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SUBSEA RESET

Global subsea industry faces a new reality.

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Subsea boosting offers field development solutions

The GoM stands to benefit from new wave of subsea boosting.

Phillip Luce, OneSubsea, a Schlumberger company

When subsea boosting was implemented in 1994, it opened a new frontier for offshore developments. In today's tough environment the technology has become more impactful than it was back then. The industry of late has been looking to innovative technologies in an unprecedented manner to overcome low oil-price woes. Introducing innovative methodology associated with subsea boosting technology aligned with project specifics is becoming even more relevant during the recent industry downturn. The value of subsea boosting technology is now being closely associated with a fixed development concept that takes into account various boosting methodologies including tiebacks, well deferral and brownfield revitalization.

Production economics

Subsea boosting will improve field economics by reducing backpressure on the reservoir, which will increase production rates. By allowing the pump to reduce the backpressure on the reservoir, an increase in well flow rates and total recoverable reserves results and flow assurance improvements such as increasing velocity in pipelines, temperature increases and production stability also are achieved. Deepwater and ultradeepwater Gulf of Mexico (GoM) operators who are embracing this technology (which has been used in other regions for some time) stand to gain much from both the production and economic perspectives.

At higher oil prices more wells were being drilled, flowlines were being added and more subsea hardware was the norm. Today the industry downturn has helped to highlight different approaches to field developments such as tiebacks, well deferral and brownfield revitalization.

The tieback option and use of a subsea pump is attractive in terms of reducing overall field development capital costs and improved recovery rates. In the instance of day-one boosting, net present value can be significantly increased by implementing a phased drilling approach, allowing the operator to see the benefits of the pump to maintain or increase the target production on top of saving drilling costs. In the case of brownfield revitalization, oil production from a mature field can be renewed by using a pump to supplement the amount of energy to drive the reservoir production.

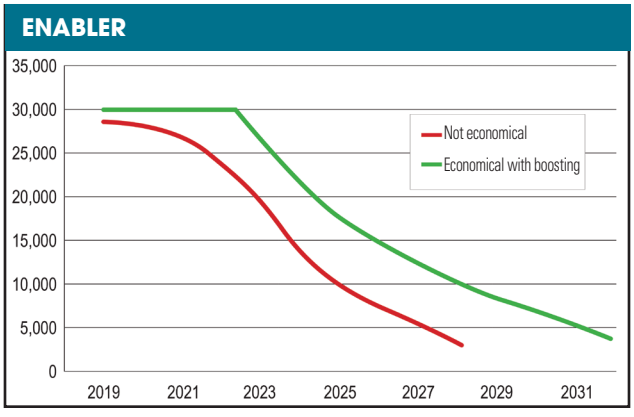

FIGURE 1. In a field where a target production was desired, use of a subsea pump resulted in accelerated production and extended plateau during the field's early years, offering an immediate return on investment and a greater return on capex. (Source: Schlumberger)

Business case to accelerate production

This better understanding of economically viable alternatives has led to customizing the methodology associated with each application of subsea boosting. For example, one GoM operator has seen enhanced production and field life extension. Based on the natural production curves, the required targets could not be reached to make the project economical. However, by implementing a subsea pump, this operator was able to increase production to the target levels and extend the production plateau, thus making the project viable. Cumulative effects of increased recovery also were witnessed in the later stages of well life (Figure 1).

In another field, an operator could reach production targets; however, enhanced production was desired. By including a subsea pump in the field architecture, the early years provided an accelerated production wedge that offered an immediate return on investment and a greater return on capex, allowing the project to become economically viable.

