

Advanced Technologies and ORF Increment

Each subsoil user engaged in long-term hydrocarbon field development planning constantly faces the issue of increasing oil recovery factor (ORF). It is commonly known that, in practical terms, the easiest way to increase ORF is to drill more wells, thus creating a denser well grid and, hence, increasing the coverage. Under this approach, economics serves as the key factor to define the number of wells to be drilled. According to the common practice in petroleum industry, the best option is considered the one that provides the highest economic efficiency. However, is it true? Can we really say that the “optimal” option is where we produce more hydrocarbons, but are forced to use more resources for extra well drilling, such as water, metal, cement, electric power, etc.? And what about offshore areas, where the waste disposal problem is especially acute? These are the challenges faced by Exxon Neftegas Limited, the Sakhalin-1 Project Operator.

According to the Russian Federation legislation requirements, hydrocarbon field development is performed in accordance with the approved development planning documentation. The early development plans for the Sakhalin-1 fields envisaged drilling a large number of wells.

Technology advancement and constant efforts to optimize the fields development system have enabled reducing the number of wells to be drilled and using fewer offshore platforms, which has immensely reduced the environmental impact.

The company planned to increase the ORF as part of the assessments conducted before commissioning of the first production facilities at the Chayvo field in 2005.

The successful implementation of annual drilling and well repair programs has increased the oil recovery rate by 10.1 per cent compared to the original TEO KIN (Feasibility studies of Oil Recovery).

Particularly worth noting is the synergetic effect of integrated use of cutting-edge technologies.

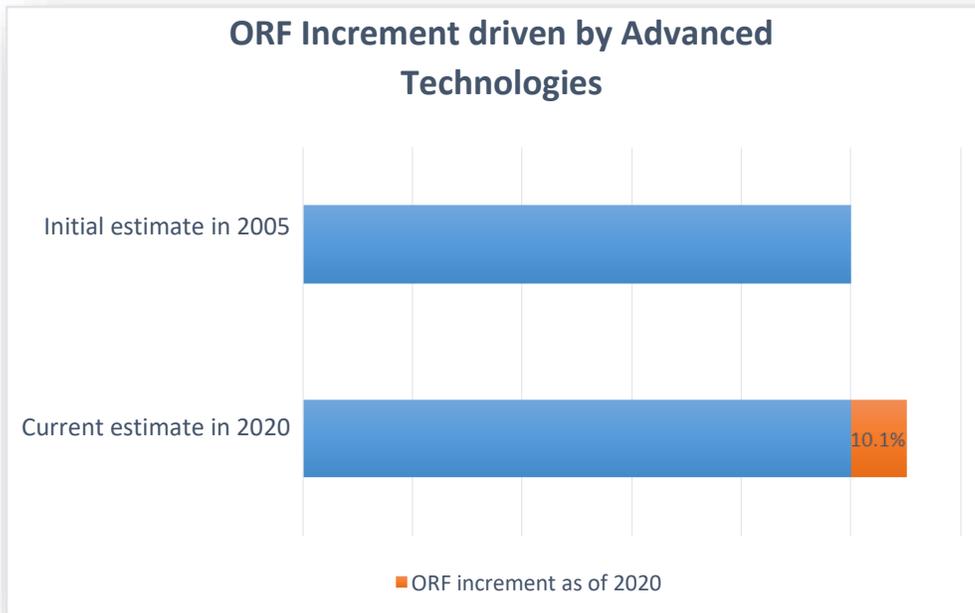


Figure 1. ORF Increment Chart

The Sakhalin-1 Project provides many examples of such synergy. Chayvo field development is one of those. The Company is the world's record driller for extended-reach (ERD) wells.

