



[Farm Tractors]



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Prepare

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✓ **Historical Introduction**

Tractors first emerged in the early 19th century when steam engines on wheels were used to help drive mechanical farm machinery using a flexible belt. The first portable steam engine used for agricultural purposes was invented by Richard Trevithick in 1812 and it was known as the Barn Engine. The Barn Engine was mainly used to drive a corn threshing machine. Advances continued and improvements to engines began to develop as the history of tractors continued. By 1903, Charles W. Hart and Charles H. Parr had successfully built the first American tractor using a two-cylinder gasoline engine. Between 1916-1922, more than 100 companies were producing farm tractors for farm uses. John Deere had previously created the first steel plow in 1837, and by 1927 they produced the first combine. By 1928, the first General Purpose Tractor was introduced, which allowed for planting and cultivating three rows at a time, increasing productivity. Until the late 1930s, farm tractors had steel wheels, making farmers very cautious about whether rubber wheels would be able to do as much work as those with steel wheels. However, by 1939, the Model "B" tractor was introduced with an electric starter and lights, rubber tires, and higher horse-power. The Model "R" tractor was the first John Deere tractor that had more than 40 horsepower, as well as the first diesel tractor. The evolution of tractors continued and by 1966, John Deere became the first manufacturer to offer farmers a tractor that had a roll bar to help protect the operator. By the early 1970s, farm tractors started to feature more comfortable seating for the operator and a sound guard protecting the tractor cab, helping to shield them from heat, cold, and dust. As technology advances, farming has become more and more mechanized. From feeding animals to tilling the land, there is a farm

tractor for every need. This technology helps farmers to be more efficient, effective, and accurate in how they plant and produce.

✓ **MECHANICAL POWER**

The important source of farm power is mechanical power that is available through tractors and oil engines. The oil engine is a highly efficient device for converting fuel into useful work.

Advantages: Efficiency is high; not affected by weather; can run at a stretch; requires less space and cheaper form of power

Disadvantages: Initial capital investment is high; fuel is costly and repairs and maintenance.

✓ **Farm tractors types**

First "- by objective:

A - General Field Surveyors.

Used for the completion of technological processes, such as plowing and sowing, and the capacity of 30-300 hp and reaches the minimum walk (the distance between the lowest point and the earth) to 25-35cm and its speed is 9-45km / h and called multi-purpose plows

B - Agricultural pullers in lines: used to carry out all the necessary processes to serve the growing crop such as hoeing, spraying, fogging and other and have a horsepower 30-500 horsepower. The walkway 60-80 cm is characterized by:

1 - Low-width wheels

2 - Possibility to adjust the transverse distance between the wheels 3-height walkway

C - Orchards tractors:

Used for the necessary work between trees and the capacity between 15-60 horsepower. - Towing is generally low and especially the driver's seat so as not to hit the branches of trees and the least possible parts of the prominent to avoid the clash tree branches

D - Garden hoppers

It is the smallest type of tugboat with a capacity of 5-15 hp and is mainly designed for light farming operations in small spaces.

E - Transport haulers:

Used for road transport on dirt roads and lanes.

F - Special drawers: Used for construction and excavation works.

Second "- depending on the type of engine:

A-pullers with spark-ignition engines (petrol engines)

B-pullers, motor, flammable (diesel engines)

Third: According to contact devices

A) Wheeled tugs: which use rubber tires Tracked Trackers: An iron curtain is used in its movement The use of wheeled or crawler-based wagons depends on

1- Soil type and nature In the medium and light clay soil, the use of roller coils is preferable. In soft, very loose soil,

2- The land area: In small spaces, the tug is preferred for ease of movement, while in the wide areas, used crawler traverses can be used where agricultural machines with large working width.

3 - Economic return:

This depends on the price of the machines, the amount of work you provide and their ability.

✓ **TRACTOR COMPONENTS**

A tractor is made of following main components:

- (1) I. C. engine
- (2) Clutch
- (3) Transmission gears
- (4) Differential unit
- (5) Final drive
- (6) Rear wheels
- (7) Front wheels
- (8) Steering mechanism
- (9) Hydraulic control and hitch system
- (10) Brakes
- (11) Power take-off unit
- (12) Tractor pulley and
- (13) Control panel.

