



*Measurements while drilling  
and  
Logging while drilling*

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# OBJECTIVES

In this lection you will learn main functions and system components work of Measurement While Drilling (MWD) and Logging While Drilling (LWD).

На этой лекции Вы изучите основные функции и работу системных компонентов «измерения во время бурения» и «каротажа во время бурения».



# Разминка «Полиглот»

English	Russian	Kazakh
<b>Well</b>	Скважина	Ұңғыма
Exploration	Разведка	<b>Барлау</b>
Recovery	<b>Добыча</b>	Өндіру
<b>Natural resources</b>	Природные ресурсы	Табиғат қорлары
<b>Steel casing pipe</b>	<b>Стальная обсадная труба</b>	Болат шегендеу құбыры
Cement sheath	<b>Цементное кольцо</b>	<b>Цементтік сақина</b>
<b>Aquifer</b>	<b>Водоносный горизонт</b>	Сұлы деңгейжиек



# HOME TASK

Arsen Alpysbai and Shyngysbek Muslimov “Wellbore construction”

Azhar Zhumatayeva “Types of directional wells”

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# WHAT DO YOU THINK?

What type of measurements does MWD provide that LWD does not?  
Tell all the correct answers.

- a. Formation measurements
- b. Drilling mechanics
- c. Survey measurements

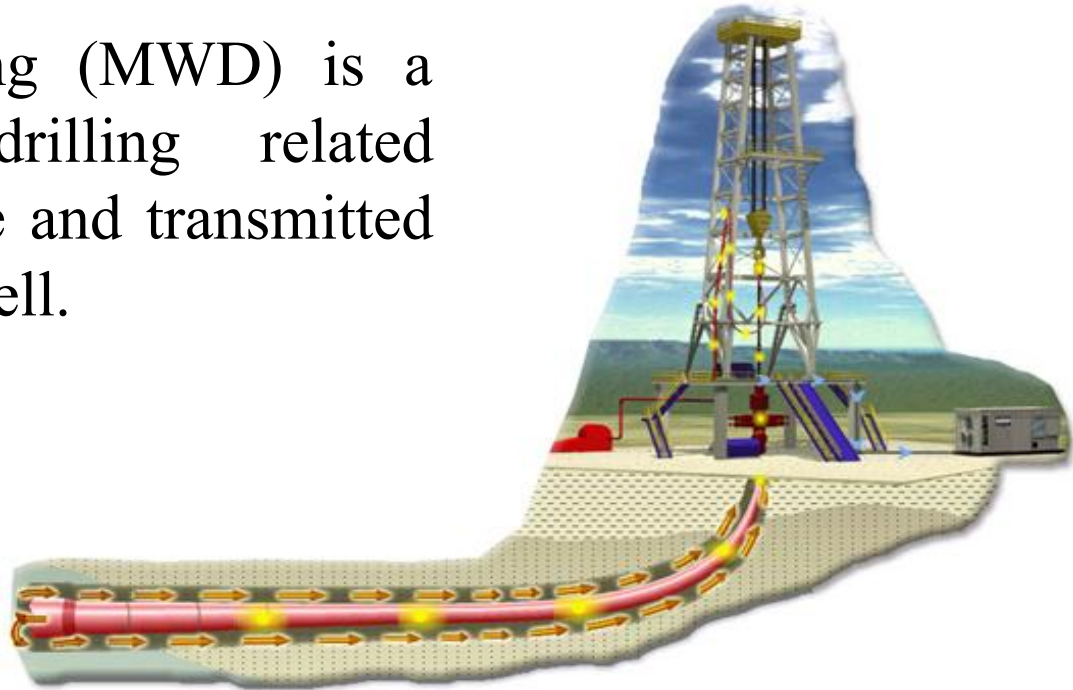
Correct answers:

- b. Drilling mechanics
- c. Survey measurements



# MEASUREMENTS WHILE DRILLING

Measurement While Drilling (MWD) is a term used to describe drilling related measurements made down hole and transmitted to the surface while drilling a well.

