

# Productivity Index @model

The most accurate prediction of [Productivity Index](#) is based on [numerical reservoir flow simulations](#).

Apart from this there are numerous [proxy models](#) covering popular categories of [reservoir flow regimes](#), [dynamic reservoir properties](#) and [well-reservoir contacts](#).

One of the most popular [proxy model](#) is [Dupuit PI @model](#) which covers a very wide range of [stabilised reservoir flow](#).

A [proxy model](#) of [Productivity Index](#) for [stabilised reservoir flow](#).

$$J = \frac{q}{p_{frm} - p_{wf}} = \frac{2\pi\sigma}{\ln \frac{r_e}{r_w} - \epsilon + S} = \frac{2\pi \cdot \frac{k h}{\mu}}{\ln \frac{r_e}{r_w} - \epsilon + S}$$

where

$q$	depending on application may mean a <a href="#">total sandface flowrate</a> ( $q_t$ ) or a product of <a href="#">surface flowrate</a> and <a href="#">FVF</a> ( $q = q_{srf} B$ )
$p_{wf}$	<a href="#">bottomhole pressure</a>
$p_{frm}$	depending on application may mean a <a href="#">drain-boundary formation pressure</a> ( $p_e$ ) or <a href="#">drain-area formation pressure</a> ( $p_r$ )
$\sigma$	<a href="#">formation transmissibility</a>
$r_w$	<a href="#">wellbore radius</a>
$r_e$	distance to a <a href="#">drainarea boundary</a>
$S$	<a href="#">total skin</a>
$\epsilon$	a model parameter depending on <a href="#">Productivity Index</a> definition and boundary type ( $\epsilon = \{0, 0.5, 0.75\}$ , see <a href="#">Table 1 below</a> )

In case of [homogeneous reservoir](#) with only one vertical well producing the [Dupuit PI @model](#) is the exact analytical solution of [Reservoir Flow Model \(RFM\)](#).

**Table 1.** Variations to [Dupuit PI @model](#) depending on the [reservoir flow regime](#) and the definition/application of [Productivity Index](#).

	<b>Drain-area Productivity Index,</b> $J_r = \frac{q}{p_r - p_{wf}}$	<b>Drain-boundary Productivity Index</b> $J_e = \frac{q}{p_e - p_{wf}}$
Steady State flow regime (SS)	$J_r = \frac{2\pi\sigma}{\ln \frac{r_e}{r_w} - 0.5 + S}$	$J_e = \frac{2\pi\sigma}{\ln \frac{r_e}{r_w} + S}$
Pseudo-Steady State flow regime (PSS)	$J_r = \frac{2\pi\sigma}{\ln \frac{r_e}{r_w} - 0.75 + S}$	$J_e = \frac{2\pi\sigma}{\ln \frac{r_e}{r_w} - 0.5 + S}$

For the fractured vertical well the [geometrical skin-factor](#)  $S_G$  is related to [Fracture half-length](#)  $X_f$  as:

$$(1) \quad S_G = -\ln\left(\frac{X_f}{2r_w}\right)$$

$$J = \frac{q}{p_{frm} - p_{wf}} = \frac{2\pi\sigma}{\ln\frac{r_e}{r_w} - \epsilon + S} = \frac{2\pi M \cdot h}{\ln\frac{r_e}{r_w} - \epsilon + S} = \frac{2\pi k_{abs} \cdot h}{\ln\frac{r_e}{r_w} - \epsilon + S} \cdot M_r = T \cdot M_r(s_w, s_g)$$

## See Also

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[Petroleum Industry](#) / [Upstream](#) / [Production](#) / [Subsurface Production](#) / [Subsurface E&P Disciplines](#) / [Production Technology](#) / [Productivity Index](#)

[ [Dupuit PI @model](#) ]