

Examiner`s report on the dissertation of Yousef M.A. Shiref:

“Geological and Petrophysical Characterisation of Hawaz Sandstones Reservoir in “H” Oil Field, Murzuq Basin, SW Libya.”

The submitted work consist of 140 script-pages accompanied by 12 tables and 74 figures (incorporated in text). Its two introductory chapters provide comprehensive description of geologic setting and main tectonic elements of Libya (chapter one) and general overview of stratigraphy and sedimentology of Murzuq Basin and its brief geologic history in time-span from uppermost Precambrian to the end of Paleozoic (chapter two). Both mentioned chapters are factologically based on satisfactorily broad selection of relevant published papers. In their scale they are suitable and proportional to the whole work.

Chapter three, which is devoted to the lithology and petrography of Hawaz Sandstones delivers a detailed microscopic description of all main rock constituents (quartz, feldspar, mica, clay minerals, rock fragments, bitumen, pyrite, matrix and cement) and final discussions on porosity, stylolytic structures and diagenesis in general. Regarding the problems of lithification of Hawaz Sandstones described in this chapter I have the following remarks:

- dominant type of stylolites as shown in most of the figures belongs apparently to the stylolytic seams, which are expressed not as toothlike, deep-cut projections (typical of limestones), but mainly as irregularly deformed sublaminar, specifically uneven plains. This would suggest their origin in compactional phase of early diagenesis by leaching of carbonate component from matrix during the initial intrastratal solution, especially in case of muddy facies of sandstones, in which the clay-carbonate matrix prevails. But it should be proven by additional chemical analyses to get sufficient comparable data (carbonate percentage in matrix).
- on page 40 the author confirms the presence of two generations of carbonate: the older one as a primary syngenetic constituent of clay-carbonate matrix and younger one as a product of cementation processes in sandstones. In such cases a careful attention should be given to the terminology used for carbonate particles: carbonate matrix must be terminologically separated from carbonate cement. In this area there were some mistakes and imperfections in the original text, figures and tables – after consultation the author made most needed corrections.
- in case of ongoing studies in the future it would be advisable to pay more attention to the processes of intrastratal solution and to the effects of late diagenetic corrosion of clastic quartz. Both these phenomena are of great importance to the final active porosity of sandstones as collectors and their resulting accumulation potential.

The facies analysis of investigated sandstones in chapter four is a valuable contribution to paleogeographic reconstruction of sedimentary environment. The author divided the entire sequence of clastic deposits into six superimposed facies (some of them with two subfacies). In agreement with prevailing scientific view of many authors this chapter brings description of variegated types of fining upward sequences as depositional product of fluvial and most probably deltaic environment. These sediments are frequently alternated by intercalations of extremely shallow marine deposits with typical sedimentary structures of Tigillites facies.

Based on these sedimentary features there is an unanimous agreement in the scientific literature, that in depositional period of Hawaz Sandstones the whole territory of Libya was a region with typical changes of continental and shallow marine environment developed mainly

in form of locally differentiated tidal flats as areas of repeated ingressions and regressions. From this point of view chapter four lacks any much needed new observations in the sense of more detailed description of tidalites. It could bring useful evidences for separation of sequences belonging to intertidal or subtidal zone. Such structures as tidal bedding, flaser bedding, herringbone bedding, types of bioturbation and other typical flood and ebb sedimentary marks should be used for clarification of facies associations of tidal inlets. This remark I mean as a suggestion for possible future studies.

Chapter five dealing with X-ray diffraction and elemental analysis as well as chapter six providing petrophysical evaluation are examined by special opponent for geophysical aspects of this dissertation work.

From the linguistic point of view the entire text suffers from frequent grammatical mistakes, formulation inaccuracy and even confusions. In case of publication of any part of the text it is unconditionally necessary to ensure thorough linguistic revision.

Conclusion:

The examined work sufficiently documents the author's ability to conduct individual research in the sense of collecting scientific data, their analytical examination and synthetic evaluation. There is no doubt about his capability to compile scientific publications and special information from other sources for research purposes and to use professional terminology adequately.

The submitted text in its scientific content comes up to common dissertation expectations and I can recommend to accept it as successful dissertation work.

Praha, 14.3.2008

Prof. Dr. Petr Čepek