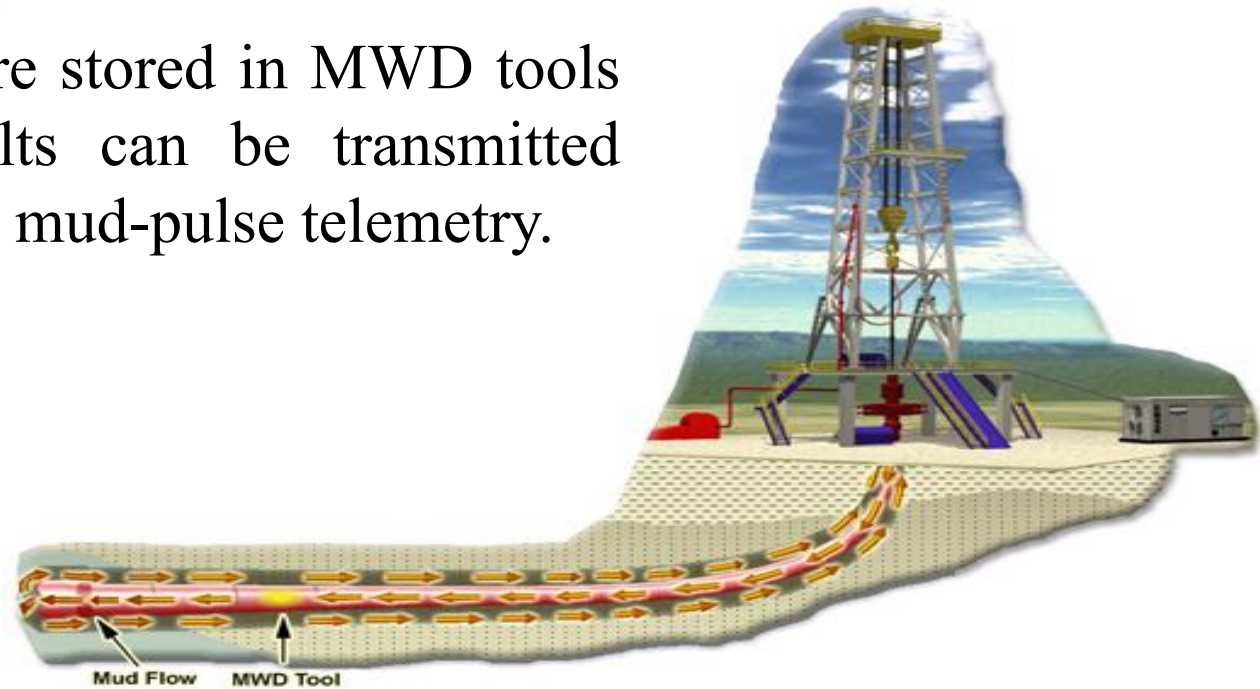


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# MEASUREMENTS WHILE DRILLING

The measured data are stored in MWD tools and some of the results can be transmitted digitally to surface using mud-pulse telemetry.



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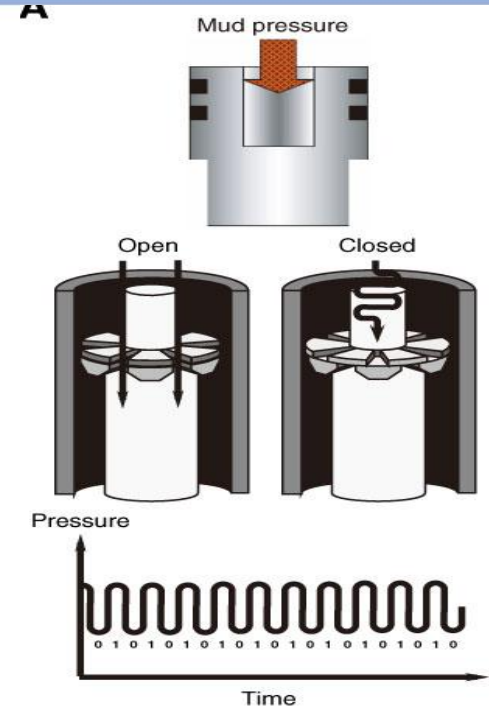
8



