

Productivity Index = PI = J

A value of [flowrate](#) normalised by pressure difference between [formation pressure](#) and [bottom hole pressure](#):

$$(1) \quad J = \frac{q}{|p_e - p_{wf}|}$$

where

q	flowrate (could be sandface or surface , see below)
p_e	formation pressure
p_{wf}	bottom hole pressure at sandface

It is one of the key metrics of [well](#) performance.

The definition of [flowrate](#) q and [formation pressure](#) p_e may vary depending on application (see [Definition specifics on formation pressure and productivity index](#)).

Overall concept is applicable to both [producers](#) and [injectors](#) but can be explicitly defined as:

Productivity Index of producer		Injectivity Index of injector	
(2)	$J^\uparrow = \frac{q^\uparrow}{p_e - p_{wf}}$	(3)	$J^\downarrow = \frac{q^\downarrow}{p_{wf} - p_e}$
$q^\uparrow$	production rate	$q^\downarrow$	injection rate

So when someone mention [Productivity Index](#) of injector it's normally meant [Injectivity Index](#).

The [Productivity Index](#) concept also applies to [aquifer expansion](#):

$$(4) \quad J^\downarrow(t) = \frac{q^\downarrow(t)}{p(t) - p_{AQ}(t)}$$

where

$q(t)$	volumetric water inflow rate from aquifer into hydrocarbon reservoir at time moment t
$p(t)$	formation pressure in hydrocarbon reservoir at time moment t
$p_{AQ}(t)$	formation pressure in aquifer at time moment t

In practice, the [Productivity Index](#) is usually not known at all times due to scarce measurements of [formation pressure](#) and [bottom hole pressure](#).

It started changing with advent of [Permanent Downhole Gauges \(PDG\)](#).

When assessing [formation pressure](#) it is often accepted that [reservoir](#) takes the same time to stabilise the flow after any change in well flow conditions and the stabilisation time is assessed based on the well tests analysis.

Although, this is not strictly true and the flow stabilisation time depends on well-formation contact and reservoir property variation around a given well.

This is also compromised in multi-layer formations with cross-layer communication.

The best practise in this case is to perform proper [Pressure Transient Analysis \(PTA\)](#) or use [deconvolution](#).

See Also

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

[[Definition specifics on formation pressure and productivity index](#)]

[[Sandface Productivity Index](#)] [[Surface Productivity Index](#)] [[Specific Productivity Index](#)] [[Injectivity Index](#)] [[Drain-area Productivity Index \(\$J_p\$ \)](#)]

[[Productivity Index @model](#)] [[Dupuit PI @model](#)]