Explicit Linear Production Model = ELPM

Model Input/Output

- Input: N , P_{wf}, q_W, Q_W, Q_O , Q_G , Q_W
- Output: q_O , q_G , q_W , P

Model Parameters

Model Parameters:

- $M = \{ V_O , y_W , x_W , x_G , y_W , x_J , J_{W0} , k^*_{ro}, n_o, k^*_{rw}, n_w \}$ – totally 11 constants

Restrictions:

- all constants are positive
- $0 < k^*_{ro} < 1$, $0 < k^*_{rw} < 1$

Model fitting

Source data corrections:

- one time-array $P_{wf}(t)$

Restrictions:

- $0 < P_{wf, min} < P_{wf}(t) < P_{wf, max}$

Goal function:

- $E[M] = w_O [q_O] + w_W [q_W] + w_G [q_G] + w_P [P] + w_f [P_{wf}]$ min

  $[A] = [2 (A-A^*)/(A+A^*)]^2$

  $A(t)$ – model prediction

  $A^*(t)$ – historical value (if any)

Weights:

- $w_O + w_W + w_G + w_P + w_f = 1$ (although it is not necessary)

  Default settings: $w_O = 0.5$, $w_W = 0.1$, $w_G = 0.1$, $w_P = 0.2$, $w_f = 0.1$

Model function

$q_O = q_{O1}$ N | $q_{O1} = J_O$ ($P - P_{wf}$)

$q_W = q_{W1}$ N | $q_{W1} = J_W(t)$ ($P - P_{wf}$)

$q_G = J_G$ N | $q_{G1} = J_G$ ($P - P_{wf}$)

$P = P_i + (y_W \ Bw \ Q_W + Bo \ Q_O + x_W \ Bw \ Q_W + x_G \ Bg \ Q_G) P_i \ x_P / V_O$

$s = Q_O / V_O$

$k^*_{ro}(s) = k^*_{ro} \ (1 - s)^{n_o}$

$k^*_{rw}(s) = k^*_{rw} \ s^{n_w}$

$J_O = k^*_{ro}(s) \ x_J$

$J_W = J_{W0} + k^*_{rw}(s) \ x_J$

$J_G = R_s \ J_O$

See Also

Petroleum Industry / Upstream / Production / Subsurface Production / Field Study & Modelling / Production Analysis / Capacitance Resistance Model (CRM) / Capacitance-Resistivity Model (CRM) @model

[Slightly compressible Material Balance Pressure @model]

[Dynamic fluid properties]