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.

Th 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) $$\Delta\text{FCF} = R_{HC} \cdot J_{HC} \cdot \left(p_e - p_{wf}\right) - \text{Cost}$$

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

where

N	number of producers
k	formation permeability
h	effective formation thickness

T	productivity multiplier based on well-reservoir contact

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]