

successive 50 feet interval from surface to total depth is then used to compute overburden gradient. The overburden pressures are referenced from the rig floor, hence in offshore drilling the height of an air gap and depth and density of seawater must be accounted for.

#### D. FRACTURE PRESSURE DETERMINATION

Fracture pressure is the pressure required to overcome the tensile strength and fluid pressure of a formation at depth. Both empirical and theoretical methods are utilised to determine the fracture pressure of the formation. Empirical data from formation pressure integrity tests and lost circulation are the most reliable. Fracture data from well histories can be very beneficial. The following theoretical models are used:

- a) Hubbert and Willis (1957)

$$\begin{aligned} \frac{F}{D} &= \frac{P}{D} + \frac{1}{3} \left( \frac{S - P}{D} \right) \dots \dots \dots \text{minimum} \\ &= \frac{P}{D} + \frac{1}{2} \left( \frac{S - P}{D} \right) \dots \dots \dots \text{maximum} \end{aligned}$$

- b) Mathews and Kelly (1967)

$$\frac{F}{D} = \frac{P}{D} + k_i \left( \frac{S - P}{D} \right)$$

- c) Eaton (1969)

$$\frac{F}{D} = \frac{P}{D} + \frac{\mu}{1-\mu} \left( \frac{S - P}{D} \right)$$

- d) Anderson, et.al (1972)

$$\frac{F}{D} = \frac{P}{D} \left( \frac{1-3\mu}{1-\mu} \right) + \frac{S}{D} \left( \frac{2\mu}{1-\mu} \right)$$