

# A Brief Discussion on the Geological Guiding Role of FEWD

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**ABSTRACT:** *FEWD is an evaluation and measurement system commonly used in logging technology. This system is mainly used for measurement while drilling. Combining with the development history of drilling technology in China, this paper mainly introduces this technology, analyses its geological guiding role in drilling engineering, and expounds the tremendous role of this system in reservoir development and drilling work, and puts forward construction suggestions on its appropriateness through displaying the advantages of this technology.*

**KEYWORDS:** *FEWD; Wizard; Drilling*

## 1. Introduction to FEWD

In the 1990s, Sperry Sun company in the United States developed FEWD, which is mainly used in the process of logging while drilling[1]. It is composed of most sensors, logging sensors, tools and drilling tool probe sensors in directional engineering. The four geological parameters of formation resistivity, natural gamma ray, rock density, pre-hole acidity and azimuth angle in compensation, well inclination and tool face angle can be displayed in real time[2]. At the same time, the vibration of downhole drilling tools can be recorded. When the drilling tools exceed the allowable range of vibration, downhole instruments can transmit the drilling information of the drilling tools to the ground first. In order to remind the constructors to take measures to reduce vibration, to prevent the occurrence of underground accidents, so that the constructors can cope with the complex underground situation more conveniently[3].

## 2. Main FEWD technologies

FEWD combines engineering parameter sensor with geological parameter measurement sensor, collects the latest and most timely engineering and geological

data according to the pre-set content, and transmits them to the ground by positive pulse through drilling fluid in drill string after automatic coding. The ground is not ready to be processed to form corresponding data and real-time logging curves. FEWD can not only conduct three-dimensional orientation (trajectory geometry orientation) but also make formation evaluation while drilling, which plays a role of geological guide.

### **3. Geological guidance of FEWD in drilling engineering**

#### ***3.1 Predict the vertical depth of target formation by comparing the formation while drilling***

The FEWD measurement curve and the data of adjacent wells are compared to the electrical combination characteristics of the marker formation. The comparison method is similar to conventional logging. But the process of comparison is more complicated than that of vertical wells. It is mainly reflected in the following aspects.

(1) The resistivity measurements while drilling are slightly larger than those of cable logging, and the gamma measurements while drilling are slightly smaller than those of cable logging. By comparing the logging curves of adjacent wells or key wells in the same block, the errors of abnormal intervals and instrument calibration caused by improper manual operation during construction are checked and corrected to improve the accuracy of FEWD real-time lithology identification.

(2) When the trajectory travels through the sand-mudstone interface, it is easy to cause the illusion of phase transformation or lithologic pinch-out. Because the electro-yang ratio is greatly affected by anisotropy, the curve stars show significant "peak" characteristics. Accuracy of formation correlation while drilling.

#### ***3.2 Determine the target orientation and predict the best landing site***

On the premise of meeting the deflection requirements of conventional drilling tools, the most suitable target and human target orientation are determined. The optimum trajectory of horizontal well is designed to make the maximum principal stress 90 degree angle with the direction of human target. If the deviation angle of the target is less than the requirement, the actual drilling trajectory can only be located above the target formation at the top of mudstone section or reservoir with poor physical properties; if the deviation angle of the target is larger than the requirement, the actual drilling route is easy to drill through the target formation to reach the mudstone section at the lower part, thus it can not reach the optimal and longest reservoir section.

#### **4. FEWD Advantage Analysis**

##### ***4.1 Real time***

The data measured by this logging while drilling system is closer to the real bottom situation. Because the underground geological assessment instrument is carried out along with the geological-oriented drilling construction, real-time data parameters can be transmitted directly to the ground through the transmission equipment. Ground engineers and geological workers can start real-time logging curves according to the data. These data are for ground workers. The engineers provide reliable basis for geological analysis and engineering control.

##### ***4.2 While Drilling Guidance***

Real-time geological parameters have a good influence on the production of single well and the recovery of reservoir, which can make the field personnel effectively control the characteristics and changes of the bottom layer. Through the judgment of these data, the trajectory of the well body travels through the best position in the formation, and the oil-gas interface, oil-water interface and water layer in the formation are avoided.

##### ***4.3 Risk Avoidance***

FEWD is a comprehensive analysis of the variability of geological parameters. It can judge some abnormal parts in the process of drilling and prevent them in advance. If DDS vibration sensing device is added to FEWD, the abnormal violent vibration can be known in time when drilling, so as to take targeted prevention and treatment measures. Control risks to reduce and reduce losses. According to the data collected in real time, the migration and properties of oil and gas can also be accurately judged.

##### ***4.4 Improving the efficiency of exploration and development***

FEWD can effectively control wellbore trajectory, so it can accurately control the direction and landing point. By adjusting wellbore trajectory and coordinating the location of the same production zone, it can avoid the trouble of repetitive drilling, improve drilling efficiency, shorten the engineering cycle, and in the overall view, also invest in drilling. Effective reduction has been made to improve exploration efficiency and development efficiency.

#### **5. Concluding Remarks**

- (1) The application of FEWD provides tremendous guidance and help for the

direction of well depth trajectory. In actual drilling engineering, the well trajectory is adjusted according to the parameters in time. While avoiding risks, the exposure degree of oil and gas reservoirs is greatly increased, while improving the accuracy and efficiency of drilling trajectory and maximizing economic benefits.

(2) Before engineering construction, FEWD should fully consider topography and landform, carefully familiarize itself with past data, prepare well, carefully avoid risks, formulate optimal plans, reasonably select accessories and set reasonable instrument parameters, so as to reduce instrument wear and prolong its service life. In the construction process, we should also be flexible, efficient and safe to complete the construction task.

(3) In order to make rational use of FEWD, on the one hand, it is necessary to use it strictly in accordance with the operating rules. On the other hand, it is necessary to combine previous experience, carefully analyze and summarize, constantly improve and repair in the field work, find the most suitable construction method in the area, make a good summary, and create a basis for future construction and accumulate experience.

#### **Reference**

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