

1- What is the Well Testing?

The measurement under controlled condition of all factor relating to the production of oil ,water and gas. And these factors are P, T, V.

Making a disturbance that will cause the reservoir pressure to change. This pressure change, when recorded and interpreted along with the measured flowrates, will yield information about well and reservoir parameters and geometry.

Creating a Pressure Disturbance

How a pressure disturbance is created depends on whether the reservoir is producing or shut down:

- If the well has been shut for a long time, the best way to create a pressure disturbance is to flow the reservoir; this is called a **drawdown**.
- If the well has been flowing for a long time, a pressure disturbance can be creating by shutting the well; this is called a **build-up**.
- A pressure disturbance can also be created in a flowing well by either **increasing or decreasing the flowrate**.

Well testing purpose:

Wells like people, change every day and it is the main purpose of well testing to measure and record these changes. Well test also assist in the **predicting of production capabilities**. Special tests are made to determine the **productive potential of the well**.

2- What are the Objectives of Well Testing?

- If testing is justified to do, it should be performed in simple & safe manner.
- Determine Reservoir Characteristics:
 - ✓ Reservoir pressure & temperature
 - ✓ Permeability
 - ✓ Thickness
 - ✓ Skin factor (formation damage)
 - ✓ Reservoir boundaries (size)
 - ✓ well productivity (PI for oil wells, deliverability & AOFD for gas wells)
- Identify the produced fluids & nature of these fluids.
- Obtain representative fluid samples.
- Reservoir description: To provide accurate information about a reservoir for the purposes of production. Compare this reservoir to surrounding wells with the same reservoir to establish similar production.
- Reservoir evaluation: To determine if the reservoir parameters are satisfactory for commercial production. Make sure all information collected has good value.
- Reservoir management: To optimize continued production from the reservoir (this will take place later during the field development or field production phases), making sure that all wells give the best data and information for continued flow in this field.

3- Why do we use the DHSV & What is its Operating Pressure?

A safety device installed in the upper part of wellbore to provide emergency closure to the well in the event of a worst-case-scenario surface disaster.

The control system operates in a **fail-safe mode** (SCSSV) actuated from a control panel located on surface with hydraulic control pressure.

TRSV Operates with 5000 psi control pressure

it may be necessary to keep as much as 4000 to 5000 psi on the control line to keep the valve open.

Has working pressure rates from 5000 to 30000 psi, the most common type is the 10000 psi for the tubing size 3 1/2" and packing bore 2.813".

4- What is the Annulus & Why do we need to monitor its pressure?

The void between any piping, tubing or casing.

In a completed well, we have many annuli:

- 1- Annulus A: is the void between the production tubing and the smallest casing string 9 5/8". It can serve some tasks like Gas Lifting and Well killing.
- 2- Annulus B: void between production casing 9 5/8" and the intermediate casing 13 3/8".
- 3- Annulus C:

We need to monitor the annulus pressure to:

- 1) Prevent excessive Annular Pressure Build-up (APD) due to brine expansion from temperature increase while well is flowing.
which leading to casing failure, collapse or formation damage.
- 2) Maintain pressure in them to ensure the well integrity of the casing strings.
To avoid BALLON Effect.

On land pressure can be relieved by opening the casing valve and venting the pressure to a tank.

Annular Pressure Buildup (APB) also known as Sustained Casing Pressure (SCP).

Extra reasons of Casinghead pressure:

- 1- Packer Seal Leak.
- 2- Poor cementing Job.

5- What is the ZTR Zero Tolerance Rules?

- 1- Completing AlMansoori forms with false information or manipulation of data (working with out PTW and without conducting TBT.
- 2- Working without completed and appropriated PPE.
- 3- Working at height without wearing fall preventive equipment (Safety harness).
- 4- Smoking in AlMansoori or clients premises.
- 5- Working under influence of Drugs or Alcohol
- 6- Fighting whilst on the company or client premises

- 7- Driving under influence of drugs or alcohol
- 8- Driving without wearing seatbelt.
- 9- Using mobile phone while driving.
- 10- Driving company vehicle without driving license.
- 11- Exceeding the limited speed while driving.
- 12- Allowing unauthorized third party to drive the company's vehicle.
- 13- Intentional extrication of Vehicle Monitoring Devices (VMD).

