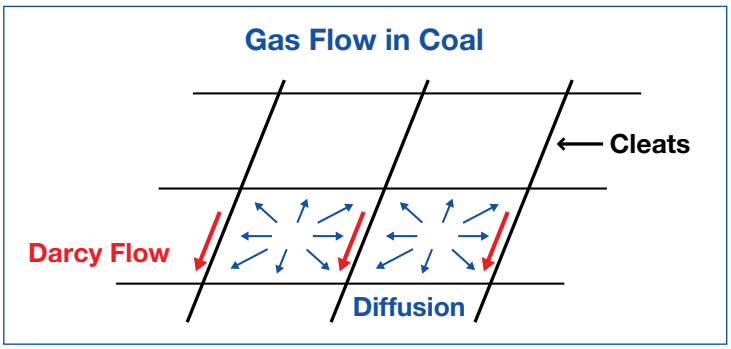
DIFFUSIONAL BEHAVIOUR OF COALS

Coal seams are composed of blocks of solid coal with sub vertical cleats and bedding planes that are parallel with the seam. The cleats are usually initially water filled but this is drained out during gas production. Gas then flows from the coal into the cleat system and on in the cleats through a process of Darcy flow. Gas flows from the coal and into the cleats by the process of diffusion. In coals where the cleats are widely spaced and the permeability is high, the rate of gas production from a coal seam reservoir may be substantially controlled by the process of diffusion. It is therefore important to determine both the diffusion coefficient and the effective cleat spacing.

Stylistic Diagram of Coal Seam



The measurement of the diffusion coefficient is achieved by monitoring the rate of gas uptake or release from pieces of coal of known dimensions. Typically, when core is taken the quantity of gas production is measured with time. The gas release rate from core seldom behaves in the manner that would be expected of a cylinder obeying the rules of Fickian diffusion. The reason for this is the fracturing and inhomogeneity of the coal within the core. The diffusion coefficient of small coal particles can, however, be determined with some reliability because they are generally of uniform composition and without fracturing. The process to determine the diffusion coefficient of particles involves taking chips from air based drilling or by re-gassing chips in the laboratory and finding out the rate of gas release or gas absorption. In each case the particle size distribution of the coal chips must be measured to determine the diffusion coefficient.

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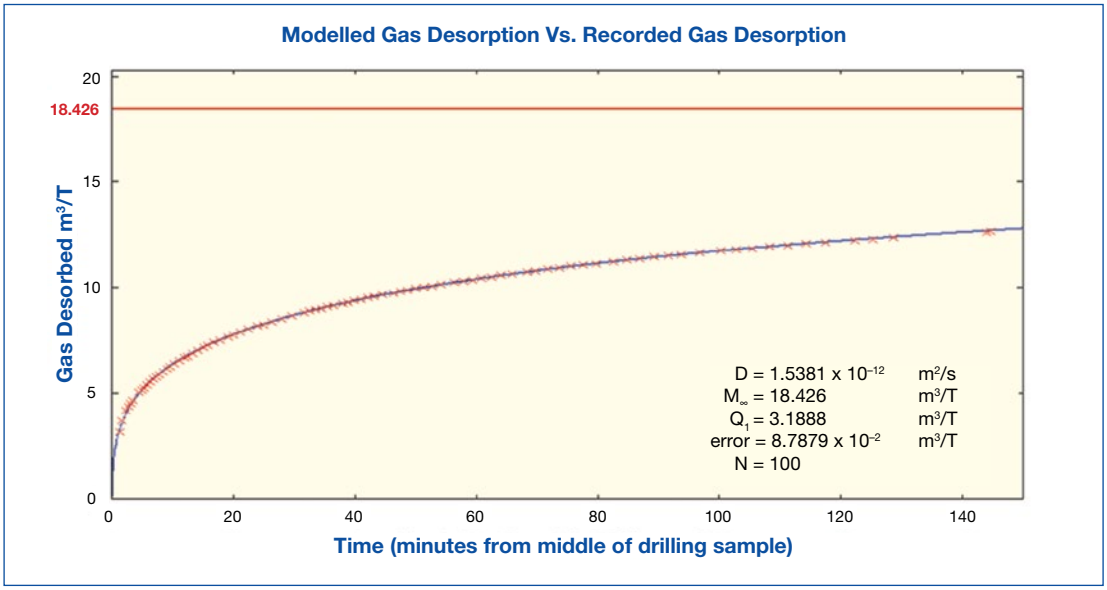
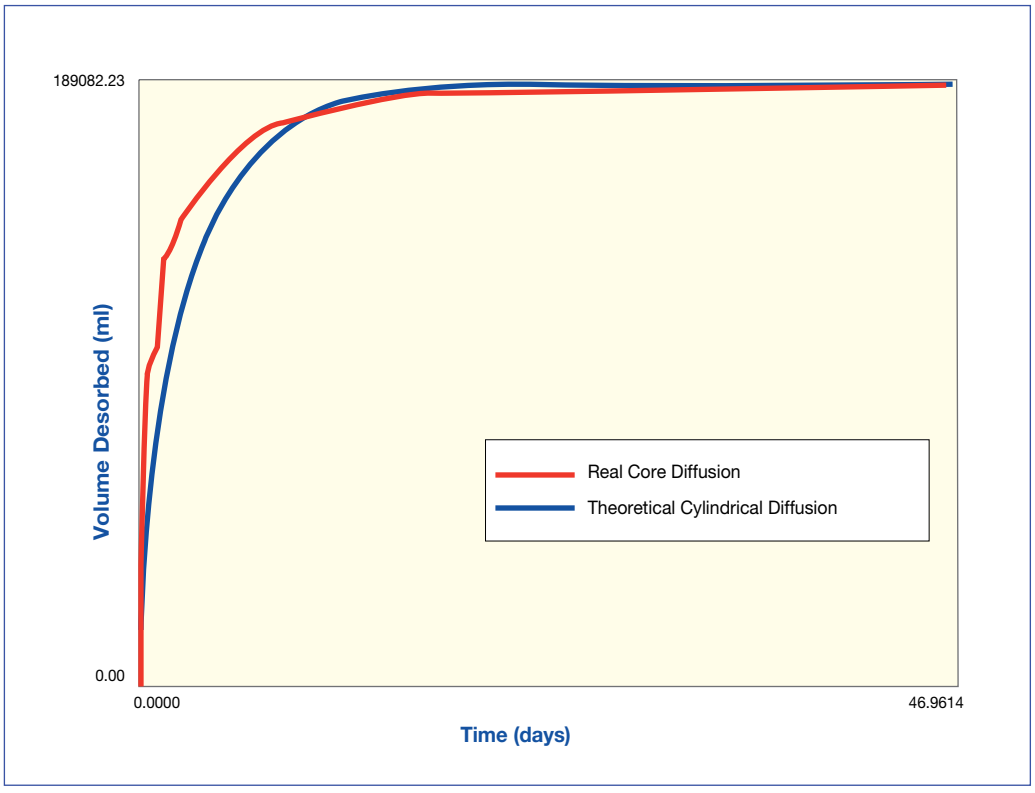
Graph of Chip Diffusion versus Time



Graph of Core Desorption versus Time



An estimate of the effective fracture spacing within core can be made by history matching core desorption using the diffusion coefficient determined from testing particles derived from crushing part of the core.