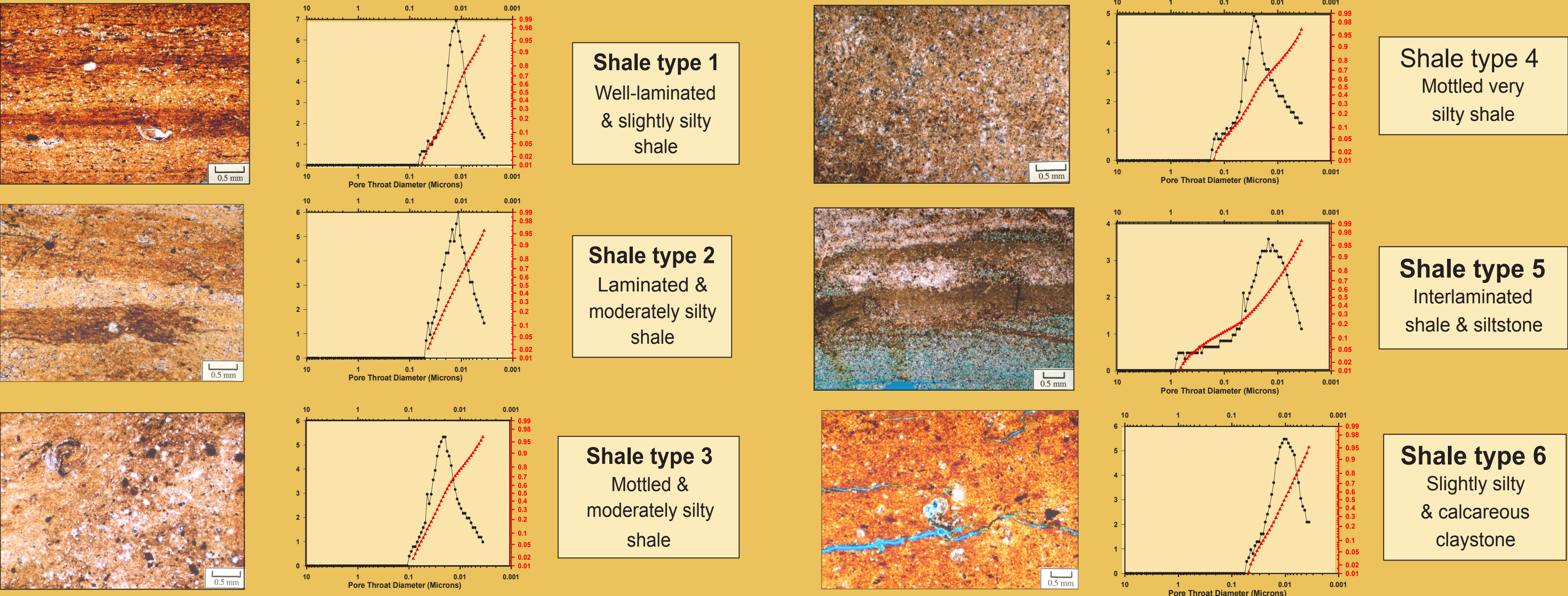
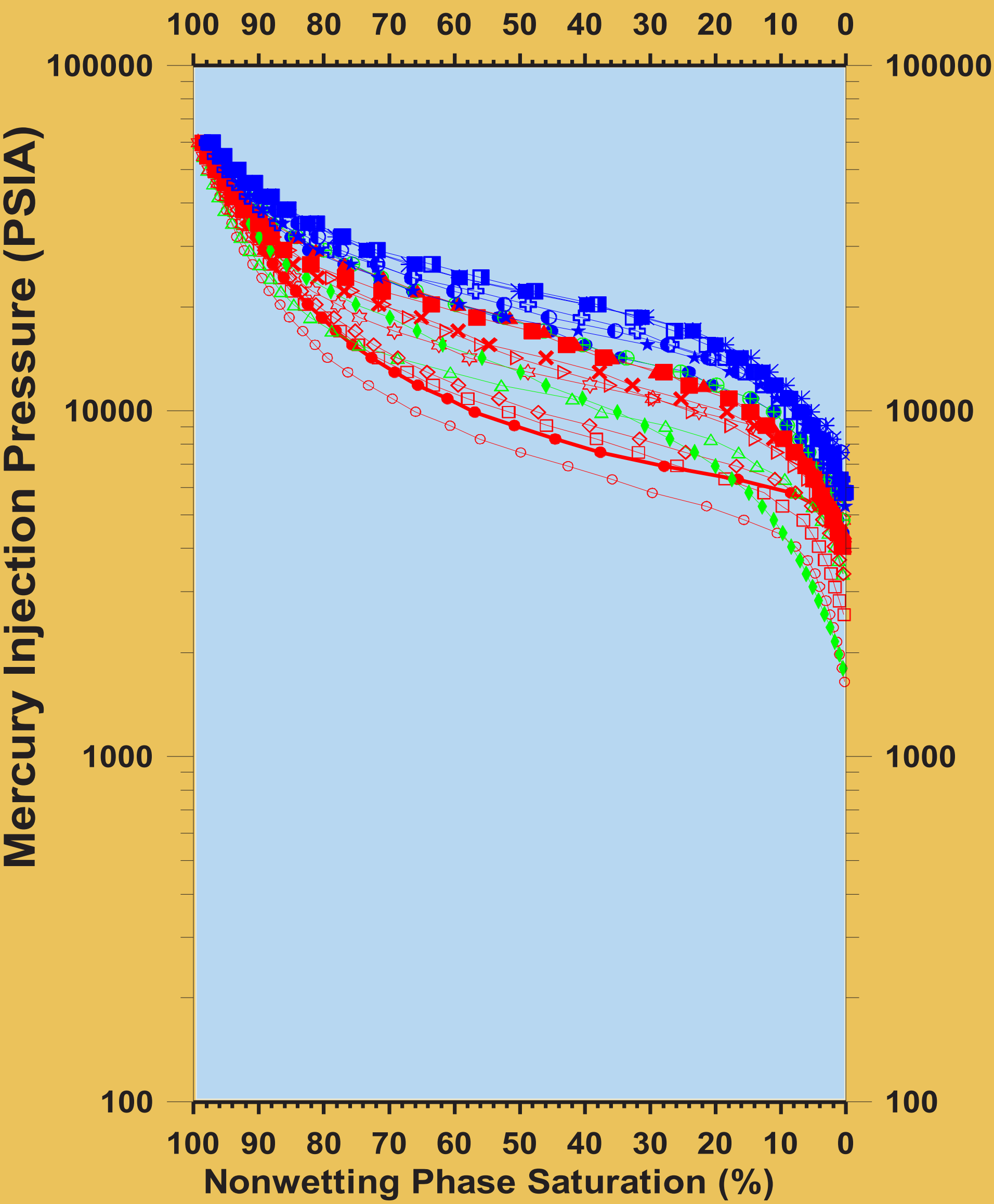


Introduction

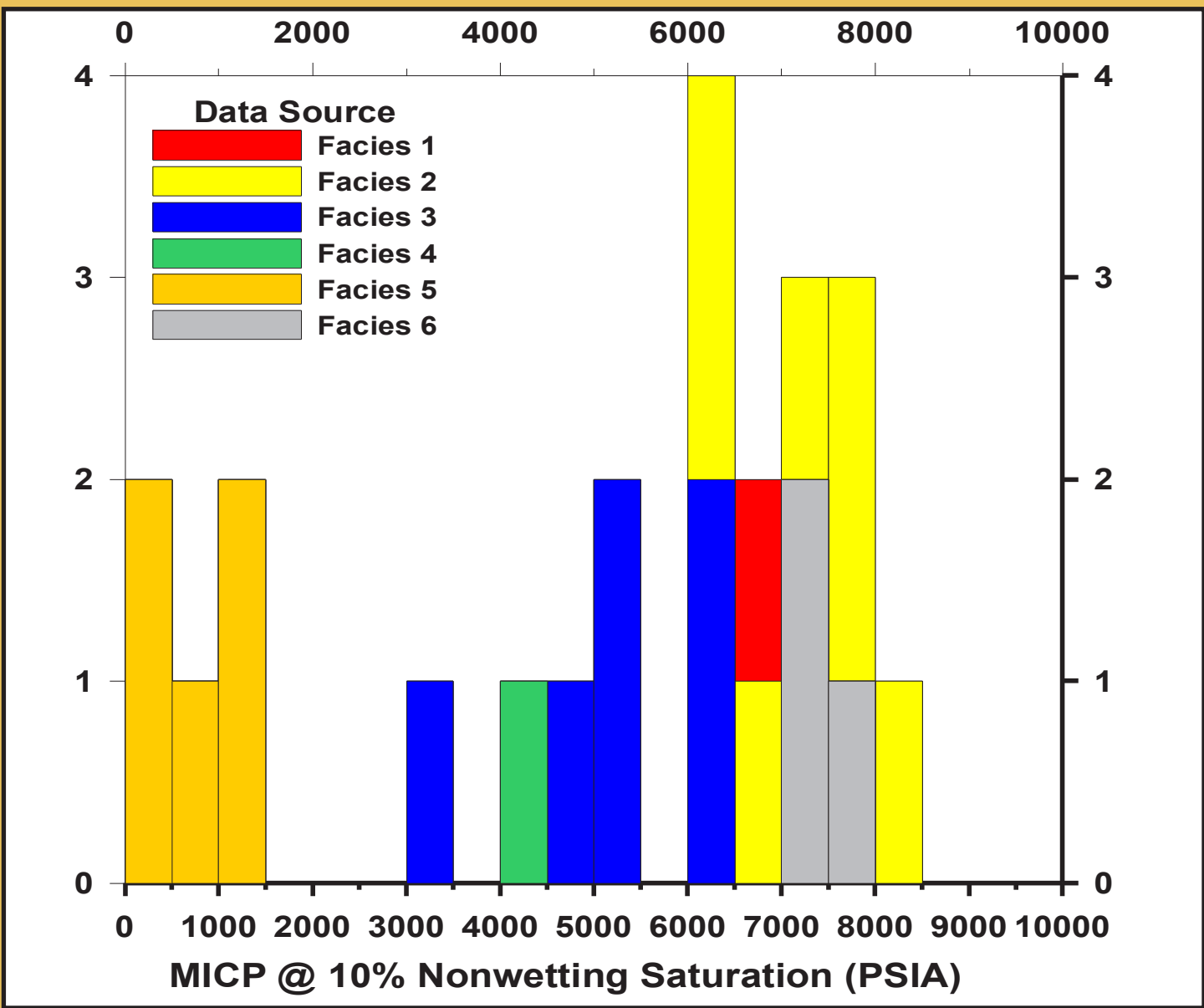
Analyses of Tertiary-aged shales from deepwater depositional settings (e.g., offshore West Africa, Brazil, and Gulf of Mexico) reveal the common occurrence of six shale end-member types (shale microfacies). Each shale microfacies has distinctive textures and fabrics, which represent variations in depositional conditions. Additionally, systematic patterns of seal character are evident where these shale types are organized within a sequence stratigraphic context. In general, silt-poor shale types 1 and 2 (representing upper transgressive units) and some condensed intervals (shale type 6) offer good to excellent seal potential. In contrast, silt-rich highstand shales (types 3 and 4) and lowstand shales (type 5) have relatively low sealing capacities. Increased percentages of detrital silt grains reduce sealing capacity by inhibiting mechanical compaction, thereby allowing the preservation of relatively large-diameter pore throats.