6- What is AlMansoori Mission and Vision?

Vision

To make world class health, safety, environment and quality a way of life within the company.

Mission

- **HEALTH** - To achieve zero lost time sickness with our health monitoring management program as the corner of its execution.
- **SAFETY** - To achieve zero lost time incidents with our milestone recognition program as the corner of its execution.
- **ENVIRONMENT** - To achieve zero environmental emissions.
- **QUALITY** - To provide quality services that will exceed our customer expectations.

Value

- Health, Safety Environment and Quality must come first in everything we do in our business.

7- What the Choke Adapter?

Used in the positive choke side.

Its used when we have small choke beans as we install the bean inside the adapter.

Used as a trim option.

8- What is the Choke Seat?

Exist in the Adjustable side choke.

Used as a bean which has a tapered inside lip allowing the adjustable cone shaped end sliding in and out of it to allow for flow control.

9- Why do we install the adjustable choke on the right side?

Because the stream is flowing in a clockwise direction that may cause a sudden movement of the adjustable choke in the closing direction (Fail-Safe mode).

But if we installed it on the left side it may cause the choke to move in the opening direction (Not Safety).

10- What is the Sleeve?

It's attached to the stem of the Adjustable Choke and as the stem moves in and out, the sleeve show the scale of size.

11- *What is the Hydration?*

Solidification of water particles and some light Hydrocarbons in the natural gas.

It happens mostly at the restrictions like Choke manifold because of the sudden drop in pressure leads to expansion without heat transfer resulting in temperature drop then to hydrate formation.

It can make the flowlines to be plugged.

12- *Why do we have to apply the critical flow while flowing?*

Critical flow: when the downstream flow is 50% or less than the upstream.

We apply it, so any changes in the pressure or flow rate in the downstream will NOT affect the downhole conditions and also to avoid the reverse/back flow.

13- *What is the GOR?*

GOR means gas-oil ratio. It is a measure of the volume of dissolved gas (Gas produced) within the oil with respect to the oil volume (both at standard conditions).

Its unit: SCF/STB stands for standard cubic feet of gas released per stock tank barrel of oil.

During well-test we calculate the GOR by dividing the separator gas rate by the stock tank oil rate (both at standard conditions). This GOR is called separator GOR (GOR1).

There is always some gas mixed with oil at separator condition (P and T) which is transferred to surge tank and later released from surge tank gas vent line. We need to measure this gas rate and then calculate the GOR2. To obtain the total GOR we need to add gas leaving the tank to separator gas rate.

Total GOR = GOR1 (Qgas from Separator) + GOR2 (Qgas from surge tank).

If you want to measure it then plan to rig up a low gas flow meter in surge tank gas vent line.

GOR is also an indicator of the type of hydrocarbon present in the reservoir.

High GOR refers to Gas well

Low GOR refers to Oil well

Gas dissolution in crude oil is a strong function of temperature, pressure, oil gravity and gas gravity. These factors influence the GOR value of a crude oil.

Heavy oils (Low API) has low capacities of dissolved gas (low GOR)

Light oils (High API) has high capacities of dissolved gas (high GOR)

14- *What is the Rig Rat System?*

It's a multi-point wireless Gas Detection System, monitoring for toxic gases, combustibles and oxygen hazards.

Its self-powered and solar-capable.

Has:

- 1- Signal transmission.
- 2- Flashing Visual Alarm.
- 3- Audible Alarm.

15- What type of meters do we have?

- Coriolis Flow Meter
- Turbine Flow Meter
- Differential Flow Meter (DPU)

16- How does temperature and gas SG affect Gas Rate?

The Gas rate increases with increasing gas temperature, due to expansion. Because of the same gas mass with same molecules will expand to occupy a larger volume resulting to decreasing in Gas SG .

The Gas rate increases with decreasing Gas SG as light gas has high velocity.

