

# OPTIMAL OIL PRODUCTION ON IRANIAN BUY BACK CONTRACT: CASE STUDY OF FOROOZAN OIL FIELD

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## Overview

Iran is considered one of the most important hydrocarbon reserves. According to the latest statistical Bulletin of the Organization of Petroleum Exporting Countries (OPEC) in 2017, the country with 157.2 billion barrels of proven reserves of crude oil, 33.7 trillion cubic meters of natural gas reserves and a total of 365.5 billion barrels of equivalent of oil & gas reserves, ranked first in hydrocarboric reserves among world countries.

Nevertheless, optimal exploitation of these reserves depends on the type of fiscal-legal regime governing development and production operations; therefore, since Buy Back service Contract has been dominated on upstream field of the Iranian oil and gas industry during more than 20 years ago, the optimum production path of one of Iran's most important oil fields (Foroozan oil field) is extracted within the frame work of the fiscal legal of this contract.

With regard to the role of the National Iranian Oil Company (NIOC) in management of operating process of the field, this optimal production path is estimated based on maximization net present value (NPV) of NIOC from oil production of the field. Thus, in according to fiscal regime of Buy Back contract and technical information of Foroozan oil field, revenue and cost functions of NIOC for the contract are estimated and then based on target function of this study and using optimal control method Generalize Reduced Gradient (GRG) is extracted optimal production path in the framework three scenario and three expected price situations.

These scenarios are defined based on the technical specifications of Foroozan oil field as follows:

4. Variable	3. Reference Scenario	2. Second Scenario	1. Third Scenario
8. Primary Reserve 9. (Million Barrels)	7. 252	6. 252	5. 252
13. New Production Well	12. 14	11. 14	10. 14
17. Reentry Production Well	16. 7	15. 7	14. 7
21. Discount Factor(%)	20. 95	19. 91	18. 95
25. Depletion Rate(%)	24. 5	23. 5	22. 8.5
29. Exceptional Price	28. Low, Reference and High	27. Low, Reference and	26. Low, Reference and

	<b>Price</b>	<b>High Price</b>	<b>High Price</b>
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- ❖ The values of the reference scenario variables are determined based on the Master Development Plan (MDP) and technical information of Foroozan field.
- ❖ The values of the variables of the second scenario are determined based on the reference scenario data, with this distinction that the discount factor (DF) in this scenario has fallen from 95% to 91%.
- ❖ The third scenario data are also based on the reference scenario data, with this distinction that the depletion rate of the field in this scenario has risen from 5% to 8.5%.
- ❖ The optimal production path of each scenario is extracted based on the three expected price levels; high price, reference price. these price levels are estimated in BP oil company's 2035 outlook.

## Methods

The methodology of this paper is based on dynamic optimization method of Generalized Reduced Gradient (GRG).

## Results

Extracting optimal production path of foroozan oil field based on three scenarios shows that:

1. In all three scenarios, the production path from the field in a high price situation is begun with a time difference relative to the two situations of reference prices and low prices. This decision will maximize the net present value of operator from the field.
2. Optimal production path of the high price situation of all three scenarios is at a higher level compared to the optimal production path of two other price situations. This condition stem from the logic of maximizing the net present value of the field.
3. By decreasing discount factor (the second scenario), the optimal production level of the field increases in all three price situations. Based on the theory of hoteling, in this condition, the value of production and sale of oil reserves is greater than the value of maintaining these reserves in the field reservoirs. Therefore, it is better to increase oil production of the field simultaneously with the reduction discount factor.
4. By increasing depletion rate of the field (the third scenario), the optimal production level of the field increases in all three price situations. Therefore, optimal field production can be achieved at a higher level.

## Conclusions

In this study, the effect of the exceptional price, discount factor and depletion rate on the optimal oil production level from the Foroozan field of Iran was investigated and concluded that exceptional price and discount factor have a positive effect on the optimal production level of the field and The depletion rate has a reverse effect on optimal production level of the field.

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