DEVELOPMENT OF THE REGULATORY BASE FOR UNCONVENTIONAL OSR TECHNOLOGIES IN RUSSIA

Alexei Chernoplekov, Ph.D, Managing Director "Technology Assessment Unit" ,
65 Leninsky prospect, Moscow, Russia,119991, Alexei.Chernoplekov@tau-ltd.com
Anatoly Kram, Ph.D, Emergency Response Manager "Technology Assessment Unit" 65 Leninsky prospect,
Moscow, Russia, 119991, Anatoly.Kram@tau-ltd.com

ABSTRACT

The report will cover the Russian regulatory framework for application of non traditional techniques of oil spill response in Russia including dispersant application and in-situ burning. The conditions of application of the above techniques are part of oil spill recovery (OSR) in Russia. The report presents proposals for regulation' improvement in Russia.

INTRODUCTION

Russia possesses enormous oil resources. Annually 350 mn tones of oil are produced and transported in Russia. Considering the amount of oil transported the losses connected with oil spills and environmental contamination are inevitable. Issues of mitigation of risk of contamination and oil spill response (OSR) are of primary importance in Russia. One of the tools contributing to mitigation of risk of contamination and providing for efficiency of oil spill response and recovery of polluted land and water areas is regulatory management.

OSR techniques recognized in Russia as extraordinary (unconventional).

In Russia as in the whole world, safety precautions in industry, preventive measures as well as OSR strategies and tactics promoting resistance to the potentially growing threat of spills and the environmental effect of the above are being improved. Nevertheless Russian traditions govern the priority when choosing safety precautions, preventive measures and OSR strategies and tactics. These traditions are reflected first in the Russian Regulations[1,2], covering regulatory management in the sphere of OSR. Analysis of case histories of OSR techniques implemented by leading Russian operators—«AK «Transneft», Rosneft, LUKOIL, YUKOS and others shows that during OSR planning mechanical recovery is traditionally preferred and possibilities of dispersants application and in-situ burning are only considered as extraordinary (unconventional) measures. Application of absorbing agents on rivers, lakes and sea areas is limited as well (only under special permission of regulatory agencies). The same can be said about bio preparations for biological recovery (bio remediation) of land areas. Dividing OSR techniques into conventional and unconventional stipulates planning of OSR operations, composition and quantity of equipment, purchasing by companies possibility of timely, qualitative and cost effective response.

Preconditions for unconventional OSR techniques application

Unconventional techniques enlarge spectrum of potential oil and oil products spills response qualitatively changing techniques and ways of achieving positive results in course of OSR operations. The principle of unconventional techniques represents the transforming of oil and oil products into harmless compounds, substances and matters under the effect of chemical compounds, sorbents, temperature and bacteriums. It considerably differs from mechanical separation of contaminant (oil and oil products) out of the cleaning territory or aquatory.

Application of unconventional OSR techniques invokes changes in specifics of contamination impact upon the environment owing to:

- Impoverishment of contaminant due to dispersants application;
- Reduction of the area of impact due to packing the contaminant inside sorbents;
- Changing of composition of contaminant under thermal impact and in-situ burning;
- Changing of composition of contaminant by means of bacterium treatment.

Resulting such changes oil and oil products concentration can be reduced to permissible level very quickly, or the area of contaminant contact with land of water area can be reduced, thus the negative impact on the environment will be reduced to the limit or eliminated absolutely. The composition of contaminant and the way of environmental impact of the above are changing in course of in-situ burning as well as resulting bio remediation.

It should be mentioned that unconventional techniques simulate natural dispersion of oil and oil products in the environment, reducing time of presence of contaminant's impermissible concentration in the above.

The unconventional techniques are less critical to conditions of OSR operations. Dispersants' and sorbents' spraying techniques allow performing OSR operations in unfavorable hydro and meteorological conditions. The same relates to in-situ burning, when ice conditions or threat of contamination of areas of special value can be overcome by quick response with application of in-situ burning. Application of bio remediation is designed for pre-recovery of contaminated territories when any mechanical recovery may inflict more harm than contaminant's residue on the given area.

Application of unconventional technique of in-situ burning in course of OSR in Russia

International best practice in the field of environmental protection against oil and oil products spills[3,4] enables to range priority in determining both response strategies and techniques. International Petroleum Industry Environmental Conservation Association (IPIECA) as the major objective of oil spills response deems mitigation of seriousness of ecological damage and promoting of restoration of ecosystem subject to ecological damage[5]. Russian environmental regulations are holding the given opinion as well.