The gas SG (density) decreases with increasing temperature ($SG \sim 1/T$) due to gas expansion. The gas SG (density) increases with increasing pressure ($SG \sim P$) due to gas high compressibility as the gas molecules are packed together (gas will occupy a smaller volume) and may approach the behavior of liquid, and the velocity of the compressed gas will decrease, so the flowmeter measurement will be low.

17- What is the relation between H₂S amount in gas and Gas SG?

The high H₂S amount in the gas, the High gas SG is.
This is because H₂S is a heavy gas 1.189 (heavier than the air).

18- What is the effect of Temperature on API?

- API gravity increases with increasing Temperature, While specific gravity decreases with increasing temperature due to thermal expansion at High T as the same mass of liquid will occupy a larger volume.
- So at high temperature (low SG), we get high API value (light oil)
- At low temperature (high SG), we get low API value (heavy oil)
- Oil SG value is inversely proportional to API value.

API:

- API is used to measure densities of petroleum liquids relative to that of water.
- Crude oil is classified as light, medium, or heavy according to its measured API gravity.
- Light crude oil (Condensate oil) has 40~60 API
- Medium oil (Volatile oil) has > 40 API
- Heavy crude oil (black oil) has < 40 API
- Extra heavy oil has < 20 API

19- What are the properties of H₂S?

- 1- Toxic Gas/fatal if inhaled
- 2- Colorless
- 3- Rotten egg odor
- 4- Heavier than air 1.189
- 5- Accumulate in low-lying areas/confined spaces
- 6- Explosive limits 4.3% to 46%

- 7- Extremely flammable
- 8- Ignition temperature 500F
- 9- Highly corrosive to metals.

20- *What do you do in Case of H2S leak?*

Follow our location Emergency Response Plan (Contingency plan) as:
 Identify the alarm
 Identify the leak location
 Know the wind direction
 Identify the safe assembly point
 Follow the Up wind evacuation routes
 Take my tie card.
 DO NOT attempt to rescue any victim without SCBA
 Call the appropriate emergency number

21- *What are the limits of H2S?*

Concentration	Toxic Effects
1 ppm [0.0001%]	H2S can be smelled
10 ppm [0.001%]	Maximum 8-hr work period allowed.
100 ppm [0.01%]	Smell “disappears” in 3 to 15 min, eyes and throat burn.
200 ppm [0.02%]	Odor disappears quickly; eyes and throat burn.
500 ppm [0.05%]	Sense of reasoning and balance lost; respiratory problems.
700 ppm [0.07%]	Death occurs unless the affected person is removed.
1000 ppm [0.1%]	Permanent brain damage or death

22- *What is the types of flanges and their gaskets we use?*

Classified according to their construction, pressure rating, and diameter to:

- 1- Flanges meet **API Specifications**.
 API flanges design for High Pressure Rating & High strength operation like WH,U/S.
 API-6A fall Into 2 categories:
 API-6B flange-Ring Type Joint RTJ with gaskets R or RX (without Raised Face RF)
 API-6BX flange- Ring Type Joint RTJ with gaskets BX (with raised Face)
 RTJ gaskets with models:
 BX 154 – 3” (3 1/16”) 10k & 15k
 BX 155 – 4” (4 1/16”) 10k & 15k
 RX 35 – 3” (3 1/8”) 5k
 RX 39 – 4” (4 1/16”) 5k
- 2- Flanges meet **ASME/ANSI Specifications**.
 Designed for Low & Moderate Pressure Rating
 ASME rates the pressure of a class based on construction Material & Design Temperature.
 - RF flanges (Raised Face)
 It using Spiral gaskets (flat type gasket)

23- What is the benefit of Color Coding and why do we change it every 6 months?

It's a visual indication of certification status of portable loads and lifting equipment.

Jan – Jun > White & Orange

Jul – Dec > Blue & Green

We change it every 6 months to ensure that there is a periodic inspection to the lifting equipment and it's safe to use.

24- What is the Meter Factor {F}?

(physical inaccuracy in meter when checked before the job with water)

It's the ratio measured volume to the metered volume of a given meter.

= true (Tank) volume/metered volume

Is the "flowing" meter correction factor (F), and this factor is used in the oil rate calculations.

How to do calibration to the turbine meter?

By doing a flowing system.

