(4) $q_0(t) = q_0 f(t)$ $\quad Q_0(t) = \int_0 q_0 f(t)\,dt$

$q_1(t) = q_1 f(t)$ $\quad Q_1(t) = \int_{\tau}^{t} q_1 f(t)\,dt$

$\ldots$

$q_N(t) = q_N f(t)$ $\quad Q_N(t) = \int_{N\tau}^{t} q_N f(t)\,dt$

По всему месторождению:

$$Q(t) = \sum_{i=0}^{N} Q_i(t) = \sum_{i=0}^{N} q_i \int_{i\tau}^{t} f(t)\,dt$$

1. $f(t) = (1 + bDt)^{-\frac{1}{b}}$

$$\int f(t)\,dt = \frac{(1+bDt)^{\left(1-\frac{1}{b}\right)}}{D(b-1)} + C$$

$$Q(t) = \sum_{i=0}^{N} q_i \left. \frac{(1+bDt)^{\left(1-\frac{1}{b}\right)}}{D(b-1)} \right|_{t=i\tau}^{t} =$$

$$= \frac{1}{D(b-1)} \left(\sum_{i=0}^{N} q_i (1+bDt)^{\left(1-\frac{1}{b}\right)} - \sum_{i=0}^{N} q_i (1+bDi\tau)^{\left(1-\frac{1}{b}\right)} \right)$$

2. $$f(t) = \begin{cases} (1+b_1 D t)^{-\frac{1}{b_1}}, & t < \theta \\ K(1+b_2 D_2 (t-\theta))^{-\frac{1}{b_2}}, & t \ge \theta \end{cases}$$

У-е непрерывности:
$$\begin{cases} f(t)\big|_{\theta-0} = f(t)\big|_{\theta+0} \\ f'_t\big|_{\theta-0} = f'_t\big|_{\theta+0} \end{cases}$$

Из условий непрерыв. и гладкости:

$$\begin{cases} K = (1+b_1 D\theta)^{-\frac{1}{b_1}} \\[2ex] \dfrac{(1+b_1 D\theta)^{-\frac{1}{b_1}} D}{(1+b_1 D\theta)} = K D_2 \end{cases} \Rightarrow D_2 = \frac{D}{(1+b_1 D\theta)}$$

$$f(t) = \begin{cases} (1+b_1 D t)^{-\frac{1}{b_1}}, & t<\theta \\[2ex] (1+b_1 D\theta)^{-\frac{1}{b_1}} \left(1 + b_2 D \dfrac{(t-\theta)}{(1+b_1 D\theta)}\right)^{-\frac{1}{b_2}}, & t \geq \theta \end{cases}$$

$$\int f(t)\,dt = \begin{cases} \dfrac{1}{D(b_1-1)} (1+D b_1 t)^{\left(1-\frac{1}{b_1}\right)} + C, & t<\theta \\[2ex] \dfrac{1}{D(b_2-1)} \cancel{} (p+g(t)) (p+g(t))^{-\frac{1}{b_2}} p^{-\frac{1}{b_1}-\frac{1}{b_2}-1} \end{cases}$$

$$\left[p = 1 + b_1 D\theta, \; g(t) = D b_2 (t-\theta) \right]$$

$$F(t) = \int f(t)\,dt = \begin{cases} \dfrac{1}{D(b_1-1)} (1+D b t)^{\left(1-\frac{1}{b_1}\right)} + C & (t<\theta) \\[2ex] \dfrac{1}{D(b_2-1)} (p+g(t))^{1-\frac{1}{b_2}} p^{-\frac{1}{b_1}-\frac{1}{b_2}-1} + C & (t \geq \theta) \end{cases}$$

$$Q(t) = \sum_{i=0}^{N} q_i F(t) \Big|_{i\tau}^{t}$$