# ABSTRACT

Ngrayong Sandstone Formation is one of the productive reservoir in Indonesia both East Java basin and Northeast Java basin (Madura onshore and offshore). This research comprehensively focuses on the fundamental reservoir properties from surface outcrop data such as porosity (Ø) and permeability (K), texture (grain size, grain sorting, and grain shape) and geological conditions such as lithofacies, and depositional environment from lithological log. The purpose of study is to give the fundamental understanding about characteristics of Ngrayong Sandstone in Western Part of Madura Island and that can be used as a pieces of information in preliminary exploration of hydrocarbon. This research, lithofacies can be divided into 7 different lithofacies such as heterolithic sandstone facies (facies A), carbonaceous shale facies (facies B), cross-laminated sandstone facies (facies C), laminated mudstone facies (facies D), upper fan turbidites facies (facies E), bioclastic carbonate facies (facies F), and mixed siliciclastic-carbonate facies (facies G). These 7 lithofacies are further categorized into 2 depositional settings, tidal-dominated shallow shelf (FA1) and lower continental slope (FA2). There are 6 rock types such as sandy micrite, lithic arenite, greywacke, mudstone, allochemic mudrock, and wackstone. Lithic arenite is composed by grain supported, moderately sorted, angular to subrounded, medium silt to very coarse grain sand size. Greywacke is comprised matrix supported, poorly to moderately sorted, and angular to subrounded, fine silt to coarse grain sand size. Both rock types are deposited in upper fan turbidite facies (lower continental slope) the porosity and permeability value significantly ranges from 34.15 to 34.73% and 209 to 273mD, respectively. However, sand micrite derived from facies A and C (tidal-dominated shallow shelf) is composed by matrix supported, poorly to moderately sorted, and angular to subrounded, fine silt to coarse grain sand size with porosity and permeability value derived from petrophysic analysis ranging from 18.23 to 30.56% and 1.22 to 7.04mD, which is quite good in quality. Indeed these sandstone can be viably considered as target for hydrocarbon exploration in Western Part of Madura Island.

# SARI

Batupasir Formasi Ngrayong merupakan salah satu reservoar yang produktif di Indonesia baik di wilayah Jawa Timur dan Jawa Timur Laut basin (Madura daratan dan lepas pantai). Penelitian ini akan difokuskan secara komprehensif pada sifat dasar reservoir berdasarkan data singkapan permukaan seperti porositas (Ø), permeabilitas (K), tekstur (ukuran butir batuan, sortasi dan bentuk butir) dan kondisi geologi seperti lithofasies dan lingkungan pengendapan dari log litologi. Tujuan studi ini adalah untuk memberikan pemahaman mendasar tentang karakteristik Batupasir Ngrayong di Bagian Barat Pulau Madura dan selanjutnya yang dapat digunakan sebagai bagian informasi awal dalam eksplorasi hidrokarbon. Lithofacies dalam penelitian ini dapat dibagi menjadi 7 lithofacies berbeda seperti fasies batupasir heterolithic (facies A), fasies serpih karbon (fasies B), facies batupasir laminasi silang siur (facies C), fasies batulempung hemipelagic (fasies D), fasies *upper fan turbidites* (facies E), fasies karbonat bioklastik (facies F) dan facies *mixed siliciclastic-carbonatees* (facies G). Ketujuh fasies ini dapat dikategorikan dalam dua lingkungan pengendapan, tidal-dominated shallow shelf (FA1) and lower continental slope (FA2). Ada 6 jenis batuan seperti *sandy micrite, lithic arenite, greywacke, mudstone, allochemic mudrock, and wackstone. Lithic arenite* tersusun oleh *grain supported*, sortasi cukup baik, derajat kebundaran yang *angular – subrounded* dan terdiri dari butir sedimen berukuran *medium silt – very coarse sand*. *Greywacke* tersusun oleh *matrix supported*, sortasi buruk – cukup baik, derajat kebundaran *angular – subrounded* dan ukuran butir sedimen terdiri dari *fine silt – coarse sand.* Kedua tipe batuan tersebut diendapkan pada facies *upper sand turbidite (lower continental slope)* dengan nilai masing-masing porositas dan permeabilitas yang cukup signifikan berkisar antara 34,73% dan 209 hingga 273 mD. Akan tetapi, batupasir micrite berasal dari fasies A dan C *(tidal-dominated shallow shelf)* yang tersusun oleh *matrix supperted,* sortasi buruk – cukup baik, derajat kebundaran *angular – subrounded*, butir pasir terdiri dari *fine silt – coarse sand* dengan nilai porositas dan permeabilitas diambil dari analisis petrofisik dengan kisaran nilai antara 18,23% - 30,56% dan 1,22mD – 7,04 mD dimana secara kualitas termasuk dalam cukup baik. Maka dari itu batupasir ini dapat dianggap sebagai target dalam eksplorasi hidrokarbon di Bagian barat Pulau Madura.