

Mathematical modeling of oil field, exploited under solution gas drive

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Oil and gas Industry plays an important role in economic development of a modern society. Main task for our country is to develop its petroleum economics. Discovery of new oilfields in Pakistan need significant capital investment, for drilling and exploration on land and offshore areas. Therefore application of new technology is important to stabilize and enhance petroleum production from pre-existing oil fields. Different forecasting methods of oil exploitation are used in today's upstream oil industry business. In the presented paper a mathematical model was developed and tested for short term forecasting of oil and gas production. Subsurface oil can be exploited on different oil drives, which mainly include: solution /dissolved gas oil drive, water drive, gas cap drive, gravity drive and combination drive. Field geological characteristics of Pakistani and Ukrainian oil fields, for devised model, were studied and production data was analyzed on computer for different oil drives. In presented model pre-existing production data of Khaskheli oil field (Baden, Pakistan) and Papeli oil field (Ukraine) was used. We proved for the first time, existence of linear relationship between cumulative volume of oil production (ΣQ_o) along Y-axis and logarithm of cumulative gas production ($\ln \Sigma Q_g$) along X-axis, at certain time interval, for oil fields exploited at solution gas drive. This simple model is based on five to ten years oil and gas past production history. Future oil and gas production for next few years can be forecasted by simply extending pre-existing straight line further as dashed line, which will give us forecasted values for ΣQ_o and $\ln \Sigma Q_g$ on Y and X coordinates. The model was tested on Khaskheli (Pakistan) and Papeli (Ukraine) oil fields. Constructed model was found applicable, with greater accuracy, for oil fields, exploited under dissolved gas drive.