

# INCREASING EFFICIENCY IN OIL FIELDS' FUTURE DEVELOPMENT

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Oil fields of Azerbaijan are basically at the late stage of development and are characterized by intensive watering of producing liquid.

One of the reasons of oil watering in bedded conditions depends on the geological structure. On the other hand, one of the basic methods of oil producing is secondary influence on a layer, in particular, flooding of exploitation objects with the purpose of seam pressure maintenance.

As known, effective powers of oil-saturated layer consists of several interlayers, and some of them can produce with marginal water as well as with water injected in a layer.

There is a number of the geological and geophysical methods allowing, with a sufficient degree of reliability, to define water-bearing horizons that allows to recommend and make decision regarding selective isolation application of water inflows.

The purpose of this article is to analyze the performed geological-technical actions for isolation of water-inflows in the example of wells KS horizon Binagadi - North "Binagadineft" field.

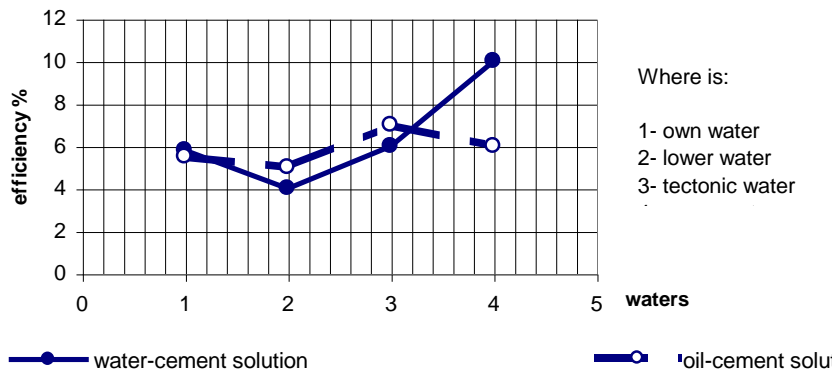
| <b>Oil field</b>             | <b>№ Drilling<br/>(wells)</b>                     |
|------------------------------|---|
| <b>Oil field 3</b><br>Zone 1 | 928<br>980<br>990<br>1510<br>1707<br>1709<br>1880 |
| Zone 3                       | 246<br>254<br>489<br>625<br>637<br>646<br>1898    |
| Zone 4                       | 1963<br>638                                       |
| <b>Oil field 2</b><br>Zone 1 | 2421<br>2265                                      |
| Zone 4                       | 644<br>653<br>655<br>1896<br>2420                 |

The major factor during efficiency of isolating works from alien water inflows is disappearance of water and its replacement with

oil or partial reduction of water inflow due to increase of oil inflow. Daily average flow rate of oil and liquid up to isolating works is calculated within last month prior to interruption of well operation.

Upon isolating works, the daily average of flow rate of oil and water were estimated for three months, but the data breaking the general law of flow rate changes were not taken into account.

**Data of isolation efficiency depending on extraneous water's character**



For convenience of the analysis in the specified table the effective group of wells was split in two categories: the first category is the wells upon isolating works of which water disappeared, and oil flow rate was restored or even increased.

The second category is wells in which the water was partially isolated, and oil flow rate it was restored or increased.

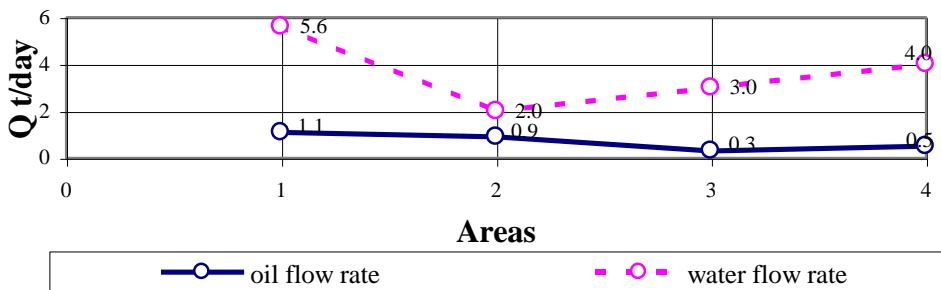
The inefficient group included all wells in which water was partially isolated and oil flow rate decreased or in which water was not isolated at all, and oil flow rate was not restored up to initial condition i.e. up to irrigation level. Besides, with the purpose of advantage revealing of one kind of solution above another, oil-cement or water-cement, the data in the table is given separately on each solution.