✓ **Farm tractor operation**

1 - Carrying portable and semi - portable agricultural machinery

2 - Withdrawal of agricultural machinery and agricultural trailers

3 - Supply of agricultural machinery with the rotational capacity necessary to operate such as rotary plows and potato sinks and grain and pump studies.

Of these three points, the minimum requirements must be met in the tug.

1 - Hydraulic system

To raise and lower the machines as well as to control remotely on some parts attached to the boat, for example to unload the cart loaded with the crop and linked by drag

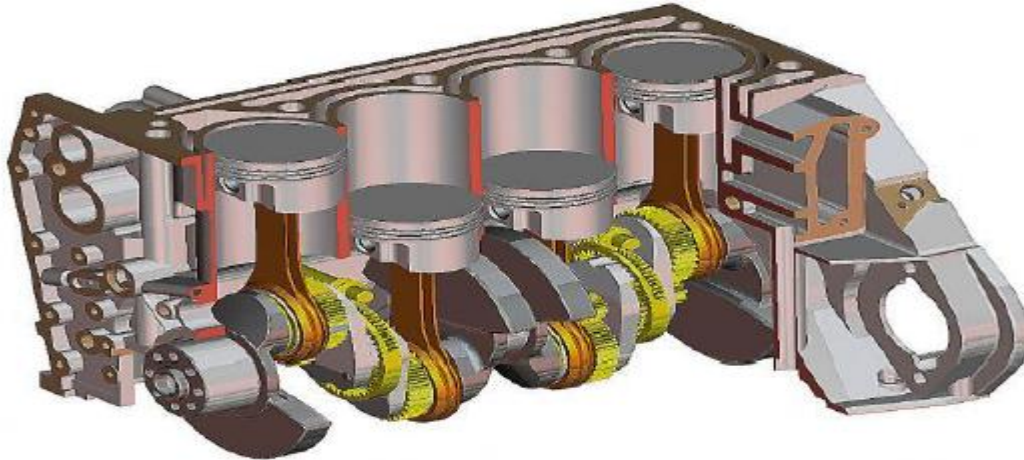
2 - Tractor to pull drawn machines drawbar

3. Power take off: To rotate the agricultural machinery we need in some agricultural operations.

✓ **Moving parts**

1-Piston

moves the vertical movement up and down due to combustion in a room combustion Figure (2)



2- Piston rings

The pressure rings and oil where the piston contains the grooves put pressure rings and oil to pressure provisions

3- Connecting rod: The part connecting the piston to the attachment column Figure (4)



Fuse: Figure 3

Shall be responsible for the entry and exit of air, fuel and exhaust gases (Fig. 3)

There are two types of valves per cylinder

A- Intake valve, which is larger than the exhaust valve, is shown in pictures (3), I, E

It is responsible for entering fuel and air mixture in gasoline or air engines only in diesel engines

B - Exhaust valve

To exit the gases must withstand the heat of the emitted gases so be thicker and smaller size than the pull valve

4. Crankshaft: The function of this part is to convert the reciprocating motor received by the piston and turn it into rotational motion.



5- Cam shaft



Engine fixed parts:

1-Cylinder block

The cylinder block, which contains all the fixed and moving parts of the engine and cylinder block, contains a number of cylinders and cavities to pass water, oil, air, etc. Sometimes the so-called cylinder liner (Bush) is placed inside the cylinders for easy replacement. The engine oil case (Case 4)

2-Cylinder head cover:

The top of the cylinder block shall be fixed with the cylinder block with strong serrated screws to ensure that the gases are not leaking from the engine. The cylinder block contains many cavities with valves and fuel pipes, as well as diesel fuel pump locations. Exhaust cavities also contain "cavities for the passage of oil for cooling, water, timing devices, etc. There is a cascade between the cylinder block and the cylinder

Thermal cycle of engines

The thermal engine is the one that converts the thermal energy from burning fuel to kinetic energy (mechanical movement) and we get this energy through several runs depending on the type of engine and as follows

1-Cycle four-stroke internal combustion engine

2-Cycle two-stroke internal combustion engine

Cycle of the four-stroke internal combustion engine The half is the distance the piston moves inside the cylinder.

