

Rock Typing

Rock Typing is a technique used to predict the spatial distribution of petrophysical parameters such as porosity, permeability and saturation, on a field-wide level.

We have divided our Rock Typing Workflow into three main components:

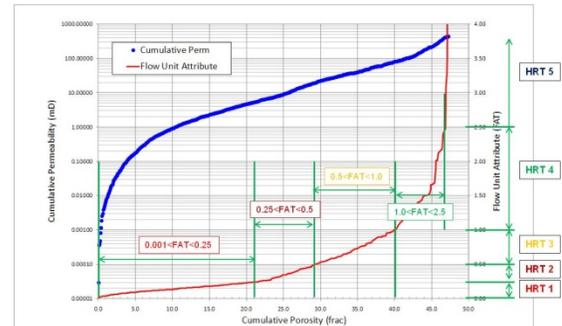
- Flow Unit Characterization
- Dynamic Validation and Prediction
- Field Development Application

Within each particular area, a number of specific deliverables will be provided.

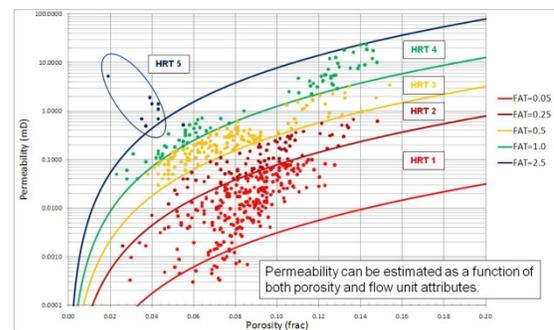
Flow Unit Characterization

There are several steps to encompass the comprehensive review of rock characteristics that are critical to fluid flow:

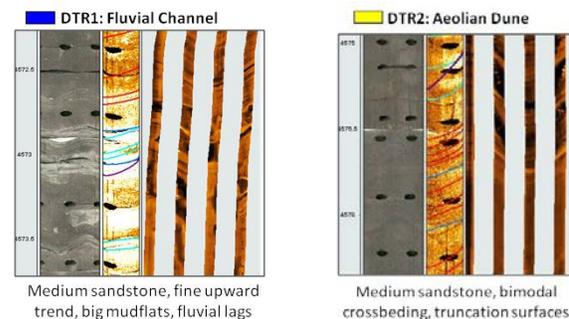
- Data QC focuses on gathering all available data and information within a geomechanical unit that is relevant to gain a full understanding of rock static and dynamic behavior differentiation;
- Hydraulic Rock Types (HRT) quantify the physical flow and storage properties of the rocks from core analysis relative to native fluids, as controlled by grain size/pore throat dimensions, geometry and the distribution of current pore and pore throat structures, using a modified Lorenz plot;
- Depositional Rock Types (DRT) are derived from core descriptions (and/or borehole images) of genetic units, according to similarities in rock composition, texture, sedimentary structure, fracture distribution, and stratigraphic sequences as influenced by the depositional environment.
- Petrographic Rock Types (PRT) are described based upon criteria of pore-scale microscopic imaging (i.e. SEM) of pore structure, rock texture, clay mineralogy, and diagenesis.



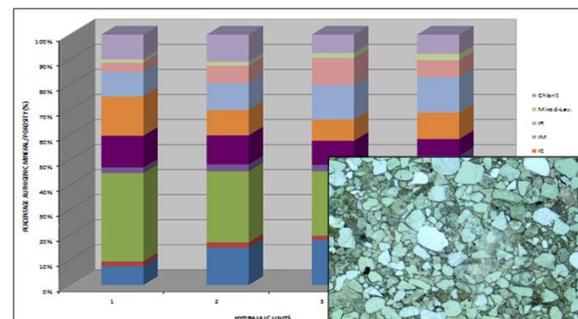
Modified Lorenz Plot to Delineate Hydraulic Rock Types



Hydraulic Rock Types Differentiation on Core Samples



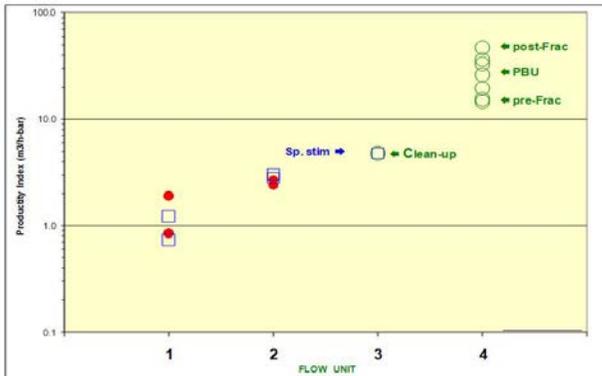
Correlate Depositional Rock Types to Flow Behaviors



