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## **Trend Breaking Completions**

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### **Abstract**

An important focus area in StatoilHydro's IOR strategy is 'efficient drainage of reservoirs'. As the oil industry struggles to improve ultimate recovery and to make marginal projects economical, wells must provide cost-effective means to gather reservoir information and produce them efficiently. This paper describes the challenges associated with uneven inflow into the well bore causing increasing water cut and/or gas-oil-ratio with corresponding declining oil rate.

As well construction becomes more and more advanced it is increasingly important to ensure optimal inflow along the entire reservoir section of the well, whether it is a long horizontal section or a multi lateral well. For some applications mechanical sliding sleeves can be an effective way of shutting off poor performing zones. Fixed inflow control devices (ICDs) has also proven to be a valuable way of equalizing inflow for maximizing oil production from thin oil rims. Remotely operated ICV's enables choking or shutting-off zones from surface if they experience high GOR or water cut. Different applications have different fit for purpose solutions.

Autonomous valves represents the next step for inflow control as it enables choking of zones with excessive water cut or GOR without any use of control cables. In order to fully utilize advanced well construction, it is also crucial to ensure adequate reservoir monitoring. The paper also describes this by means of fibre optics.

### **Introduction**

In most oil fields with declining oil production it is caused by uneven inflow along the wellbore giving early gas and/or water break through. Inflow control by mechanical sliding sleeves, fixed inflow control devices (ICDs) and remotely operated ICVs (smart completions) have given valuable increased production due to limitation of unwanted production of excessive gas or water. Future challenge will be to find cost effective completions for the advanced well architecture that is robust enough.

### **Mechanical sliding sleeves**

Mechanical sliding sleeves have been used for decades for selective zonal shut-off of unwanted water production or excessive GOR. It has proven to be a robust solution, but there are some limitations. In addition to the economic aspect of well intervention to shut or open a sleeve, it is limited to open or shut and has does not enable choking.

### **Fixed inflow control devices (ICDs)**

The use of inflow control devices, ICDs, has proven very beneficial for the production of thin oil rims. This is especially the case when the permeability is high. This gives a frictional pressure drop which is large compared to the draw down when production rates become high, hence giving too much production into the heel section of the