



ABSTRACT

The research area is located in the Rembang area, a well known prospective region for oil and gas in Northeast Java, Indonesia. This research is aimed to fully understand and geological, petrological and petro-physical characteristics of Ngrayong Sandstone from Rembang area. The current research is carried out by the field investigation involving facies analysis from the five measured stratigraphic sections followed by the petrographic study, grain-size analysis, paleontologic study and petrophysics analysis. Sandstones are very fine- to medium-grained, angular to poorly-rounded, moderately- to very well-sorted, grain- and matrix-supported. They are classified as sub-lithic arenite, sub-feldspathic arenite, and lithic greywacke. Ngrayong sandstone is regarded as clean, matrix poor, fairly-matured quartz sand stone. The limestone layer generally caps the upper part of the Ngrayong sandstone and it is characterized by the presence of Orbitoididae species such as *Cycloclypeus* sp., *Lepidocyclina* sp., *Miogypsinoidea* sp., *Discoicyclina* sp., and *Planorbulinella* sp. Based on these foraminifera assemblage, the age of the Ngrayong Formation is assigned as Middle Miocene. The occurrence *Cycloclypeus* sp. indicates that it was deposited in shallow marine (middle inner neritic) environment. Ngrayong sandstones have porosities ranging from 25.97% to 40.21% and permeabilities ranging from 94.6 to 3385mD. Thus, sandstones exhibit good to excellent reservoir qualities. Eight lithofacies were identified from five measured stratigraphic sections and include cross-bedded sandstone facies (Facies A), carbonaceous mudstone facies (Facies B), laminated shale facies (Facies C), thin-bedded sandstone facies (Facies D), massive sandstone facies (Facies E), bioturbated sandstone (Facies F), fossiliferous sandstone facies (Facies G) and bioclastic limestone facies (Facies H). These facies were group into two different facies association: (1) tidal-dominated shallow marine shelf (shoreface) sediments association (2) coastal (foreshore) sediment association..The Ngrayong sequence shows both transgressive and regressive cycles. Of nine lithofacies observed in the this study, five principal facies are identified as potential reservoir facies. Cross-bedded sandstone (Facies A) and massive sandstone (Facies E) are identified as the best potential reservoirs facies based on their outcrop nature, lateral and vertical distribution, sedimentological and petrophysical properties.

Key words: Ngrayong Sandstone, Rembang Area, Lithofacies, depositional environment, reservoir characteristics



SARI

Daerah penelitian terletak di daerah Rembang, wilayah yang terkenal sebagai penghasil minyak dan gas di Cekungan Jawa Timur Utara, Indonesia. Penelitian ini bertujuan untuk memahami kondisi geologi, karakteristik petrologi dan petrofisika Batupasir Ngrayong di daerah Rembang. Penelitian ini dilakukan dengan pengamatan lapangan yang melibatkan analisis fasies dari lima jalur stratigrafi terukur yang dilanjutkan dengan analisis petrografi, granulometri, paleontologi dan petrofisika batuan. Batupasir mempunyai ukuran sangat halus hingga menengah, menyudut – membulat sedang, sortasi menengah hingga bagus, dan terdukung butiran hingga matrik. Batupasir Ngrayong ini diklasifikasikan sebagai sub-litik arenit, arenite sub-feldspathic, dan greywacke litik. Batupasir Ngrayong termasuk batupasir kuarsa yang bersih, kurang matriks dengan kedewasaan yang sedang. Perlapisan batugamping secara umum menumpang pada Batupasir Ngrayong dan ditandai oleh hadirnya spesies Orbitoididae seperti *Cycloclypeus sp.*, *Lepidocyclina sp.*, *Miogypsinoides sp.*, *Discocyclina sp.*, dan *Planorbulinella sp.* Berdasarkan kumpulan foraminifera ini, Formasi Ngrayong ditafsirkan berumur Miosen Tengah. Adanya *Cycloclypeus sp.* menunjukkan bahwa itu lingkungan pengendapan formasi ini adalah laut dangkal (neritik tengah). Batupasir Ngrayong memiliki porositas berkisar antara 25,97% sampai 40,21% dan permeabilitas 94,6mD-3385mD. Berdasarkan data petrofisika tersebut menunjukkan batupasir Ngrayong sangat bagus kualitasnya sebagai batuan reservoir. Delapan lithofasies dapat diidentifikasi dari lima jalur pengukuran stratigrafi terukur, yaitu Facies batupasir perlapisan silang (Facies A), Facies batulumpur karbonan (Facies B), Facies serpih laminasi (Facies C), Facies batupasir berlapis tipis (Facies D), Facies batupasir masif (Facies E), Facies batupasir bioturbasi (Facies F), Facies batupasir berfosil (Facies G) dan Facies batugamping bioklastik (Facies H). Facies ini dapat dikelompokkan menjadi dua Asosiasi Facies, yaitu (1) Asosiasi Facies laut dangkal dominasi pasang surut (2) Asosiasi Facies laut dangkal tepi pantai. Suksesi batupasir Ngrayong menunjukkan siklus transgresif dan regresif. Dari sembilan lithofasies yang diamati dalam penelitian ini, lima fasies diidentifikasi mempunyai potensi sebagai reservoir. Batupasir perlapisan silang (Facies A) dan batupasir masif (Facies E) diidentifikasi sebagai reservoir dengan potensi terbaik berdasarkan data singkapan, distribusi lateral dan vertikal, sifat sedimentologi dan petrofisika batuan.

Kata kunci: Batupasir Ngrayong, daerah Rembang, litofasies, lingkungan pengendapan, karakteristik reservoir