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DETERMINATION OF AVO ATTRIBUTES FOR ACOUSTIC IMPEDANCE ZONES OF MALAY BASIN: FLUID FACTORS

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Based on previous study on Acoustic Impedance (AI) characteristics of the end member of two clastic rocks i.e. sandstone and shale, the Malay Basin can be generally divided into 2 major zones (Uzir et. al, 2009). It was observed in that study that the similar AI characteristic was displaying distinct distribution pattern, which later was postulated to be much related to the tectonic setting and depositional environment (Figure 1). Changes in AI pattern will directly affect the AVO response and its attributes. This paper is analyzing one of the most important AVO attributes which is the fluid factor and it is highly desirable for a hydrocarbon indicator (Smith and Gidlow, 1987). The typical published fluid factor ($\Delta F = 1.252A + 0.580B$) was derived from the combination of two well known equations i.e. Castagna mudrock equation and Gardner equation. The indicator should be negative for shale over gas-sand interfaces and significantly more negative than for shale over brine-sand interfaces (Castagna and Smith, 1994). The respective values of A and B were the intercept and the gradient attribute of reflection amplitude versus $\sin 2\theta$ plot. The A and B values can also be calculated from Shuey Approximation equation (Shuey, 1985). In this paper, the fluid factor equations were derived based on rock physical trend lines of Vp versus Vs plot and density (ρ) versus Vp plot, which were obtained from 48 well logs data that have been rigorously conditioned (Table 1).

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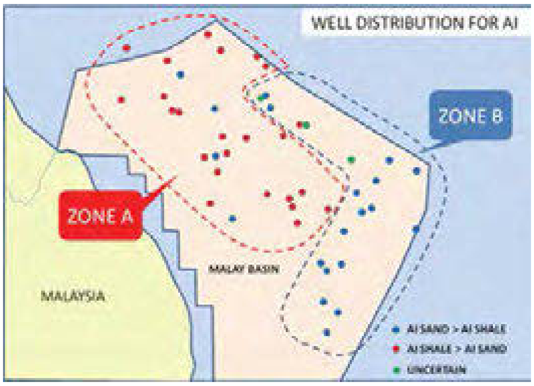

Figure 1: Subdivision of Malay Basin into 2 major zones based on the AI characteristics of sand and shale end member.

Table 1: Fluid factor derived from V_p-V_s and density-V_p relationships for both Zone A and B

Zone	Number of wells	V_p-V_s empirical equation	ρ-V_p empirical equation	Fluid factor (ΔF) equation
A	27	$Vp=1.1469Vs + 1590.3$	$\rho=0.2134Vp^{0.2944}$	$\Delta F=1.231A+0.574B$
B	21	$Vp=1.1962Vs + 1123$	$\rho=0.2254Vp^{0.2884}$	$\Delta F=1.222A+0.598B$