Well Logging
and
Reservoir Evaluation

Oberto SERRA
Doctorate degree in geology
Engineer from ENSPM (IFP)
From 1968 to 1978, former manager of the Well logging Department
in the Exploration Division of the ELF-Aquitaine group
Former chief geologist of Schlumberger Technical Services
Scientific advisor of the Serralog Company
This third book on Well Logging, focuses on reservoir evaluation of which the main goal is the determination of the hydrocarbon volume existing in the drilled well and the discovered field. This evaluation requires a reservoir model and, for each sedimentation unit composing the reservoir, the determination of several factors:

- the reservoir volume;
- the reservoir tectonic and stratigraphic settings (spatial & temporal position);
- the presence of fractures;
- the reservoir mineralogical composition;
- the hydrocarbon volume in place and extractible, which depends on the saturation of hydrocarbon in each unit composing the reservoir, which, in turn, depends on:
  - the total pore volume of each unit composing the reservoir,
  - the pore size, which is a function of the texture (grain size, sorting, packing...).
- the diagenetic effects affecting the initial porosity (compaction, cementation, transformation, dolomitization, dissolution...) undergone since the deposition of the sediment;
- the hydrocarbon type;
- the permeability which depends on sedimentary features, fractures, dissolution and fluid type;
- the production potential that is a function of the permeability and the reservoir pressure.

The determination of these factors depends on the well type and the well logging data available. It will be considerably improved using a complete logging set including images of the borehole wall and nuclear magnetic resonance data and their interpretation by a team including geologist, geophysicist, petrophysicist and reservoir engineer. This team must determine the depositional environment in order to precisely determine, from well logging and seismic data, possibly calibrated on core data, the reservoir model, its extent and its possible evolution of its petrophysical and geological properties, taking into account:

- the facies of each depositional unit (composition, texture, internal structure, thickness);
- the type of facies succession composing genetic increments and genetic sequences.

This determination, completed by the detection of the faults crossed by the well, will allow a more precise interpretation of seismic data and consequently a much better and accurate modeling of the reservoir for its economical evaluation and development.

Remark: In this book an * indicates a Schlumberger’s mark.