

# Stabilized reservoir flow

A [boundary dominated Reservoir flow](#) around the well with [well productivity index](#) is not changing over time:

(1)  $J(t) = J = \text{const}$

There should be no confusion between [stabilised reservoir flow](#) and constant-rate production.

Constant-rate production may not represent [stabilised reservoir flow](#) as [productivity index](#) maybe still in transition after the last rate change.

On the other hand, a [stabilised reservoir flow](#) may go through a gradually changing flow rate due to formation pressure change with [productivity index](#) staying constant.

The [WFP](#) methods are not applicable if the well flow is not [stabilised](#) even if the flow rate is maintained constant.

There are two special reservoir flow regimes which are both [stabilised](#) and maintain constant flow rate:

- [Steady State flow regime \(SS\)](#)

and

- [Pseudo-Steady State flow regime \(PSS\)](#).

The [Steady State flow regime \(SS\)](#) is reached when the flow is [stabilised](#) with the full pressure support at the external boundary.

The [Pseudo-steady State flow regime \(PSS\)](#) is reached when the flow is [stabilised](#) with no pressure support at the external boundary.

In both above cases, the [drawdown](#) and flow rate will stay constant upon productivity [stabilisation](#).

The formation pressure  $p_e(t)$  and bottom-hole pressure  $p_{wf}(t)$  in [PSS](#) they will be synchronously varying while in [SS](#) they will be staying constant.

The table below is summarising the major differences between [SS](#) and [PSS](#) regimes.

|                                          |                                    | Steady state regime ( <a href="#">SS</a> ) | Pseudo-steady state ( <a href="#">PSS</a> ) |
|------------------------------------------|------------------------------------|--------------------------------------------|---------------------------------------------|
| <a href="#">Boundary</a>                 |                                    | Full pressure support                      | No pressure support                         |
| <a href="#">Productivity index (PI)</a>  | $J(t) = \frac{q}{\Delta p}$        | constant                                   | constant                                    |
| <a href="#">Flowrate</a>                 | $q(t)$                             | constant                                   | constant                                    |
| <a href="#">Drawdown</a>                 | $\Delta p(t) = p_e(t) - p_{wf}(t)$ | constant                                   | constant                                    |
| <a href="#">Botomhole pressure (BHP)</a> | $p_{wf}(t)$                        | constant                                   | varying                                     |

|                    |          |          |         |
|--------------------|----------|----------|---------|
| Formation pressure | $p_e(t)$ | constant | varying |
|--------------------|----------|----------|---------|

It's again important to avoid confusion between the term:

- [Stationary \( or Steady State\) reservoir flow](#), which means that all dynamic properties are not changing in time,
- and
- [Stabilised reservoir flow](#) which may happen during pressure variation.

## See Also

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[Physics](#) / [Mechanics](#) / [Continuum mechanics](#) / [Fluid Mechanics](#) / [Fluid Dynamics](#)