

Field Development Planning (Subsurface Discipline)

One of the [Subsurface Production Disciplines](#) related to building [Field Development Plan \(FDP\)](#).

The key instrument of [Field Development Planning](#) is [Nodal Analysis](#) and [Investment Planning](#).

The ultimate goal of [Field Development Planning](#) is to maximize the [Financial Investment Metrics](#).

These are quite complicated metrics and need a fine-tuned [digital petroleum asset twins](#) to accurately simulate the economic response to various [FDP scenarios](#) before selecting the winner.

The alternative approach is follow some key principles:

1	Maximize free cash flow balance
2	Speed up the free cash flow
3	Maximize the hydrocarbon recovery

Principle 1 – Maximize [free cash flow balance](#)

The key principle of [Field Development Planning](#) is based on maximizing the [free cash flow balance](#) :

$$(1) \quad \Delta FCF = R_{HC} \cdot J_{HC} \cdot (p_e - p_{wf}) - \text{Cost}$$

where

R_{HC}	Market price of hydrocarbons
J_{HC}	Total field productivity index
p_e	Formation pressure in producers
p_{wf}	Bottomhole pressure in producers
Cost	Cost of production

The [Waterflooding](#) and [Gasflooding](#) facilities produce an effect on [formation pressure](#) in [producers](#) p_e and through this to the final [production](#) economics.

The total field [productivity index](#) can be approximated by:

$$(2) \quad J_{HC} = N \cdot k \cdot h \cdot T$$

where

N	number of producers
k	formation permeability
h	effective formation thickness

<i>T</i>	productivity multiplier based on well-reservoir contact
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The actual economics of [petroleum production](#) is more complicated than equations [\(1\)](#)- [\(2\)](#) but it shows the fundamental ideas behind the [Field Development Planning](#) process.

The [digital petroleum asset twins](#) are capable to accurately simulate the holistic process of [discounted cash flow](#) generation from [production](#) activities and associated [Financial Investment Metrics](#) but it takes many more parameters than equations [\(1\)](#)- [\(2\)](#).

Principle 2 – Speed up the [free cash flow](#)

This principle suggests that early [cash inflow](#) is worth more than late one.

This effect stems from the [cash discount](#) and often viewed as the "cash aging".

The basic idea is that annual budget of the [petroleum asset](#) should generate better income comparing to other free market opportunities.

The usual discount rate ("aging") in petroleum industry is around 10 – 15 % which consider as quite aggressive comparing to other industries.

Principle 3 – Maximize the [hydrocarbon recovery](#)

This principle states that the long-term economic effect is correlated with the [hydrocarbon recovery](#) and hence one should explore and engage maximum [reserves](#) into [production](#).

See Also

[Petroleum Industry](#) / [Upstream](#) / [Production](#)

[[Subsurface E&P Disciplines](#)]

[[Nodal Analysis](#)] [[Investment Planning](#)]

[[Field Development Plan](#)] [[Field Summary](#)]