By matching between the analyzer and the flow meter and while calibration we change the numbers of pulses until we get the factor 1.

As sometimes the defect of reading comes from the flow analyzer because the pulse is put incorrectly, so the translator is wrong.

25- What is the Meter K Factor?

Number of pulses per unit volume at particular flow rate.

These pulses are generated during the rotation of the turbine and then translated by the analyzer into readings.

k-Factor of different sizes of flow meters:

1" ➡ 900 pulses/gallon

2" ➡ 55 pulses/gallon

3" ➡ 57 pulses/gallon

26- What are the flow rates of different sizes of flow meters and their ranges?

1- 1" ➡ 170 - 1700 BPD

2- 2" ➡ 1300 - 13,000 BPD

3- 3" ➡ 2750 - 27,500 BPD

27- What is the difference between oil meter reading of separator and Stock Tank reading?

the meter reading volume higher than the true volume measured in the tank, This is due to the fact that dissolved associated gas in the liquid rate going through the meter

As metered Volume should be corrected for meter errors, Shrinkage%, entrained BS&W% and volume correction at standard conditions 60°F.

But measuring Liquid flow rates using test tank eliminates the need to apply a meter correction factor and a shrinkage correction factor in the volumes measured because with a test tank, you are recording the data under stock tank conditions

28- *What is the Procedure for Ranarex?*

Used to measure Gas Specific Gravity.

Procedures for taking Gas Sample:

1. Connect ¼" SS liner tubing to top part of separator gas line.
2. Flush SS liner with separator gas, to ensure no air contamination.
3. Connect the stainless-steel sample Cylinder (with two isolation valves) to the SS liner.
4. Crack opens the isolating valve on the sample liner and fill the Cylinder.

NOTE: Do no over-pressurize the Cylinder (0-15psig) as it is not a pressurized device and will rupture if excess pressure is applied.

5. Vent the gas in the Cylinder in order to flush the container and repeat this 2 times.
6. Fill the Cylinder with gas and measure the specific gravity using the Ranarex gravitometer.

Ranarex (Gravitometer) using procedures:

1. Connect Ranarex to 110V/220V electric source.
2. Put selector valve on "O" position
3. Unlock pointer and adjust to 0.0 scale
4. Change selector valve on "L" position if gas SG lower than (1.0) or "H" for SG more than (1.0). Mostly "L" is sufficient.
5. Connect the cylinder to Ranarex inlet valve at flow meter.
6. Crack open valve to adjust flow in middle of flow glass.
7. Observe pointer ready, whenever stable "record gas SG" e.g. 0.750
8. Whenever completed, close cylinder valve.
9. Disconnect the cylinder
9. Put selector valve on "O" position
10. Monitor scale going back to 0.0
11. Lock pointer and adjust to 0.0 scale
12. Off electric source.

We use Silica Gel as a desiccant to dry the Gas if it's not dry and the silica Gel is normally blue in colour and must be replaced when the colour changes to Pink.

29- *What kind Of Inspections are needed for Pipes?*

- MPI: Magnetic Particle Inspection, Detecting Flaws on the surface of objects.
- UT: Ultra Sonic Inspection, manually moved over an object. The transducer introduces high-frequency sound waves into the material and hollow spots-tiny cracks, hairline fissures-creating an Echo to create a full 3D image of the object.
- Hydrotest: 130% of Design pressure.
- Visual Test

30- *What are Certification required for diesel Air compressor?*

- MPI for bad eye (welding point)
- Zone 2 certification
- Load test
- Visual inspection

31- **Why do we need to give serial numbers for pipes?**

SR is Product Identity as it's a unique identifier given to specific equipment or product.

- Provide the ability of tracking the movement and lifecycle of each item between warehouses and locations.
- Provide Items Inventories.
- Provide Items Expiry dates.
- Systematic way for maintenance.
- Faster product recall.

32- **Why do we use burners in clean up job?**

It gives us ability to dump the cushion fluids into the pit.

Also used in case of we want to burn oil or condensate.

33- **Oil Shrinkage**

Volume reduction in oil taken from separator conditions to stock tank conditions.

