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## **Combined Underground Gas Storage and Enhanced Oil Recovery in a Fractured Reservoir**

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### **Abstract**

The Schönkirchen Tief reservoir is located in the Vienna Basin. The reservoir contained 19 mn m<sup>3</sup> oil originally in place. The current recovery factor after 45 years of production is 59 %. The field was produced by water injection. The wells, located at the crest of the high relief structure are exhibiting a high water cut. In 2006-2007, a comprehensive study was performed to optimise the future development of the field.

The field is made up of different types of dolostones. The lower part of the field consists of fractured dolomite, the upper part of weathered dolomite and dolomite debris. A dual-permeability model was used to simulate the flow in the dolomite and the weathered zone, whereas a single-permeability model was sufficient for the debris.

The main recovery mechanisms for this reservoir are imbibition and water/oil gravity drainage. Laboratory experiments indicated that the dolomite is water-wet to mixed-wet at reservoir conditions of 100 degrees centigrade.

The results of the study show that an economically attractive option for the field development is a combination of Underground Gas Storage and EOR. Due to the fact that the current reservoir pressure is below initial pressure, within half a year, about 1 bn m<sup>3</sup> can be injected. Only about one third of this gas has to remain as cushion gas during the first cycle. To further increase the amount of gas which can be used for UGS, fluids have to be withdrawn from the reservoir. Drilling horizontal wells close to the original oil/water contact enable injection of additional 2 bn m<sup>3</sup> gas.

The gas injection leads to gas/oil gravity drainage of the oil and water present in the matrix of the fractured reservoir. The oil is collected by the horizontal wells, resulting in incremental oil recovery of up to 5 % of oil originally in place.