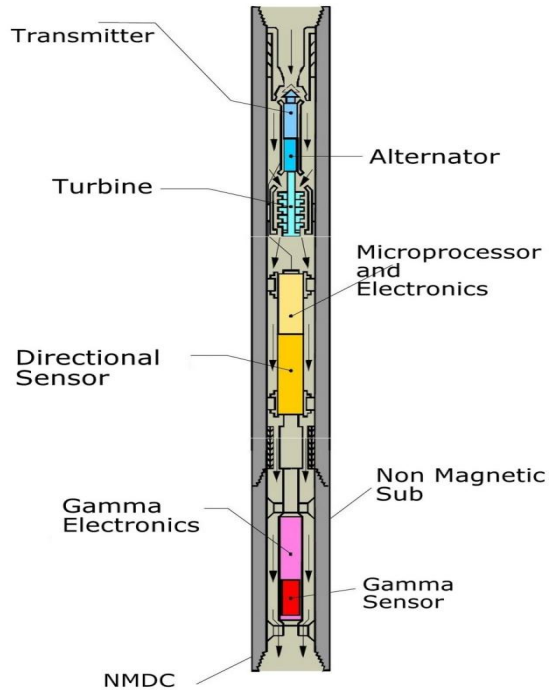
# MEASUREMENTS WHILE DRILLING

## Mud pulse telemetry

A method of transmitting LWD and MWD data acquired downhole to the surface, using pressure pulses in the mud system. The same telemetry system is used to transmit commands from the surface.



# MEASUREMENTS WHILE DRILLING

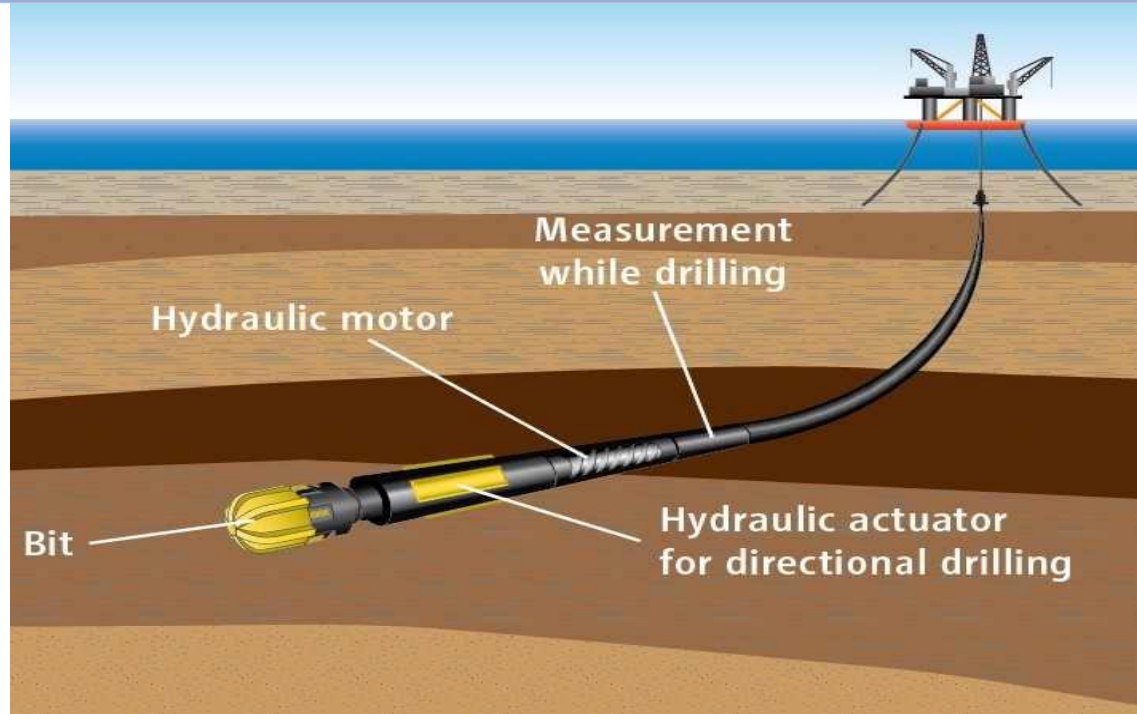


MWD tools are generally capable of taking directional surveys in real time. The tool uses accelerometers and magnetometers to measure the inclination and azimuth of the wellbore at a location, and they then transmit that information to the surface.