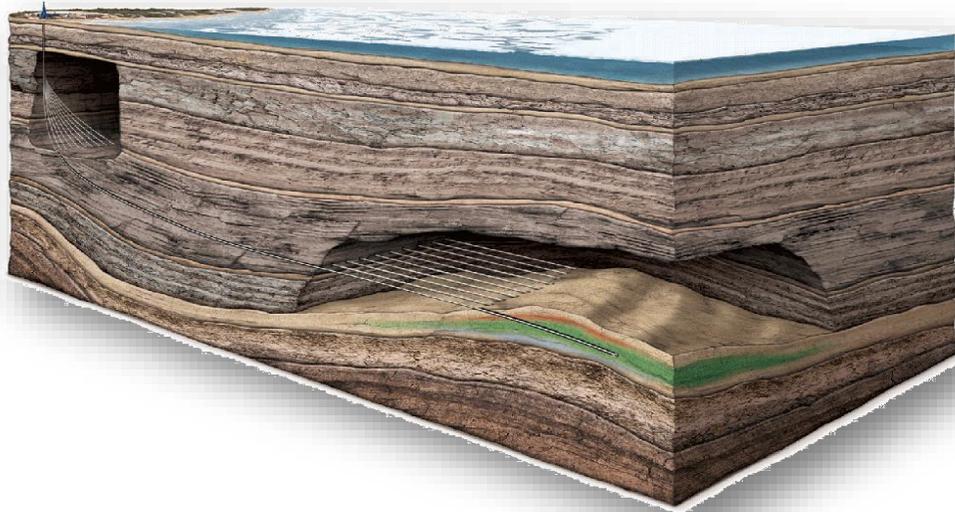


Figure 2. Extended Reach Drilling Diagram

This technology has made it possible to drill most of the field from onshore, which in turn, has enabled using a smaller platform form offshore drilling and development. Advanced ERD technology development and application has increased the well completion length from one to three kilometers. This provides for a smaller well count along with increased oil rates and higher resultant ORF. Application of innovation

completion technologies, such as advanced sand screens with inflow control devices, dual production valves, inflow control stations, provides for a considerable longer well producing life.

