Identification of petrophysical rock types with the use of flow units concept and cluster analysis: A case study from the South Pars gas field, Iran.

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Abstract:

Aptian Dariyan formation is one of the oil reservoirs in the South Pars gasfield. Occurrence of the world's great unconformity at the end of Aptian, has caused the formation is strongly influenced by the meteoric diagenesis processes and extension of dissolution pores. The goal of reservoir characterization is to study petrophysical properties such as porosity, permeability and water saturation. The porosity-permeability relationships in the framework of hydraulic flow units can be used to characterize heterogeneous reservoir rocks. A flow unit is defined as correlatable and mapple zones laterally and vertically within a reservoir which control fluid flow and significantly is different from those of other rocks. Each flow unit is characterized by a flow zone indicator (FZI). So, reservoir zonation with the use of flow zone indicator and identification of flow units can be used for evaluating the reservoir quality based on porosity-permeability relationships. In this study, Dariyan formation is divided into five hydraulic flow units based on flow zone indicator variations. In order to study the reservoir quality of the facies, the percentage of the identified flow units was calculated in each facies.

In order to determination of the reservoir rock types, porosity-permeability data of each facies is plotted in the Lucia petrophysical chart.

In the second stage of study, a cluster analysis approach is used to classify reservoir rock types. The goal of cluster analysis is to classify data into groups called cluster, so that data within each group have no significant differences with each other. In the present study, five clusters were identified based on porosity and permeability data. Finally, in order to establish a connection with rock fabrics, the reservoir quality of rock facies was evaluated in each cluster, independently. Both of the methods show the satisfactory results in reservoir geology study of the of the Dariyan formation in the South Pars gas field.