It is necessary to note that the absolute size of an additional gain of oil can not serve as a criterion of performed works' success, therefore for an estimation of application efficiency of each kind of a solution it is necessary to define *success interest of each of actions in relation to their general number*.

So from 52 wells in 31 wells at isolating works oil-cement solution were used. From this total number 20 wells were successful. At the same time from 22 wells where the water-cement solution was applied - there were 11 successful wells.

General efficiency of all implemented works makes 60 %. From this comparison it is visible, that oil-cement solution use as flooding liquids for isolation of alien waters is more rational.

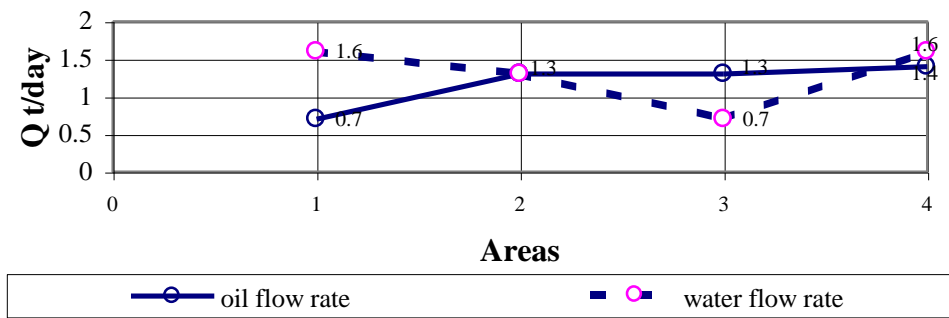
**Daily flow rate changing of water and oil before isolation.**



**Where Area's name is:**

- 1 – Northern Limb
- 2 – Southern Limb
- 3 – Bangler
- 4 – Sulu-Tepe Shabandag

### Daily flow rate changing of water and oil after isolation.



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During 1989-99 on “Binagadineft” oilfield 105 isolating works were carried out in 94 wells. In 57 wells out of total 94 isolating works yielded good results, 38 isolating works appeared unsuccessful, the others 10 wells were not developed. Therefore, the efficiency of isolating works has made 60 %.

Having analyzed total daily average extraction of all of 88 wells, before isolation producing was 33.1t oil and 375.7t waters, and after isolation the total daily average of oil recovery has increased up to 134.3t, and waters has decreased in 2 times, average daily oil flow rate for 1 well has increased almost 4 times, the best result from isolation is received on a southern part of Binagadi's corrugations (I and II oilfield where efficiency of works makes 70 %, and on northern part efficiency of the same works makes 62 %).

The basic parameter of efficiency of application of any method of alien waters isolation should be full or partial restoration of oil in-

flow. Therefore, the important factor is duration of time during which instead of decreasing a water and increasing of oil the isolation of waters cannot be considered as increase of effectiveness.

As an example it is possible to review on a results of wells No. 205 and No. 216 in which inflow of the tectonic water penetrating from above after isolation was completely liquidated, and in 1.5-2 months water isolation was broken again and watered the wells.

For the wells as described gradual increase of % watering production, the initial data for definition of efficiency of isolating works is daily average flow rate of oil and waters within last month prior to their stop.

In case of sudden irrigation wells a parameter of efficiency was partial or full restoration of an oil production.

In an initial stage of operation after isolating works the wells very frequently results on increased contents of water especially if during these works they absorbed a plenty drilling water which usually disappears in several months and then the stable contents of water in an extracted liquid is established.