It is of fundamental importance that the selected techniques of environmental protection should greatly comply with international practice in the field of oil and oil products spills response.

Currently international practice considers three basic techniques providing for oil and oil products spills response and mitigating the seriousness of environmental consequences. These techniques are known as mechanical recovery, dispersion and in-situ burning. The last two techniques represent rather unconventional techniques taking into consideration application in emergency situation and regulatory coverage (basic). The same can be said about bio remediation, when oil slick is treated and annihilated by bacteriums.

Comparing the environmental protection techniques in terms of technological effectiveness of oil and oil products spills removal it should be mentioned that:

- Mechanical recovery provides for special, consequential recovery of the contaminated surface in every particular segment and therefore represents the most non-technological effective operation. Mechanical recovery has a lot of restrictions in terms of conditions and efficiency of application. Mechanical recovery requires much time and involving of numbers of participants;
- Dispersion activates the process of splitting of oil slicks and consequent oil and water intermixing. Dispersant is spread on the whole contaminated surface simultaneously. At that the accurate mechanical operations are not required. Dispersants' application is a more technologically effective operation and it doesn't have such restrictions in respect of terms and efficiency of application as mechanical recovery. Such disadvantage of dispersion as negative impact on the biota may be eliminated after development of new types of dispersants;
- Bio remediation is used mainly for soil recultivation via oil treatment by bacteriums. Bio remediation belongs to high technology of treatment of contaminant and it represents a durable process that can sometimes take years.
- In-situ burning—is a technique enable to annihilate a large bulk of spilled oil very quickly. During application of in-situ burning the oil slick is affected over the whole contaminated area. Here are advantages of the given technique:
  - In course of in-situ burning a large bulk of oil is removed quickly and effectively. At that there is no need to involve numbers of participants.
  - In-situ burning makes it possible to prevent or minimize the amount of oil that can reach the shoreline.
  - In-situ burning can be often used in circumstances when mechanical recovery is physically or technically impossible.
  - In-situ burning may to a considerable extent reduce the need in waste storage sites, located close to the oil slick area.

Primary factor, limiting the in-situ burning application is the associated air pollution, and conditions required to maintain burning process.

At present international practice accumulates a lot of examples of successful application of in-situ burning as perhaps an exclusive oil spill response technique acceptable for the specific conditions. Especially in case of oil spill response on sea, where the possibility of mechanical recovery is limited, and the tendency to mitigate environmental damage requires to take immediate and effective actions, contributing to ecosystem rehabilitation.

Mostly in-situ burning is an unplanned operation and results spontaneous combustion. Fires on sea occurred voluntarily, as a result of which oil burned. For instance:

- On November 1, 1979 in the area of Galveston (Texas) the tanker Burmah Agate collided with freighter Mimosa. The tanker fired. The exact amount of oil burned was uncertain, however estimates ranged from 24,000 to 37,000 tones.
- On June 8, 1990 at the same place (offshore Galveston, Texas), the tanker Mega Borg exploded. About 16.000 tones of crude oil spilled. Approximately 50% of spilt oil evaporated or was burned.
- On January 21, 1993 at the entrance to the Strait of Malacca sea channel the Maersk Navigator collided with the Sanko Honour. As a result of the accident, the Maersk Navigator spilled oil and caught fire. Most oil was consumed by fire; only a strip of oil a few hundred meters wide in the water was reported.

In all these cases more severe environmental consequences of oil bulks' exposure upon the shoreline were averted. Literally the danger was burnt away.

The scientific and technology groups within the oil spills response (OSR) community recognized the advantages of in-situ burning and started research into applying in-situ burning as one of the countermeasures in the process of oil spill response.

The researches are being carried out in the field of theory of oil and oil products burning process and as well experimental researches are being accomplished pertaining to operational feasibility of in-situ burning of oil and oil products under different conditions.

The following is under survey:

- Effectiveness of application of in-situ burning;
- Conditions (local, weather and other) limiting in-situ burning application;
- Oil contamination treatment techniques, enhancing effectiveness of in-situ burning.

Eventually the sphere of in-situ burning application is enlarging. At present techniques are known that contribute to effectiveness of in-situ burning under severe environment such as exposure of low and negative temperatures or afterburning of thin oil films on the open water and on ice.

An essential instrument providing for required for the process of combustion thickness of oil film on the open water is a fireproof floating boom. The application of the above provides for combining of advantages of mechanical recovery (such as localization) with advantages of in-situ burning (such as quick removal of spilt oil by transforming of the above into carbon dioxide gas and soot).

