

FORMATION OF OIL EMULSIONS, THEIR PROPERTIES, AND CLASSIFICATION. BASIC CONCEPTS.

Oil-production enterprises supply the consumers, i. e. oil refinery plants, with the output production being governed by the regulatory documents that are effective in the sphere. At present, in all the CIS countries there is a single standard that provides for in-field oil treatment in accordance with the three quality categories (table 1).

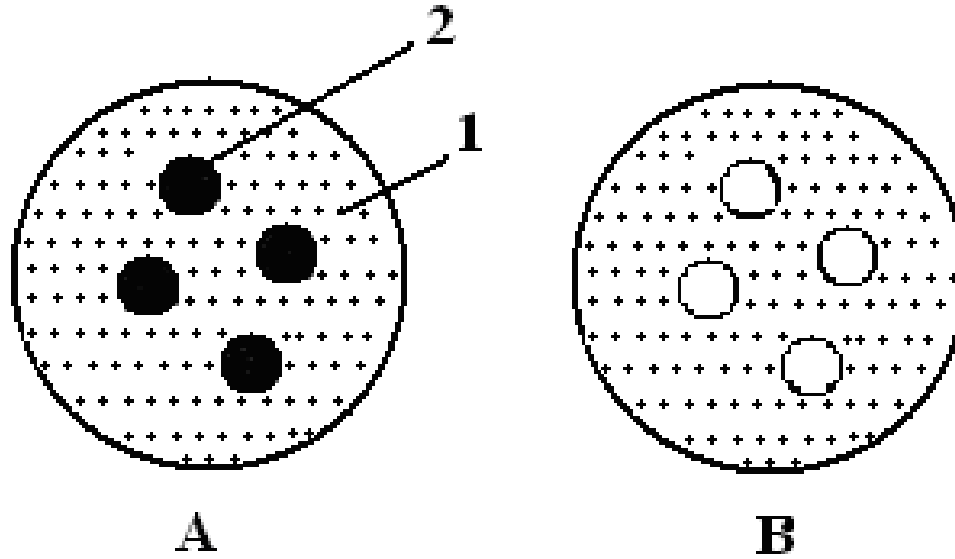
Table 1 – Quality Categories of Oil Treatment

No.	Quality parameter	Category		
		I	II	III
1	Water content, not more than %	0.5	1.0	1.0
2	Salt content, not more than, mg/l	100	300	1800
3	Content of mechanical impurities, %	0.05	0.05	0.05
4	Pressure of saturated hydrocarbons vapors, Pa	660	660	660

It can be seen from the provided table that the field oil treatment comes down to separation of water (dehydration), inorganic salts (desalting), and mechanical impurities. In certain cases, depending on the conditions of oil transportation to the consumers, there arises a necessity to stabilize it, i. e. separate the non-stable propane-butane fractions, in order to reduce the pressure of the saturated vapors and losses of hydrocarbons.

Water separation is considered to be the main problem of oil treatment. A considerable amount of water and sometimes even the major one is available in oil in the form of water-oil emulsion. Oil emulsion is considered to be a mixture of oil and formation water that cannot be soluted in one another and that are in a fine-dispersed state.

There are two phases that can be distinguished in oil emulsions – internal and external. The liquid in which there are some drops of another liquid is called a dispersion medium 1 and the liquid that is dispersed in the form of small drops in the dispersion medium is called a dispersion phase 2. (fig.1)



A – oil-in-water (O/W); B – water-in-oil (W/O);
1 – dispersion medium; 2 – dispersion phase

Figure 1 – Water-Oil Emulsions

Scientists distinguish oil-in-water, i. e. when oil in the form of small drops is placed in water, and water-in-oil emulsions, i. e. when water in the form of fine drops is dispersed in oil.

Water is an external phase in the oil-in-water emulsions therefore they mix with water in any ratios and have high efficiency. Meanwhile, water-in-oil emulsions can mix only with hydrocarbon liquids and have low electrical conductivity.

Under field conditions, water content in an emulsion can be assessed mainly on the basis of its color: the emulsions that contain up to 10% of water hardly differ on the basis of their color from pure dry crude oil; the emulsions with the water content ranging from 15 to 20% are brown or yellow; and the emulsions that contain more than 25% of water are yellow.