All major overhauls on isolation of alien waters for convenience of the analysis of their productivity were subdivided into III groups:

- The first group consist of priming as a result of which the oil recovery was completely liquidated wells encroaching and oil production increasing.
- The second group consists of priming due to which has considerably decreased watering production of wells and oil flow rate increased or did not changed.
- The third group consists of all other wells.

Thus effective were considered the priming after which oil flow rate has increased or stay unchanged during months at full or partial isolation of water.

Positive priming included in first two groups, and negative ones in third group.

In I group of 24 wells in which the daily average oil recovery before isolation has made 4 t, and after isolation 39.2 t.

Water flow rate before isolation made 129.6t/day, and after isolation water has completely disappeared.

II group included 33 wells daily average flow rate which oil before isolation – 18,4 t and after isolation - 79.1t ; daily average extraction of water of the specified wells before isolation have made 260.1t, and after isolation – 128.1t.

III group included 38 unsuccessful isolating works, in overwhelming cases came into service with water. Comparing results of isolating works in wells, water influx of various categories, it is possible to say, that the best results were received after isolation of the top water, as a whole on “Binagadineft” makes 69%.

Positive results were received after implementation of isolating works in wells, encroached by the tectonic waters penetrating on bottom hole from deep horizons.

Less effective results are received on isolation bottom, stratal and tectonic waters penetrating from above.

As it was shown above in the mentioned period it was made 96 cement priming on oil and water bases. From 95 isolating works 64 priming were made on an oil basis, 31 priming on a water basis. Comparison of the received results from priming cement on water and oil bases shows, that success priming on an oil basis and makes 68% while for priming on an oil basis - % of success is equal 56.8.

As a result of the analysis of the works made on isolation of alien waters it is established, that:

- best results, from isolation of alien waters are received on isolation of the bottom tectonic waters.
- good results are achieved on isolation of the top waters by cement on a water basis with ram of bottom part of the filter sand; success of these works has reached 88.3 %.

- significant smaller success of works was achieved on isolation of stratal waters with grout injection on a oil basis; success of these works makes 57.6%.
- satisfactory results are received on isolation of the bottom waters; success of these works makes 53%.

Smaller success of these works says that from 7 unsuccessful priming in 6 wells priming made on technology of top water isolation.

Numerous infringements of priming technology is explained with difficulty of recognition of waters and establishment of their accessory to the certain layers.

The best results on isolation alien waters are received at liquidation of inflow of the top waters penetrating on bottom hole in consequence of infringement of a cement ring or untighting of a column, and efficiency of isolation of these waters, decreases on a direction from northeast (III craft) to a southwest (VII craft), as in this direction intension of their inflow is increasing.

Good results are received on isolation of water in the wells located in a raised or central part of structure and watering by intermediate water.

It is not recommended to carry out isolation:

- In wells, watering planimetric water and located in a positive part of structure.
- In wells, watered by tectonic water (III craft), as these waters, are shown, as planimetric.
- Cement, on a water basis, in wells watered by stratal water.

Proceeding from requirements of the State Oil Company of Azerbaijan Republic (SOCAR) to efficiency of work at success of actions for isolation of alien waters about 70% corresponds to requirements showed such type to a kind of works is economically successful and effective.



# НЕФТ ЙАТАГЛАРЫНЫН ЭЯЛЪЯК ИНКИШАФЫНДА ЕФФЕКТИВЛИЙИН АРТЫРЫЛМАСЫ

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Азярбайъанын нефт йатаглары ясаян сон инкишаф мярщялясиндядир вя истещсал заманы интенсив суланма иля мцшаийят олунур. Су ещтива едян лайларын тьяин едилмясинин бир нечя эеологи вя эеофизики методу вар ки, бунларын сайясиндя йатагларда дахили суланманы изолйасийа етмяк мцмкндцр.

Мцяллиф Бинягядинефт йатабындакы бир чох нефт гуйусу цзяриндя апарылан арашдырмалар