

Modern Depositional System of Kepulauan Seribu Carbonate, Offshore Jakarta, North West Java Basin as An Analogue for Petroleum Reservoir

Muhammad Tressna Gandapradana¹, Taufan Tryastono¹, Achmad Chaidar¹, and Muhammad Irwan¹

¹Pernando Napitupulu, Abdurrokhim, Universitas Padjadjaran, Indonesia

Abstract

Carbonate rocks are one of reservoir rocks with the largest reserves in the world. Different from other types of sedimentary rocks, carbonate rocks are unique as the reservoir rock. Carbonate rocks have large porosity and permeability caused by diagenetic process. Kepulauan Seribu is located about 45 km from the northwest coastline of Java Island, geographically on latitude $-5^{\circ} 24'$ to $-5^{\circ} 45'$ LS and longitude $106^{\circ}25'$ to $106^{\circ}40'$ with 107.489 hectares wide, distributed in north - south trend. Kepulauan Seribu platform is separated from Java mainland by major deep channel, which Van Bemmelen interpreted as a major Pleistocene river system draining westward from Sumatera (Park, 2004).

The carbonate platform in Kepulauan Seribu build under tropical climate condition, with sea surface temperatures ranging from 26.500 C to 300 C and has the low salinity of sea level on average between 30-34%. In that conditions of temperature and salinity, it is currently belong to the optimal conditions for carbonate rock reservoir to grow as well. It can be a new and special modern carbonate depositional system because Kepulauan Seribu platform is isolated by global ocean system since it surrounded by large archipelago. Beside that, Indonesia has very humid climate and low ocean salinity.

The methodology used in this research is by surface mapping. The mapping technique including collecting the rock, see the fossil assemblage, and make thin section of the rock which taken directly from the field. The analysis conducted to know the facies distribution in Kepulauan Seribu area, depositional environment and diagenetic environment so we can use it for analogue to characterize the ancient reservoir in subsurface carbonate reservoir. The goal of this research is more focused on Kepulauan Seribu lateral facies distribution, depositional environment, diagenetic environment and the character as implication to be a good reservoir.

Carbonate platform in Kepulauan Seribu comprises of quaternary coral rudstone (Holocene) with large quantities. Several types of organisms such as brain corals, branching corals and algae have been collected from five islands. They are Pramuka Island, Panjang Island, Kotok Island, Semak Daun Island and Pari Island. Each island has their own type of fossil assemblage. In Pramuka Island, there was abundance of brain coral and large bivalves. In Panjang Island, there was abundance of branching coral and mollusca. In Kotok island, there as assemblage of Algae and Branching coral. In Semak Daun Island, there was assemblage of brain coral. In addition, in Pari island there was assemblage of brain coral. From this distribution, the pattern of the coral growth has been known. From the south to the north, the coral growth pattern is begin with brain coral dominated and in the south and changing to branching coral dominated to the north.

As a modern depositional environment model, coral rudstone in Kepulauan Seribu has a huge potential to formed as reservoir because it composed by coral with bioclastic abundance and low mud percentage. The porosity and permeability came from interparticle porosity and as dissolution by meteoric water. This process creates a good porosity and permeability of the rocks to be petroleum reservoir.