Also MWD tools contain an internal gamma ray sensor.

# MEASUREMENTS WHILE DRILLING

The primary use of real-time surveys is in directional drilling. For the directional driller to steer the well towards a target zone, he must know where the well is going, and what the effects of his steering efforts are.



# MEASUREMENTS WHILE DRILLING

MWD tools can also provide information about the conditions at the drill bit. This may include:

*Rate of penetration*

*Rotational speed of the drill string*

*Smoothness of that rotation*

*Type and severity of any downhole vibration*

*Downhole temperature*

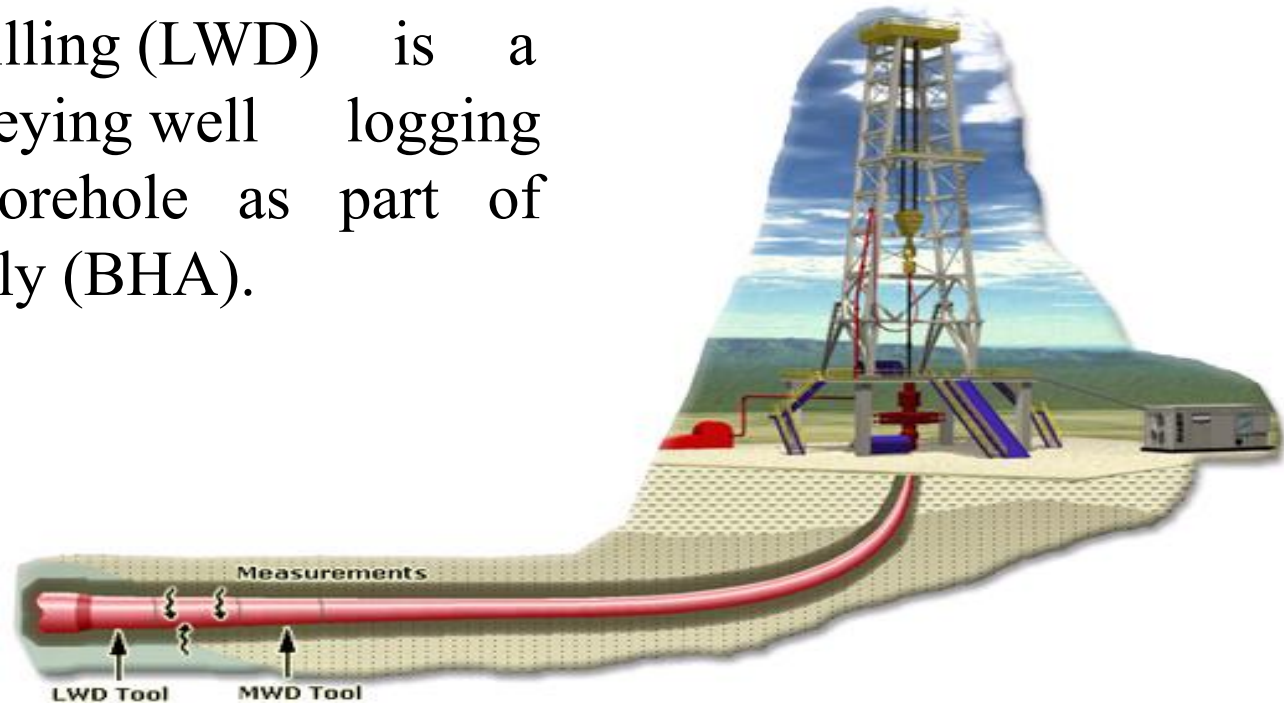
*Torque and weight on bit, measured near the drill bit*

Use of this information can allow the operator to drill the well more efficiently, and to ensure that the MWD tool and any other downhole tools are operated within their technical specifications to prevent tool failure.