We have 2 types of Shrinkage:

Shrinkage due to **pressure drop**, as when pressure decrease, the gas coming with the oil can be released.

Shrinkage due to **temperature drop**, as volume of oil decreases with decreasing temperature.

As cooling makes molecules move slower, get closer together and become more dense.

How to take shrinkage value:

By shrinkage tester

It measures the oil volume change between separator conditions and atmospheric conditions (Pressure & Temp.)

Procedures:

- 1) Flush the shrinkage tester with gas.
- 2) Keep the shrinkage tester filled with gas and close the gas inlet to shrinkage.
- 3) Start filling the shrinkage tester with separator effluent until the oil level reaches. 0% (full).
- 4) Crack open the shrinkage tester to free the gas.
- 5) After the gas has escaped, take the new oil level reading = shrinkage value.

if shrinkage measurement = 5%, the shrinkage factor (1-shr) in this case is 0.950.

Then the SHR has to be corrected from shrinkage tester conditions to 60 deg F using K factor Chart or computed formula..

34- **What is the meaning of:**

- **LSR** – Life Saving Rules
- **NACE** – National Association of Corrosion Engineers
- **TRSSSV** – Tubing Retrievable Sub-Surface Safety Valve
- **MSDS** – Material Safety Data Sheet
- **SCBA** - Self-contained breathing apparatus
- **CGR** – Condensate Gas Ratio
- **RTF**
- **RF** – Radio Frequency (for communication between Field Unit and the Base Radio)

- **ASTM** – American Society for Testing and Materials
- **ASME** – American Society of Mechanical Engineers
- **ANSI** - American National Standards Institute

35- What is the RF?

Set of frequencies on which communication between the Base Radio and the Field Unit takes place.

All Base Radios and Field Units can be set to one of 16 different RF channels.

The RF Baud Rate refers to the speed at which the Base Radio and Field Units communicate

We have 3 options:

4.8K –Rate of 4.8 K baud (Update every 20 seconds)

–Range of 3000ft (Line of Sight)











☐ 19.2K– Rate of 19.2 K baud (Update every 5 seconds)☐

–Range of 2000ft to 2500ft (Line of Sight)

☐ 76.8K– Rate of 76.8 K baud (Update every 1 second)☐

–Range of 500ft to 750ft (Line of Sight)

36- Types of Fire Extinguishers?

Symbols found on fire extinguishers & what they mean		 Water	 Foam spray	 ABC powder	 Carbon dioxide	 Wet chemical
Wood, paper & textiles		✓	✓	✓	✗	✓
Flammable liquids		✗	✓	✓	✓	✗
Flammable gases		✗	✗	✓	✗	✗
Electrical contact		✗	✗	✓	✓	✗
Cooking oils & fats		✗	✗	✗	✗	✓

37- How to do inspection to the fire Extinguisher?

- Make sure it has a valid maintenance tag on it.
- Make sure the pressure gauge at the green mark (operable range)
- Make sure that Tamper Seal is holding the pin firmly.
- Check any physical damages.
- Make sure the hose is acceptable.
- Ensure it's full by lifting (weigh it).
- Dry powder should be shaken once a month to prevent solidification at the bottom.
- Write the date of inspection.

38- Types of Sensors?

- 1- DAS Sensors:
Pressure sensors, Temperature, Differential Pressure, flow rates transmitters
- 2- Gas Detection Sensors:
H₂S sensors, SO₂ sulfur dioxide, LEL

39- Safety features in lab cabin?

First Aid Kit
Fire Carpet
Fire Extinguisher
Gas and smoke detector
Air-purged and exhausts
Air conditioner
Eye wash and shower room
Wind sock

40- Types of Sight glasses?

We have 2 models:

- 1- Transparent Sight glass: with front and back glass, allowing the passage of the light to give a clear indication of the level.
- 2- Refracting sight glass: with only one glass on one side of the chamber and we can take reading by refracting the light.

41- Difference between Junior Daniel Box and Senior one?

Junior: with one chamber and we can not change orifice plate while operation.
Senior: with 2 chambers and we can change orifice plate while operation.

42- What is the Dead Weight Tester?

