

## **Innovative Approaches of Using Fluid Level Data for Production Optimization and Reservoir Monitoring**

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### **Abstract**

A new technology for fully automated fluid level measurements was developed during the past eight years. This paper describes the technical features of the new device and summarizes via case studies new approaches of using fluid level data for optimizing artificial lift systems and for reservoir monitoring applications (well testing).

The unique feature of this system is its fully automated and purely electronic functioning. The measuring device is mounted on the casing outlet and, contrary to conventional devices, works without the need of a gas gun.

It has a sampling rate of one measurement per minute. The measured fluid level data is transmitted from each wellsite to the operations center via standard communication systems.

The fluid level data can be used as an input signal to a VSD (Variable Speed Drive) controller for automatic pump regulation, thereby enabling operators to run downhole pumps in a safer and more efficient way.

The new device has successfully been used to avoid pump-off conditions and the resulting serious equipment damage of artificial lift systems. Due to the availability of online fluid level data, downhole pumps (ESPs and Sucker Rod Pumps) could be operated safely at more aggressive production rates.

The device can also be used to control a VSD to keep the fluid level in a well at a specific depth to avoid downhole flow conditions below the bubble point pressure in oil wells. This application has been used on several oil production wells to avoid the generation of free gas within the reservoir, which would decrease the relative oil permeability and could also have a negative impact on the ultimate recovery of a reservoir.

Furthermore, a transient multi-phase flow model has been developed which has successfully been applied to derive bottomhole flowing and build-up pressure for production performance monitoring and reservoir engineering applications (well testing) from the continuously available fluid level data. Comparisons with pressure data from downhole gauges show a very good agreement.

The new approach of obtaining bottomhole flowing and build-up pressure data from continuous fluid level measurements has proven to be a valuable method to optimize operations of artificially lifted wells and to obtain valuable data for reservoir monitoring in a cost-effective way.