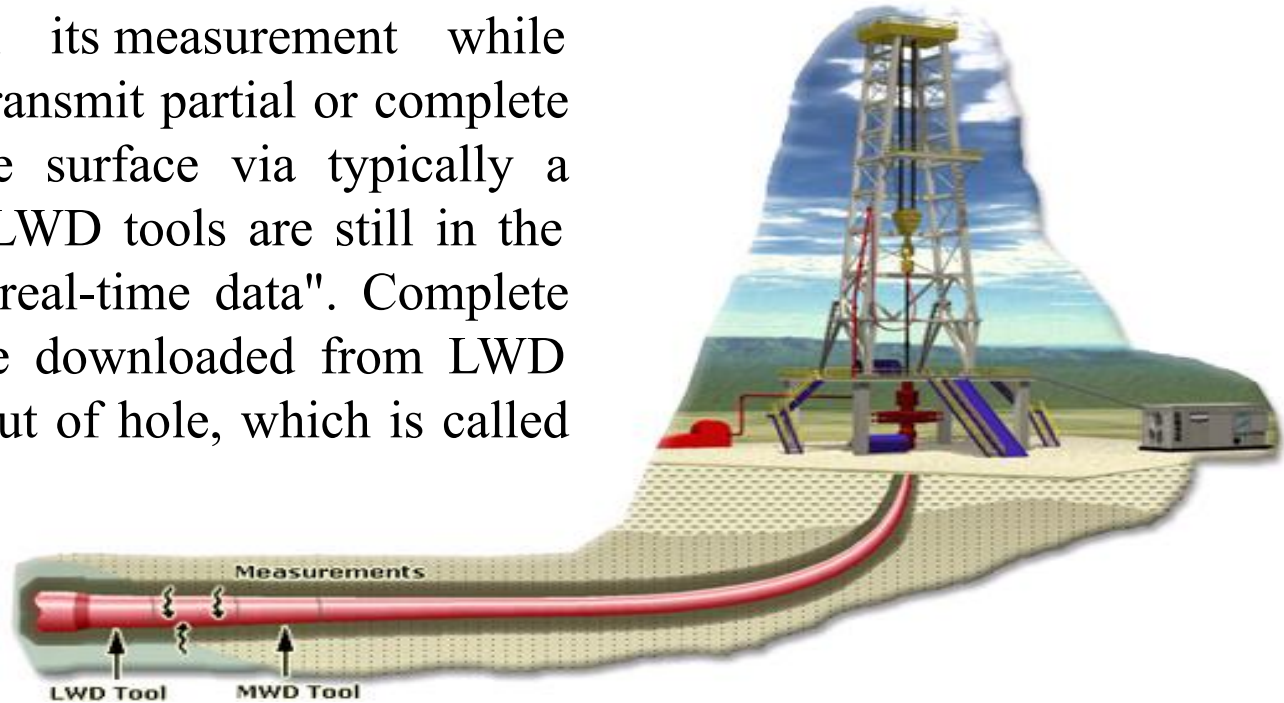
# LOGGING WHILE DRILLING

Logging while drilling (LWD) is a technique of conveying well logging tools into the well borehole as part of the bottom hole assembly (BHA).



# LOGGING WHILE DRILLING

LWD tools work with its measurement while drilling (MWD) system to transmit partial or complete measurement results to the surface via typically a drilling mud pulser, while LWD tools are still in the borehole, which is called "real-time data". Complete measurement results can be downloaded from LWD tools after they are pulled out of hole, which is called "memory data".



# LOGGING WHILE DRILLING

The following is an incomplete list of available measurement in LWD technology.

