



# Statoil: Tune 2000–2002

## Drilling and completion



PHOTO: STATOIL ASA

### Drilling and completing with formate brines delivers four problem-free wells and 100% of recoverable reserves over ten years.

Tune is a gas-condensate field located about ten kilometres west of the Oseberg Field Centre in the northern part of the Norwegian sector of the North Sea. Water depth in the area is approximately 95 metres. The reservoir lies at a depth of around 3,400 metres and consists of Middle Jurassic sandstones of the Brent Group, divided into several inclined fault blocks. Reservoir thickness is 100 metres. At the time of development it was classified by the operator as high temperature (131°C) and on the border of high pressure (525 bar).

The field is developed with four wells in a subsea template. Reservoir permeability is between 10 and 200 mD with porosity of 16%. Tune's recoverable reserves were estimated by the Norwegian Petroleum Directorate (NPD) to be 18.3 billion m<sup>3</sup> of gas and 3.3 million m<sup>3</sup> of condensate.

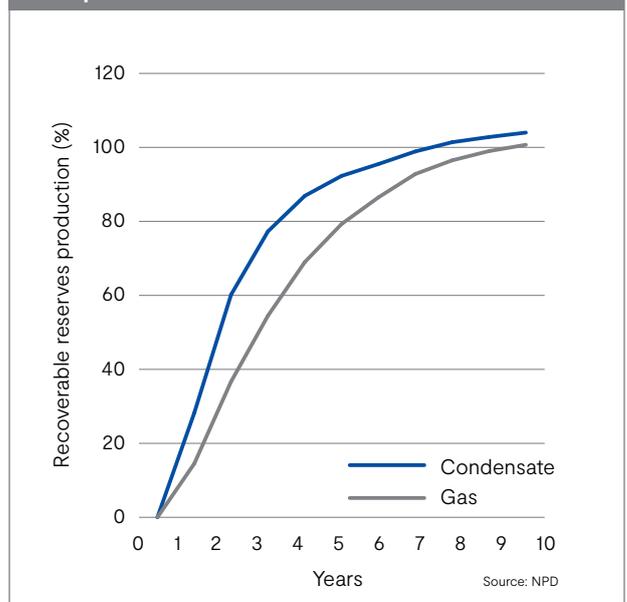
### Horizontal drilling with openhole completions

A potassium formate drill-in fluid with density of 1.65 g/cm<sup>3</sup> (13.8 lb/gal) was used to drill and complete the 8" reservoir sections of four wells in Tune from 2000 to 2001 [Nottveit, 2003]. The wells were drilled horizontally through the reservoir and completed in open hole with 300-micron single-wire-wrapped screens. Reservoir section lengths were between 350 and 900 metres. Lower completions were run in the formate drilling fluid and upper completions in clear cesium/potassium formate brine. The wells were also successfully suspended for six to twelve months in cesium/potassium formate brine pending completion of the production pipeline.

### Production payback

Tune was brought onto production in November 2002. Good well-flow performance was recorded at production start-up and, in June 2003, the field was reported to be producing 12.4 million m<sup>3</sup>/day of gas and 23,000 bbl/day of condensate [Karlsen, 2003]. The wells and residual filter-cake lining the open boreholes cleaned up naturally during early production [Karlsen, 2003] and no filter-cake removal or well stimulation treatments were required. Production records on the NPD website indicate that by the end of year seven of full production the four Tune wells had produced 92% of recoverable gas reserves and more than 97% of estimated recoverable condensate reserves. Seventy percent of recoverable gas and 87% of recoverable condensate were produced after only four years, while 100% recovery was reached within ten years.

Tune production over time



## Literature

*Nottveit, A.: Tune Case: Experience from Drilling and Completion Using Formate-Based Fluids, presented at IQPC Drilling & Completion Fluids Conference, Aberdeen, UK, 23–24 June 2003.*

*Karlsen, S. B.: Tune Case: Experience from Cleanup and Production Using Formate-Based Brines as Drilling/Completion Fluids, presented at IQPC Drilling & Completion Fluids Conference, Aberdeen, UK, 23–24 June 2003.*

*Downs, J. D.: A Review of the Impact of the Use of Formate Brines on the Economics of Deep Gas Field Development Projects, SPE 130376 presented at SPE Deep Gas Conference held in Manama, Bahrain, 24–26 January 2010.*

*Downs, J. D.: Life Without Barite: Ten Years of Drilling Deep HPHT Gas Wells With Cesium Formate Brine, SPE 145562 presented at SPE/IADC Middle East Drilling Technology Conference held in Muscat, Oman, 24–26 October 2011.*

*Olsvik, G., Howard, S. and Downs, J. D.: The Long-Term Production Performance of Deep HPHT Gas Condensate Fields Developed Using Formate Brines, SPE 165151 presented at SPE European Formation Damage Conference and Exhibition, Noordwijk, The Netherlands, 5–7 June 2013.*