It's a calibration standard that uses calibrated/dead weights to apply known pressure to a fluid to check the accuracy of readings from pressure gauges, sensors, transmitters and transducers.

43- Manual Handling

Manual handling covers a wide variety of activities including lifting, lowering, pushing, pulling, and carrying. It can cause injuries to back, arms, legs and joints.

Good handling techniques for lifting:

- Think & Plan the lift before lifting.
- Remove obstructions
- Where is the load going to be placed
- Will help be needed with the load
- Start in a good posture.

When lifting from a low level

- bend the knees. Do not kneel or over flex the knees.
- Keep the back straight.
- Keep the load close to the waist.
- Adopt a stable position.
- Get a good hold.

How to prevent back injuries

- Avoid twisting the back or leaning sideways.
- Keep the head up when handling.
- Move smoothly.
- Don't lift or handle more than can.
- Put down. Then adjust.
- Get help when required.

44- *Chemicals we use*

- Imo 634: acid neutralization
- Truscav (H₂S scavenger reagent): to scavenge (remove and absorb) the produced H₂S "Hydrogen Sulfide" up to a desired value above (0-20ppm).
- H₂S corrosive inhibitor: to create resistant protective film on the surface of metal equipment.

45- *Why do we fix the Earthing/grounding?*

To prevent the build up of the static electricity.

46- *Why do the burner should be supplied with air?*

This is for atomization to break the effluent into very fine droplets for efficient burning.
Burner boom supplied with water to spray the water into the flame to reduce the heat radiation and for flame containment.

47- *Why do we measure the DP in WC" inches of water column?*

This unit is used for low pressures as 1 PSI = 27.7 WC"

48- *What is the Safety Relief Valve SRV?*

It's a safety device designed to protect the pressurized vessels from overpressure.
It's a spring operated device with a set pressure (spring pressure). Once the system pressure exceeds this value, the valve opens to release the excess pressure.
It's required a calibration and certification by a third party.

49- *What is the Retention Time RT?*

The time for one hydrocarbon molecule to enter and leave the separator.
Expressed in ½ vessel volume/oil flow rate.
It has to be from 30 to 60 seconds.

50- *What is the Knockout Drum?*

It's a high pressure vessel to scrub the Gas from liquid droplets (secondary separation), this to prevent liquids from passing to the flare stack and causing a smoke emissions.

This is by reducing the speed of the gas so that the liquid droplets settle out.

Installed upstream of the flare stack.

We pump the liquids out regularly to ensure the KO is always empty of fluid.

51- *What is the water salinity and how we measure it?*

The concentrations of salts in water, Expressed in ppt (Parts Per Thousand).

Measured by:

Titration.

Refractometer.

Sodium & Chloride ions represent about 90% of saline water.

52-

53-

54-

55-

56-

57-

58-

59- *Different types of transfer pumps?*

It can be electric or pneumatic driven:

Electric Driven: Centrifugal pump, 8 BPD with discharge pressure 50 psi.

Pneumatic Driven:

- **Diaphragm pump:** 1" or welded pump 3"
- **HASKEL pump:** with discharge pressure 10,000 psi.

Chemical Injection Pump:

- **Williams pump:** 22.9 GPH
- **Texsteam pump:** 43 GPD

Re injection Pumps:

- **SUNDYN Pump:** electric driven, centrifugal type.
- **Multistage Pump:** electric driven, centrifugal type.
- **RAM Pump:** electric driven, Plunger type.
- **Oil Well Pump:** Diesel Driven, Plunger type.

- We add the Atmospheric pressure to the Gas Rate Calculations as we use PSIA.
- Separator oil control valve is a Globe valve (Throttling valve).
- Strainer is used to trap the sand and protect oil meters.
- LO/HI level switches in Separator to Maintain a proper Operating level in separator.
- The optimum orifice plate size yield a beta ratio of (30-70).

- Y2 Gas Expansion Factor is a function of:
 - Static Pressure of separator.
 - Differential pressure.

- Straightening Vanes to convert the turbulent flow to laminar flow.

- **Data Header:**
It`s a pipe joint with several tapped-in ports.

- The thermostat on the Heater is for sensing the Heater temperature.