*Natural gamma ray (GR)*

*Density and photoelectric index*

*Neutron porosity*

*Borehole caliper*

*Resistivity (ohm-m)*

*Sonic*

*Borehole images*

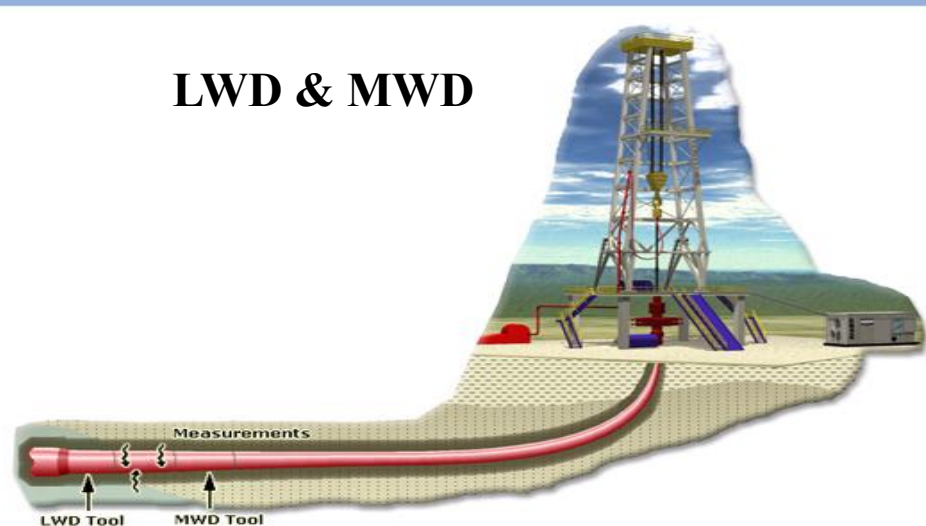
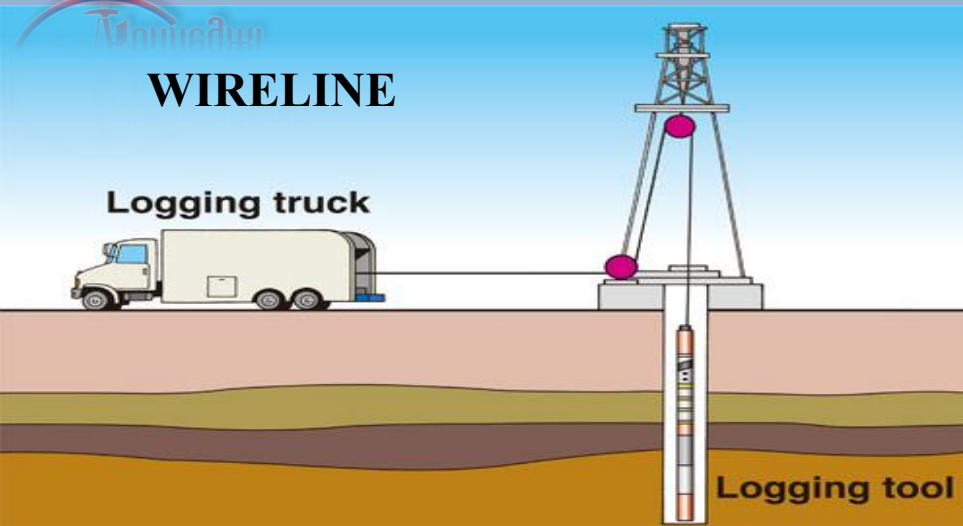
*Formation tester and sampler*

*Nuclear magnetic resonance (NMR)*

*Seismic while drilling (SWD)*



# WIRELINЕ vs. LWD



LWD technology was originally developed to partially or completely replace wireline logging. Over the years, more of the measurements have been made available in LWD. Certain new measurements are also development in LWD only.





# MWD & LWD engineers at work



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# ЗАКРЕПЛЕНИЕ

## Игра в группах

- Открываем ноутбуки;
- Запускаем браузер;
- Заходим на страницу [www.quizlet.com.live](http://www.quizlet.com.live)

# ЗАДАНИЕ НА ДОМ

1. Подготовить презентацию на тему «Perforation job» с использованием интернет ресурсов.
2. «Measurements while drilling and logging while drilling»



# РЕФЛЕКСИЯ

- сегоднѧ я узнал...
- it was difficult for me...
- мен ... ....ҰҚТЫМ
- I would like to...



Назарларыңызға рахмет!  
Спасибо за внимание!  
Thank you for attention!  
Dikkat için teşekkür ederim