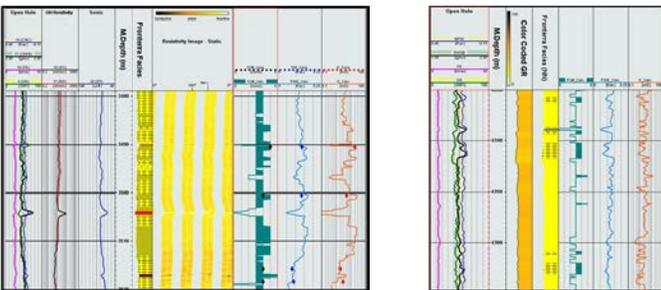
Identify Petrographic Characteristics related to Dynamic Flow Behavior

Dynamic Validation and Prediction

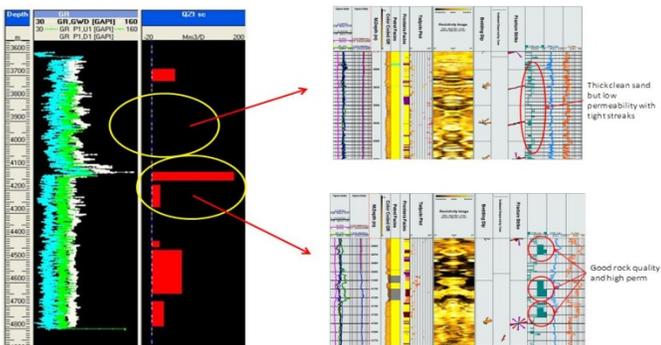
Identified Rock Type characteristics are validated against (or to predict) dynamic flow behaviors, e.g. rate transient analysis (RTA), pressure transient analysis (PTA) and production logs. In this phase, the focus of the evaluation process is placed upon the consistency of Rock Types and dynamic phenomena. Not only do we always find great correlation between identified rock types with dynamic behavior, but also the value of Rock Typing drastically increases as a simple yet useful tool for realistic applications to diagnose or optimize a field development plan.



The highest quality rock (Rock Type #4) is consistent with observed high productivity index.



Predict rock types using BHI and OH logs with and without core data. The prediction successfully explains a production log behavior (see below) that was otherwise unclear to the operator.

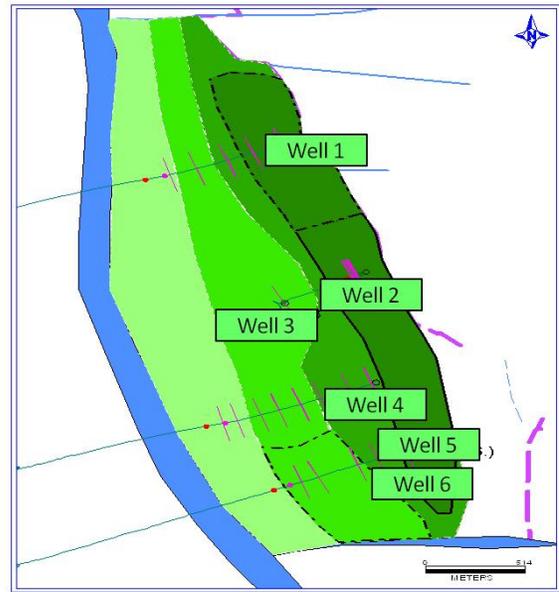


Predicted rock types explained clearly the production discrepancy in two clean sandy turbidite intervals.

Field Development Application

The ultimate objective in Rock Typing is to guide optimized drilling, completion and stimulation operations, to reach a successful technical and economic development of the fields of interests. To achieve the desired goals, Rock Typing can have several applications, to name a few:

- Production Mechanism Diagnosis
- Sweet Spot Identification
- Facilitating Static Modeling
- Evaluating Leverett J Function for Capillary Pressure and Relative Permeability Modeling



The aggregation of high quality rock is determined from primary porosity (DRT) and the diagenetic process and tectonic events (PRT) that are consistent with flow behavior and HRT. This defines sweet spot allocations.

The established relationships between depositional environment, rock composition and mechanical boundaries are very important for controlling static model propagation, in addition to maintaining dynamic validity ultimately leading to a realistic and representative optimized field development plan.

Task Fronterra Geoscience is a global independent provider of industry leading, integrated geoscience solutions, from single well analysis to complete reservoir studies. Some tasks described herein may be performed by one or more associates.