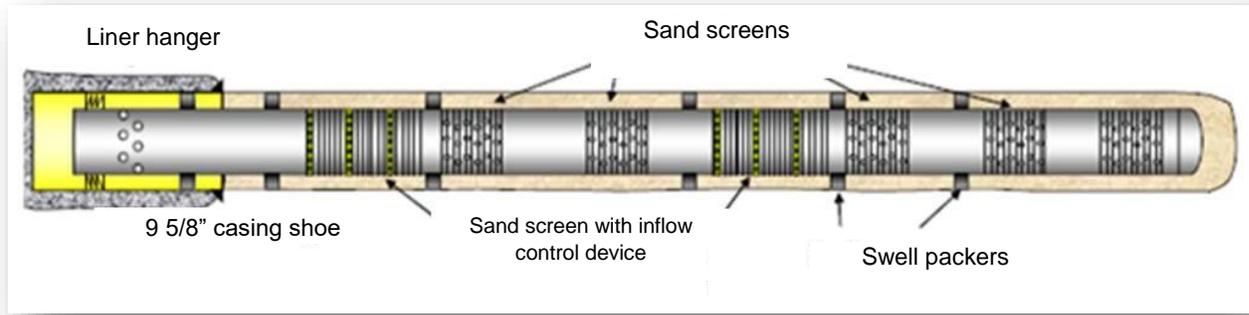


Figure 3. Sand Screen and Inflow Control Completion Design

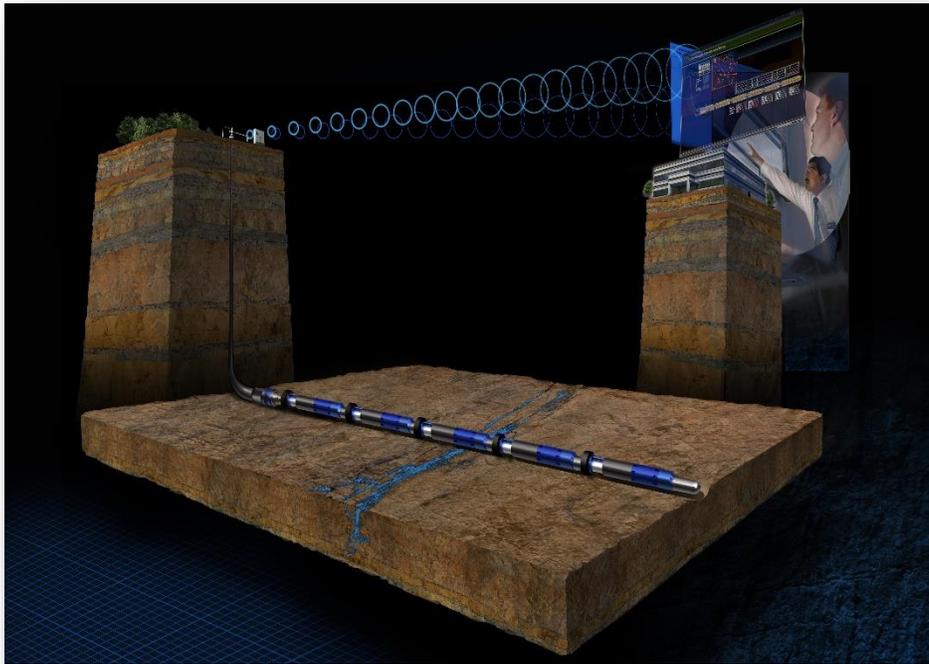


Figure 4. Completion Design with an Inflow Control System

The successful application of the method of increasing ORF - maintaining reservoir pressure by gas injection at the Chayvo field, made it possible to extend this method to the Odoptu (gas and water injection), Arkutun-Dagi (water injection) fields.

Exxon Neftegas Limited is developing and applying new technologies that are capable of increasing oil production rates several times and increasing oil recovery by involving undrained areas in the development. This is, precisely, the method of drilling multilateral wells.

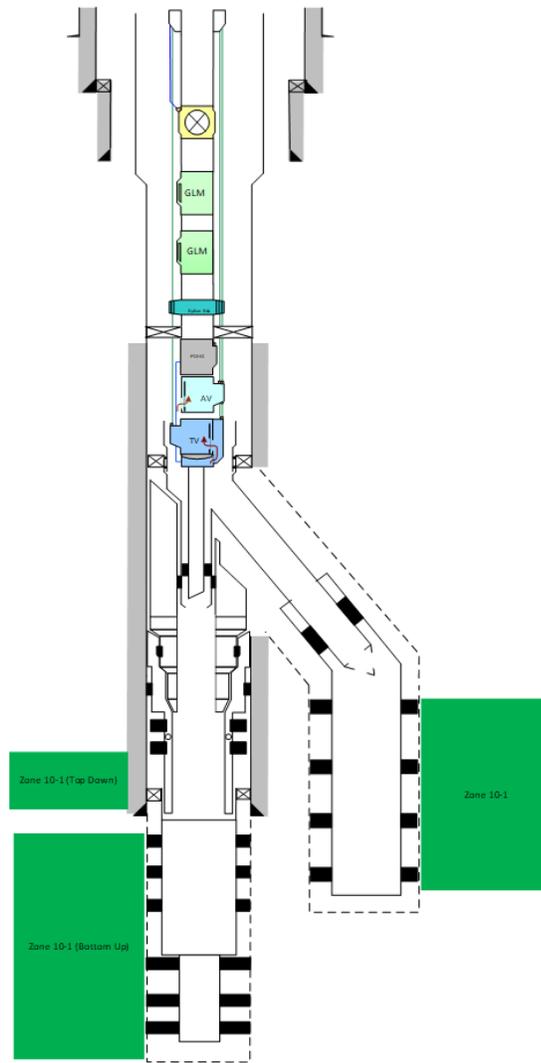


Figure 5. Multilateral well

Today, drilling technologies used at the Sakhalin-1 Project allow sidetracking old wells to make them multilaterals as well as drilling initially new multilateral wells.

The following indicators demonstrate the advantages of this technology:

- less time spent on drilling;
- reduce environmental impact;
- development of large areas oil reserves with a lack of space for wellheads on offshore platforms;
- increase oil production rates by wells;
- saving money on drilling and equipment operation, reducing the total cost of work.

Well service technologies do not stay still either: now we can fix 13 km long wells and reduce water and gas inflow.

The Company takes pride in the fact that innovation technologies used at the Sakhalin-1 Project not only help increase ORF, but also contribute to considerable reduction of environmental impact in the severe offshore conditions of the Sea of Okhotsk.