Researches of Russian specialists demonstrate that reduction of oil ignition temperature being so required under cold temperatures may be achieved by application special additive agents in spilt oil, similar to the process of dispersion. The given technique combines advantages both of dispersion and in-situ burning.

Taking into consideration that application of the given technique provides for removal of oil contamination under conditions of broken ice and hummocks and doesn't require involving numbers of personnel for oil spill response, it is rather complicated to find any alternative for in-situ burning under the given conditions.

The undertaken researches are especially topical in course of development of new fields located in more severe environment. In Russia it is primarily related to oilfields on continental shelf of the Sakhalin Island and in the Komi Republic.

The achieved level of development of technique of in-situ burning and future results shall be stated in Regulations. Regulations are being required that provide legality of application of in-situ burning as one of techniques of oil spill response.

There are some examples in the international practice when application of in-situ burning on open water is approved or is being approved by government bodies of the USA and Canada. Specialized OSR divisions lawfully use in-situ burning technique as practicable method for oil spill response.

Regulations covering oil spills response in the Russian Federation (Decrees ## 240; 613 and 193), don't exclude application of in-situ burning in OSR operations at certain stages as well. However Russian Regulations pertaining to fire safety contain numbers of restrictions for application of an open fire, and it considerably reduces a number of cases when in-situ burning is possible. Unfortunately Russia lacks methodical and regulatory framework for application of in-situ burning. Therefore in Russia the application of oil and oil products in-situ burning isn't regulated and every case of spill requires specific consideration and approval. Resulting the unavailability of unambiguous permitting documents and techniques for application of in-situ burning is the fact that application of in-situ burning during oil spill response has many opponents in the name of supervising and regulatory agencies and social organizations operating in the sphere of environmental protection.

Unavailability in Russia of unambiguous permitting documents for application of in-situ burning brings about situations when every case of emergency connected with oil spill and matter of issuing of approval for in-situ burning is considered particularly. Consequently while spending time on concurrences and making decisions we don't have enough time to prevent or minimize environmental impact making use of the technique of in-situ burning. In order to change the given approach to the efficient technique of oil and oil products spills response it is necessary to take measures to timely identification of issues that may considerably impede the process of decision making and to cooperate with the Russian Regulators.

The given measures will allow minimizing time required for getting approvals for application of in-situ burning. Unavailability in Russia methodical and regulatory framework for application of in-situ burning and the above listed factors make problematic to use in-situ burning as well-developed and reliable technique for oil or oil products spills response.

For the benefit of settling the question of application of in-situ burning in Russia as a method for oil and oil products spill response, a Regulation is required providing for legality and application conditions of the above technique.

After approval of this kind of document it will become the only legislative document in Russia regulating the application of in-situ burning in OSR operations. This document will ensure validation of application of in-situ burning in the Russian Federation that is very important for determination of OSR System strategy and tactics as well as in course of development and approval of OSR Plans for oil-producing and refining companies.

BIOGRAPHY

Alexei Chernoplekov has many years of experience as a safety consultant in the oil and gas industry in Russia. He has Ph.D. degree in Ph. D. in Control Theory and System Analysis, his scientific interests are focused on Qualitative Risk Analyses (QRA) and its applications to various problems in safety and environment protection in oil and gas industry.

He is a member of Society for Risk Analysis and a member of the Advisory Group to the President of Russian Academy of Sciences for the problems of risk and industrial safety.

His project experience includes Safety Declarations (Russia), Safety Report (EU), Safety Case (UK and Australia), Environmental Impact Assessment (Russia) and Oil Spill Response Plan (Russia and USA) development for main oil and gas companies operating in Russia and overseas (Sakhalin Energy Investment Company (SEIC), SHELL, BP, EXXON, Exxon Neftegaz Limited (ENL), LUKOIL, GAZPROM) as well as for locally operating companies (Rosshelf and Nizhnekamskneftechim (Russia), BHP Petroleum and Esso Australia Pty. Ltd. (Australia), Hamilton Oil (USA)).

Anatoly Kram is well known specialist in Oil Spill Response (OSR) field of oil industry in Russia. He has Ph.D. degree in technical sciences; he participated in numerous scientific research works on environmental protection problems. He has more than 80 scientific publications. He participated in developing of OSR Plans for main international oil companies operating in Russia: Exxon Neftegaz Limited(ENL), Sakhalin Energy Investment Company (SEIC), Caspian Pipeline Consortium (CPC), YUKOS, LUKOIL, TRANSNEFT.

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