ABSTRACT

There are several basins with oil productive formations on the North African Platform. The Murzuq basin is one of them; it is situated in the south-west part of Libya and the northern portions of Niger, representing an intracratonic sag basin. It was initiated during the Palaeozoic Pan-African orogine. The deposition of the basin started with basal barren conglomerates of Hassaouna Formation unconformably overlying the Precambrian basement and being unconformably overlained by productive Hawaz Formation. The top of the Hawaz Formation is strictly demarcated by radioactive shales (lower Silurian Tanezzuft shales). The contact between top of the sedimental cycle of upper fluvial delta to shallow marine sea deposits and Silurian marine pelagic sediments documents an important palaeoclimatic change in sedimentary environment owing to Caledonian Unconformity. Silurian pelagic marine sediments represent an extensive marine flooding in all North-African Platform area. This flooding event of sea level rise was caused by melting and dissolving of the glacial material on the surrounding mountainous area during Caledonian unconformity, while this mountainous area transformed in peneplane.

The present study is based on slabbed cores, core samples, and thin section; photographic of cores, conventional core analysis and well log data of the Hawaz siliciclastic sediments. The average covers thickness is about 130-170m from the total formation thickness. All data are analyzed in terms to focus on the main petrology, lithology of sedimentary facies, clay mineral associated, and the main petrophysical property of the reservoir rocks sequences which related to hydrocarbon potential.

The Hawaz Sandstone Formation shallow marine deposition facies is one of the most important oil-bearing formations in the Murzuq Basin, The Hawaz reservoir occurs within the upper levels of the Lower Paleozoic Group (Lower to middle Ordovician Llanvirnian /Llandeilian time); which occurs directly underlies the lowermost Silurian Tanezzuft shales; attaining thicknesses over (120-150 m) in average.

The Hawaz Formation in the 'H' oil field consists of thin to thick bedded very fine to medium grained quartzitic sandstone, slightly crossbedded and interbedded with feldspar, silty micaceous, and gray to dark gray shale beds. Generally the clastic sediments of the Hawaz Formation is characterize with ranging from weakly calcareous shales (argillaceous) to relatively pure non-fossil very fine to medium grained sandstones; and shows coarsening upward trend. Five facies has been interpreted based on the sandstone/clay ratio, grain size, wireline log response, dominated structure, and petrophysical character for each facies.

The sandstones are typically quartz arenites with other minor rock fragments in trace amounts. The x-ray diffraction results pointed out the essential clay minerals are kaolinite and Illite, In addition, mica, montmorillonite muscovite are important components. Feldspars are present, but due to aggressive dissolution is alteration to clays by weathering and digenesis process. Cementation and grain replacement also occur. The initial matrix is authigenic

clays followed by quartz overgrowth and silica spray cement. Evaluation of reservoir quality has led to recognition of five facies ranging between poor to good porosity (2 to18 %); ranging between negligible to very good permeability (0.01 to >900 mD); and ranging between shale volume (10 to 80%). Primary porosity was controlled by depositional environment with shale content with sandstone facies displaying greater porosities and permeabilities than the more mud-rich facies deposits. Decrease in primary porosity and permeability was affected by cementation process, calcite and authigenic clays precipitation. Mostly of observed porosity in thin section is secondary, developed by dissolution process which contributed to enhanced of the effective porosity. Facies no. three represent the best reservoir potential of hydrocarbon occurrences, in terms of hydrocarbon prospectively.