Dimensionless Water Influx (WeD)

Dimensionless transient water flux response from aquifer to unit step change in net pay pressure:

(1) $$W_{eD}(t, r_{aD}) = \int_0^t \left. \frac{\partial p_1(t_D, r_D)}{\partial r_D} \right|_{r_D=1} dt_D$$

where

$p_1(t_D, r_D)$	solution of unit-pressure radial composite reservoir transient flow (2)– (5)

(2) $\frac{\partial p_1}{\partial t_D} = \frac{\partial^2 p_1}{\partial r_D^2} + \frac{1}{r_D} \cdot \frac{\partial p_1}{\partial r_D}$	(3) $p_1(t_D = 0, r_D) = 0$	(4) $p_1(t_D, r_D = 1) = 1$	(5) $\left. \frac{\partial p_1(t_D, r_D)}{\partial r_D} \right\|_{r_D=r_{aD}} = 0$ or (6) $p_1(t_D, r_D = \infty) = 0$

The Dimensionless Water Influx $W_{eD}(t)$ is a unique function of time t for each dimensionless value of r_{aD} which represents the ratio of external aquifer size r_a to net pay size r_e:

(7) $$r_{aD} = \frac{r_a}{r_e}$$

This function is readily tabulated for a wide range of r_{aD} variations.

There are also polynomial approximations.

See Also

Petroleum Industry / Upstream / Subsurface E&P Disciplines / Field Study & Modelling

[Depletion] [Aquifer] [Aquifer Drive @model] [van Everdingen-Hurst (VEH) Aquifer Drive @model]