LECTURE №4-5

INDICATORS OF DEVELOPMENT

Indicators of oil field development

To characterize the process of extracting oil from the depths using indicators that determine the time intensity, the degree of extraction of oil, water and gas. Among the indicators of development are the following.

Production oil Qoil - the main indicator, the total for all producing wells drilled in the object per unit time, and **average daily production** - mining, which accounts for one well. The variation in time of these indicators depends not only on the properties of the reservoir and fluid but also from manufacturing operations which are carried out in the fields at various stages of development.

Production liquid Qlig - the total production of oil and water per unit time. From purely petroliferous wells in the reservoir for some time (waterless period of operation of wells) producing clean oil. For most fields, sooner or later their production begins to increase the water content. Since then, the production liquid exceeds oil production.

Considered indicators reflect the dynamic characteristics of the process of producing oil. To characterize the development process for the entire past period of time using the integral indicator - **summary production.**

There are the following parameters: **summary production oil**, **liquid** and **water**. **Summary production oil (liquid, water)** reflects the amount of oil (liquid, water), which is extracted by the object for a certain period of time from the beginning of development, i.e. since the start of the first production well.

Unlike dynamic indicators, summary production can only increase.

It is absolute indicators. But there are also relative indicators which characterize the process of extraction products in parts of the initial oil reserves. One of the important indicators of technological development of oil deposits is **rate development**. This indicator varies over time, reflects the impact on the development of all technological operations carried out on the field. Using the indicatoris obtained graph

There are four periods of the oil field, called stages

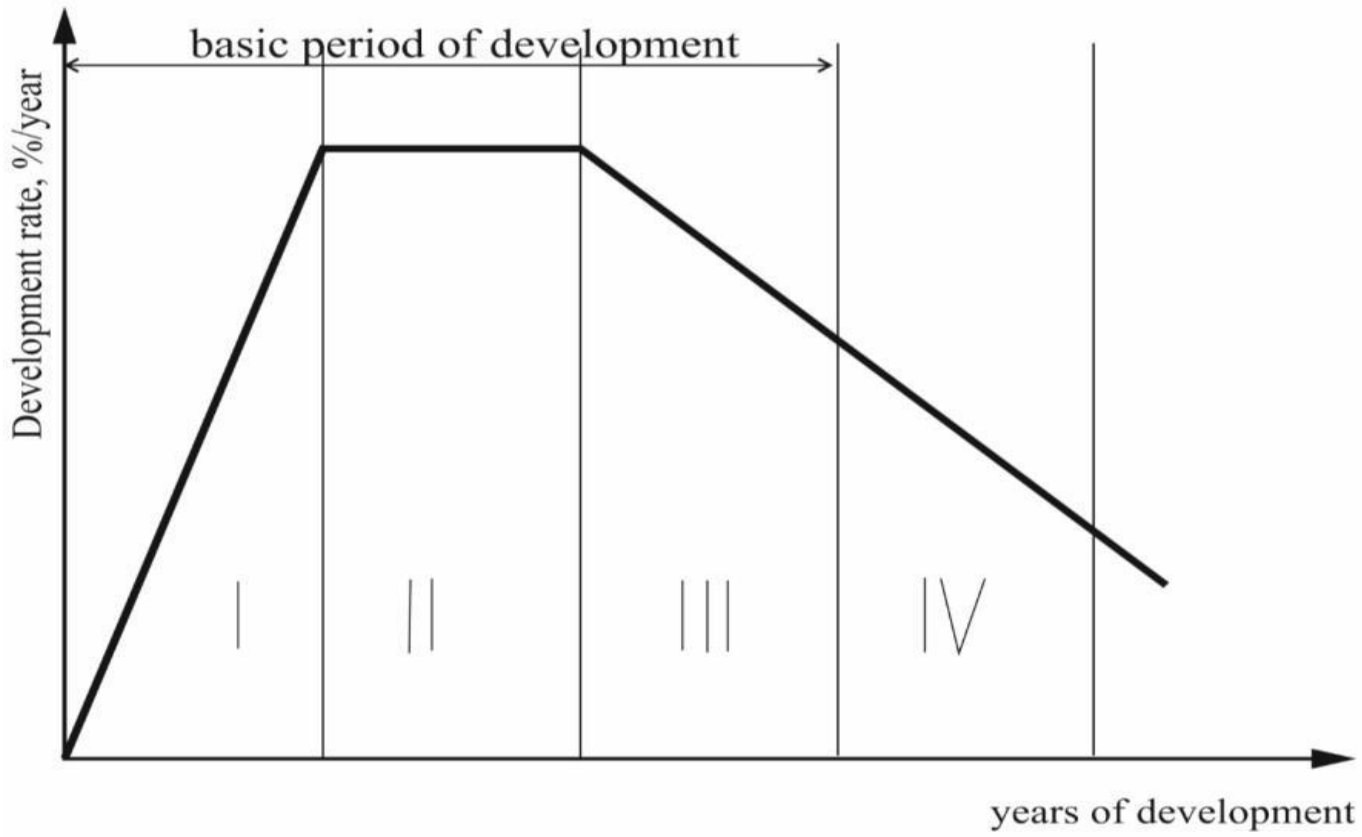

Figure 2.1 – The periods of the oil field

The first stage *(stage input field operation)* when taking place intensive drilling of the main amount of wells, the rate of development continuously increases. During this phase mined usually oil without water. The duration of the stage depends on the size of the deposit and the rate of drilling. Duration of the stage is 4-5 years, depending on the rate of drilling deposit.

The second stage *(the stage reached by maintaining the maximum level of oil production)* is characterized by more or less stable annual oil extractions. The main objective of this phase is done by drilling reserve fund regulation modes of development wells and the full system flooding or other method action on the layer. Some wells by the end of the stage stop and gush their way transferred to mechanized operation. The main task - to support high levels of oil production for a longer period. The duration of the stage - 5-7 years, with the larger oil viscosity, the shorter duration of the second stage.

The third stage *(stage falling production oil)* is characterized by intense slowdown rate development, progression to the product water content of 80-85%. Because water content is reduced through disconnection well stock wells, almost all the amount of well transferred to a mechanized method of operation. The main task of this stage - slow down the fall in oil production.

The main objectives are to reduce the production of formation of water through insulation work. The duration depends on the stage of preliminary stages and durations of 5-10 years or more.

The fourth stage *(final stage of development)* is characterized by slow rate development. Amount of water in oil is high and slowly increases decreases operating well stock. During this stage carry large amount of repair work. The duration of the fourth stage of 15-20 years and more.

Formation pressure Pf - the pressure at which oil and gas are found in the reservoir.

Amount of wells n - the total amount of injection and production wells that are designed to carry out the development process. The number of wells divided into **primary** and **backup**.

Gas-oil factor (gas-oil ratio) G - the ratio of the extracted gas to the amount of oil produced

$$G = \frac{Qgas}{Qoil} \qquad m^3/m^3 ; m^3/t.$$

Water-cut (amount water in oil) nw - the ratio of water flowrate to the total flowrate of oil and water.

$$n_w = \frac{Q_w}{Q_{liq}} = \frac{Q_w}{Q_{oil} + Q_w}, \%orf.u$$

Amount of substances pumped into the reservoir. In implementing different technologies to effect on the layer using different agents that improve conditions for extracting oil from the depths. Pumped into the reservoir water, steam, hydrocarbon gases and other substances. The injection rate these substances and their total amount and rate at which they extract the surface with production wells - important indicators of the technological development process