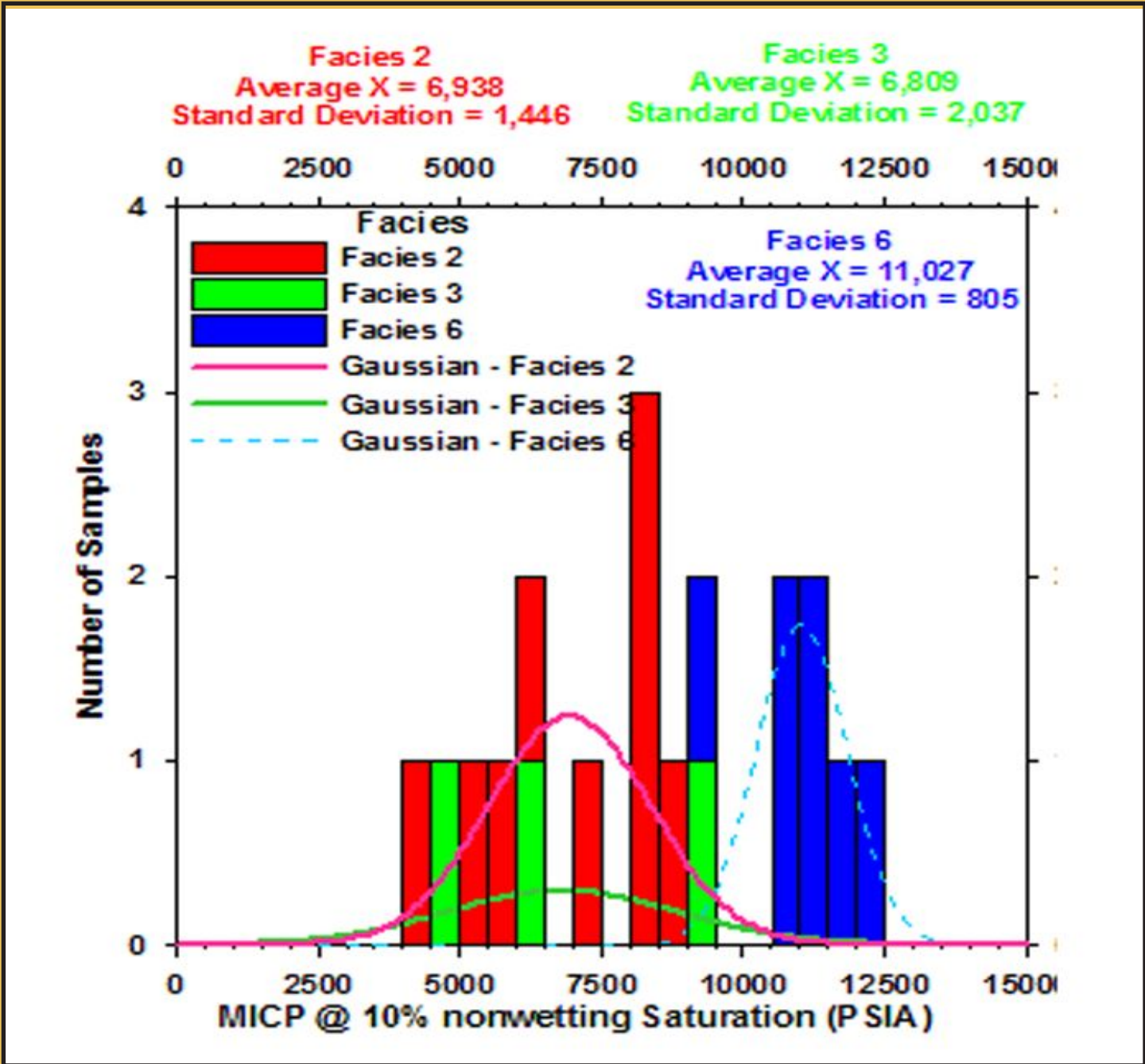
Seal potential is quantified using mercury-injection capillary pressure (MICP) analysis (Berg, 1955; Showalter, 1977; Jennings, 1987; Watts, 1987). Shale facies are defined petrographically and interpreted sedimentologically on the basis of fabric and texture (e.g., Schieber, 1999; Dawson, 2000). The content of detrital silt appears to influence the effectiveness of mechanical compaction processes (Krushin, 1997), shale permeability (Dewhurst et al., 1999), and ultimately, sealing capacity (Almon et al., 2002; Dawson et al., 2003).



These shale samples have very good to excellent membrane seals. Shapes of injection profile curves indicate that there are three pore structure families in this data set, which can be related to total clay content and shale fabric. Samples are color-coded by shale type. Type 2 shales have a mean critical injection pressure of 6,938 psia. Type 3 shales have a mean critical value of 6,809 psia. Type 6 shales exhibit a mean critical injection pressure of 11,027 psia indicating exceptional seal potential, assuming the absence of open micro-fractures.



Shale types 1, 2, and 6 exhibit excellent top (membrane) seal potential. Silt-rich shales (types 3, 4 and 5) have considerably lower critical seal pressures.



The distribution of measured capillary pressure values in the data set fits within the distribution of critical seal pressures (10% non-wetting phase saturation) from samples in other deepwater wells, analyzed to date.