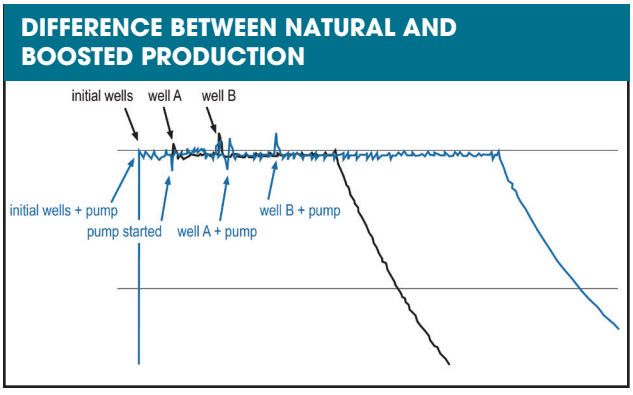

FIGURE 2. By incorporating subsea boosting, a well deferral scenario was implemented that allowed the operator to increase production while maintaining a better return on investment. (Source: Schlumberger)

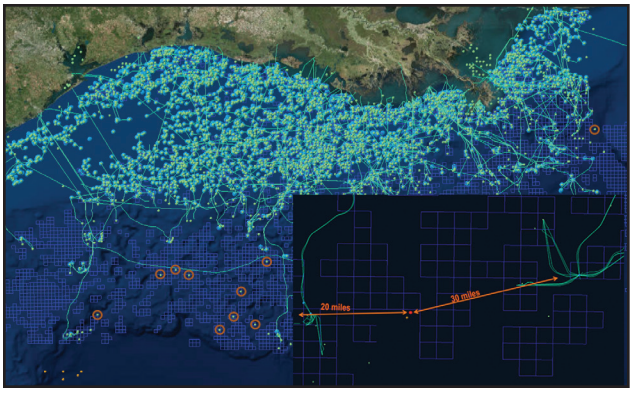

FIGURE 3. Rather than create a local host for a GoM field development, a 32-km boosted tieback provided the most economical solution. (Source: Schlumberger)

Well deferral: sensible economics

Another GoM operator was able to get over the FEED hurdle by applying a well deferral scenario that allowed the company to increase production while maintaining a better return on investment. The operator had originally planned to drill multiple wells. However, the operator was struggling to pass the FEED stage. By deferring two wells and only drilling three initial wells, the operator was able to use a subsea pump to boost these three wells, increasing production and in turn paying back costs incurred at project startup (Figure 2).

Tieback vs. host facility

One operator, also in the GoM, found that taking a tieback-to-existing facility approach had significant savings rather than taking the traditional approach to create a local host for the development. While a local host was considered in the early stage of the project, economics were just not strong enough to support that concept. A review was conducted of surrounding infrastructure that identified multiple tieback opportunities. First under consideration was a 32-km (20-mile) tieback. The effects of adding subsea pumps allowed this concept to support increased production over natural production while adding higher arrival temperatures and optimizing flowline sizing. Second under consideration was to examine the effects of extending the tieback to 48 km (30 miles), which still showed promising economics through boosted production. Considering the overall production of the field, the 32-km boosted concept provided the most economical solution, allowing the operator to progress the concept where a local host was no longer needed (Figure 3).

Brownfield revitalized

When a GoM operator's reservoir was maturing and reaching the end of its natural production, the operator decided to evaluate subsea boosting technology as a concept to remove the overburden and constant pressures being placed on the reservoir. Through the implementation of subsea boosting, the operator was able to revitalize the field and extend field life by many years. This allowed further reduction in overall life-of-field costs. Subsea pumps were able to reduce wellhead pressure while increasing total recoverables. The subsea pump also was used to alleviate flow assurance instabilities. Terrain slugging was present due to the maturing natural production. By the pump increasing velocities in the flowline, slugging concerns were eliminated. An additional enhancement of pump operations was the ability to restart flowing conditions from the weak wells. Taking advantage of these multiple subsea pump operational benefits, an additional 30 MMbbl were recovered.

Continuing a legacy of innovation

Subsea boosting technology, when combined with a well-planned and well-executed development design, yields economically viable projects and delivers the optimal solution for various well conditions and development drivers. With a multitude of GoM wells possible to be tied back and many brownfields on the decline, options abound for operators in the GoM to leverage subsea boosting as a technology and economic enabler. Under the current economic conditions subsea boosting promises to become a concept that will continue to challenge the industry to reevaluate project development scenarios. EP