical composition of reservoirs at operation of objects of oil production is made by oil spills and waters with a high mineralization. At hit of oil in reservoirs on a water surface the film interfering air exchange is formed.

Ways of hit of toxic pollution to natural waters:

– intake of toxic substances from sludge depots in ground waters;

– pollution of ground waters as a result of lack of a waterproofing of technological platforms;

– hit of pollution in ground waters at emergency oil spills, sewage and other waste as a result of rushes of pipelines;

– intake of oil and the mineralized waters in underground waters as a result of overflows on annular space at low-quality cementation of the well and its leakage.

Actions for rational use and protection of water resources:

1. Dumping of sewage into water objects is forbidden;

2. Establishment and maintenance of the water protection zones;

3. Removal of objects from ecologically vulnerable zones;

4. The pressurized system of collecting and transport of production of wells;

5. Dispersal of volume of pumping water on layer;

6. Use of pipes from the synthetic materials corresponding to climatic conditions of the area;

7. Quality control of welded seams;

8. Transitions of pipelines through water barriers have to be carried out;

9. Dumping of well pads taking into account superficial system of a drain;

10. Collecting the spread oil products in emergency capacity with the subsequent transfer on OTP.

11. To carry out biological purification of utility fluids;

12. At repairs of wells to carry out collecting an oil emulsion in a collector.

Protection and rational use of lands

Pollution of soils oil results in significant ecological and economic damage: efficiency of forest resources goes down, sanitary state of environment worsens.

At the choice of platforms and routes under construction of facilities the main criterion is the minimum use of the woods of I and II groups, an inundated part of the rivers and lakes, and also a round of cedar forests, ways of migration of animals and birds. Laying of linear constructions (highways, pipelines, power lines) in one corridor is accepted that provides decrease in the area of the occupied lands by 30-40%.

According to requirements of forestry of the organization, the performing construction works are obliged:

– to provide the minimum damage of soils, grassy and moss vegetation;

– to make cleaning of cutting areas and to liquidate the felling remains;

– not to allow damage of root systems and trunks of edge trees;

– not to leave stubs it is higher than 1/3 diameters of cut, and at the cabin of trees it is more than 30 cm - higher than 10 cm, including root neck height.

Upon termination of drilling operations on well pads elimination and recultivation of sludge depots as follows are carried out:

– clarification, neutralization of a liquid phase with the subsequent pumping in an oil-gathering collector;

– filling of a sludge depot imported soil;

– planning of a recultivation surface a peat layer - sandy mix 15 cm thick and seeds long-term herbs.

Land reclamation on routes of linear pipelines carries the nature protection direction and is carried out in two stages:

1. The technical stage of recultivation consists of collecting the spilled oil, cut of a soil and vegetable layer 0.2-0.4 m thick and his moving to temporary dumps prior to construction works.

2. The biological stage of recultivation includes a soil disking harrows in one trace, superficial introduction of mineral fertilizers and crops of long-term herbs mechanically.

Prevention of emergency oil spills and chemical reagents is provided:

– control of pressure in the general collector and a main separator with the signaling of extreme values on the MS;

– in case of accident on OTP automatic switching of a stream of oil in emergency capacities;

– emergency shutdown of pumping units on OTP and knots of dispensing of inhibitors;

– fixing of pipe ducts on design marks the freights and anchors interfering emersion and a rush;

– a layer pad of pipe ducts in housings through highways;

– quality control of welded seams of pipelines.

Protection in Emergency Situations

Development and statement of actions for ES elimination. Accidents can be the cornerstone both the technical reasons, and a human factor, they can be objective and subjective, and also be a consequence of ecological and spontaneous factors. Then it is necessary to develop the list of actions for increase in stability of a designed project (increase in durability of designs, reservation of raw material inventories, systems electro-gas-water supply, etc.). Shortly emergency situations spontaneous, logical and social character are considered.

Possible ES on an object: open spouting of oil from wells; rushes of oil-gathering network and RPM network.

Typical ES is floods during a flood.

Preparation for a flood season, check and strengthening of external constructions, the immediate message on ES to the supervising foreman, a call of specialized crew for ES elimination.

Common Hazards Faced by Oil and Gas Employees

More than half a million of the US population works in the oil and gas industries. These workers are exposed to hazardous working conditions most of the time. Though many of these companies are taking responsible steps to eradicate all possible dangers in the oil and gas rigs, there are many fatalities that have become a part of the industry now. The injuries caused by the oil and gas rigging activities are far more severe and take much more time to recover from as compared to the other sectors of the industry. Looking at the severity of such accidents, rigging companies are playing their part to mitigate risks by manufacturing quality rigging equipment that are much safer and easier to use.

Most of the rigging injuries occur due to varied reasons such as, carelessness and recklessness of the workers, misuse of equipment, not using proper safety equipment, failure to provide proper training and delaying the repair or replacement of rigging equipment.

Following some of the commonly occurring oil and gas hazards which need to be controlled:

1. Vehicle Collision

One of the biggest dangers for oil workers is not at the rig but on the road. Over the past decade many oil workers have been killed in fatal road accidents. Working for 17 long hours at the oil rig and then climbing on to the truck for a 4 hour long journey to the oil service company outlet, is an activity that earns quite a few dollars for these workers. With the increase in drilling activities like fracking, millions of gallons of fresh water are required for this process. This requires a continuous supply of water, which is generally transported from various places.

All of the above activities have increased the number of trucks on roads, leading to frequent collisions. One of the main reasons for these reckless accidents has been carelessness and less alertness or exhausted drivers. Many a time’s trucks were found to be in disrepair and in a bad condition

2. Machine Hazards

Amongst all the industries that uses hazardous machines and equipment, the oil and gas industry arguably ranks first. Many of these machines operate in

unguarded areas which further endangers the workers using them. This means operations such as traveling derrick, heavy lifts and hoists, spinning chain, loading and unloading materials, drilling should be conducted with care by competent operators.

Machines used for drilling activities generally cause a lot of noise and vibration which can harm the operator. While using such equipment the operator should make it a point to wear protective gear like gloves and earplugs. Equipment like pumps, compressors, hoist blocks, belt wheels, and conveyors might cause injury if the operator gets struck by or caught between such machinery. Falling objects and equipment can cut or crush body parts of the workers in the process. It is important to follow OSHA regulations to guard machinery, update equipment and keep them in good working condition to ensure safe use.

3. Chemical Exposure

Chemical risks are common on oil rigs. Many of the drilling and oil processing plants diffuse extremely hazardous chemicals into the atmosphere most of the time. Prolonged exposure to toxic and volatile, chemicals and fumes can cause respiratory as well as major brain problems to the workers. Most of the oil rigs release high concentrations of H2S (Hydrogen sulfide). Pipeline operator and crude oil shippers face maximum risks caused by dangerous levels of H2S. It can cause paralysis, leukemia and other cancers or even death.

Other side effects of toxic exposure that have been reported are headaches, nausea, dizziness, eye and skin irritation and chemical burns. This is the reason it is important that proper eye, face and respiratory protection masks are used on rigs.

4. Fall Hazards

Oil and gas rig workers have to work on elevated platforms. Lack of proper fall protection systems and safety wear can result in fatal falls. Most of the rig workers hurt their head, fracture their arms, and suffer brain and spinal cord injuries and even death. Some of the leading causes of such falls include harness failure or improper rigging methods, slipping over chemicals or tools and even being struck by tools and equipment.

A good housekeeping practice can reduce many of the trips and slips on the rig platforms. It is important that the floor is kept clear of unnecessary tools, ropes or cords. Also make it a point to clean oil or chemical spills immediately. Make use of slip resistant and waterproof boots to reduce slips and trips. Also ensure, you cover open cellars or potholes and use appropriate signage warning people of the same, wherever required. Make sure the ladders, guardrails are kept in good condition before every use. Use personal protective equipment like hard hats, gloves, goggles, masks and safety nets all the time.

5. Fire And Explosion

Oil and gas rigs house a lot of highly combustible chemicals and gas, which means there is always a chance of a fire breaking out or explosions. Most of the times these occur without the slightest warning and so are difficult to prevent. You need to be ready with all possible preventive measures to face such hazards.

Having a detailed fire-fighting plan is always recommended. You need to have equipment, extinguishers and suppression agents ready in case of an emergency. Most of the accident prone areas like gas chambers, oil tanks and electricity rooms are under continuous threat of fire and explosion; it is important that all the machinery and equipment susceptible to fire should be inspected on a regular basis. Place adequate amount of extinguishers and safety equipment in and around such places. Offer proper safety training to the employees working in such hazardous areas. Regular inspection and maintenance of such places and equipment can reduce the risks of such hazards.

These are the commonly known hazards that occur frequently on oil and gas rigs. It is important that every company follows proper safety and health regulations to reduce such risks. Training your worker to perform their job with care and efficiency, and monitoring these risks will surely diminish the hazards.

Заключение

В результате выполненной работы, была разработана методика исследования непрозрачных систем методом фотонно-корреляционной спектроскопии с помощью угла обратного рассеивания, был доказан оптимальный угол лимба – 333 градуса.

Согласно задачам дипломного проекта, выполнено:

– ознакомление с современными представлениями о нефтяных дисперсных системах и их свойствах;

– рассмотрена нефть с содержанием асфальтенов, смол и парафинов в рамках коллоидно-химического подхода, было выявлено что нефть месторождения А нуждается в детальном изучении;

– проведен литературный обзор современных методов изучения структуры и свойств нефтяных асфальтенов, было выявлено, что в настоящее время требуется новый упрощенный метод изучения нефтяных дисперсных систем.

– проведена оценка влияния диспергирующей присадки на агрегацию асфальтенов, оценка показала, что диспергирующие присадки оказывают стабилизующее влияние на процесс агрегации асфальтенов, причем это влияние заметно при добавлении 1% присадки С5-А. Размер ассоциатов асфальтенов после добавления присадки уменьшился приблизительно в 3 раза. Также при добавлении присадки наблюдается тенденция уменьшения размера ассоциатов по сравнению с изначальным раствором;

– определен экономический эффект применения диспергирующих присадок на одну обрабатываемую скважину, который по сравнению с обработкой скважины горячим теплоносителем выгоднее в 2,39 раза;

– определены параметры экологичности и безопасности в чрезвычайных ситуациях;

Разработанная методика исследования модельных систем методом ФКС, алгоритм обработки и форма представления результатов позволят

установить закономерности изменения размеров ассоциатов под влиянием разных факторов, в том числе и состава нефти, которые могут быть использованы для выбора методов предотвращения образования асфальто-смолисто-парафинистых отложений в процессе разработки месторождений