1. Feeding drag stroke:

(If gasoline) or air (if diesel) is carried out by moving the piston from the top dead point which is the piston at the top to the lower dead point where the piston is at the lowest point and during this transition the pressure will permeate higher. The piston is in the piston cylinder leading to the air entering from outside the roller into the cylinder. To increase the input efficiency of the mixture (air and fuel) can be used

Ways to force the air to enter (Turbo or Super Garg). In the case of the feeding step, the exhaust valve is closed and the open valve is open (5)

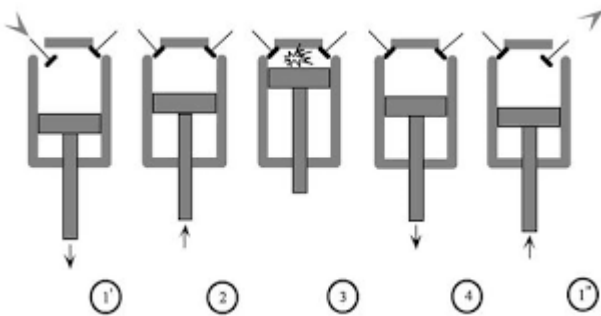


Figure (5) drag stroke and pressure stroke

2- Pressure stroke:

The piston moves from the lower dead point to the upper dead point. The two valves are closed, leading to pressure on the mixture and the high temperature of the mixture in the case of gasoline engines or the high temperature of compressed air in diesel engines

3- Power stroke (combustion) The combustion is done in this part by sparking in gasoline engines or spraying fuel and burning it due to the high temperature in the diesel engines. A strong explosion results in pressure on the piston and pushing it down to move the attachment column

4- Exhaust stage (discharge)

The cylinder is cleaned from the burning gases by the movement of the piston from the lower dead point to the upper dead point and the exhaust valve is open and the feeding valve is closed.

It is clear from these steps is a single step is the step of power can be taken advantage of him and the rest of the help. In practical terms and at high speeds, there is an overlap between these runs to maximize the fuel and power to operate the engine. Figure (6)

These cycles occur in each cylinder of the engine and if there is more than one cylinder of the engine (it may be four or six or more) there must be an ignition regulation that distributes spark or fuel injection in diesel

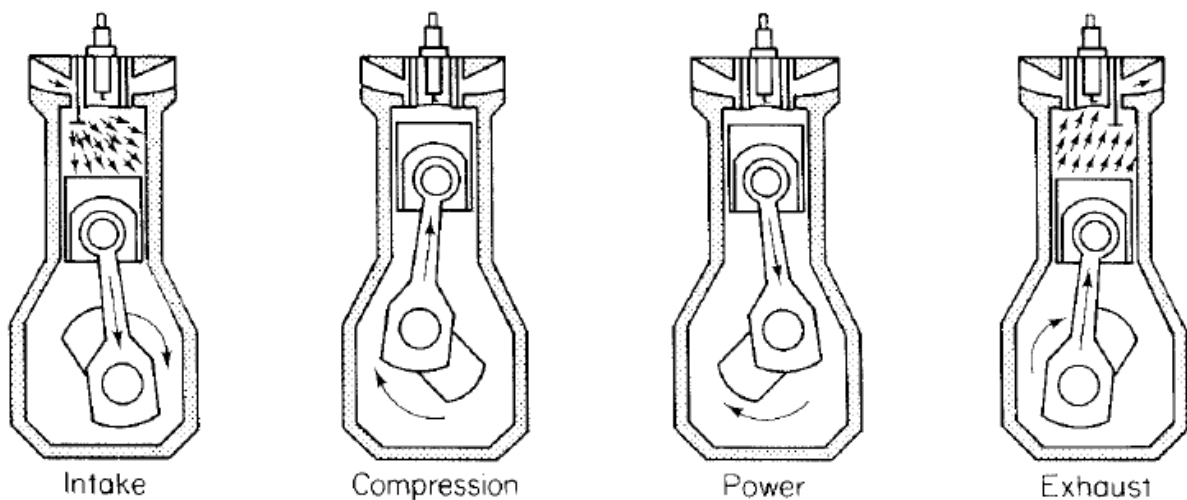


Figure (6) Power stroke and run-off

2- Cycle of two-stroke internal combustion engine

In two-stroke engines, the air or the mixture is removed and the exhaust gases are expelled in the same interval

As in Figure (7)

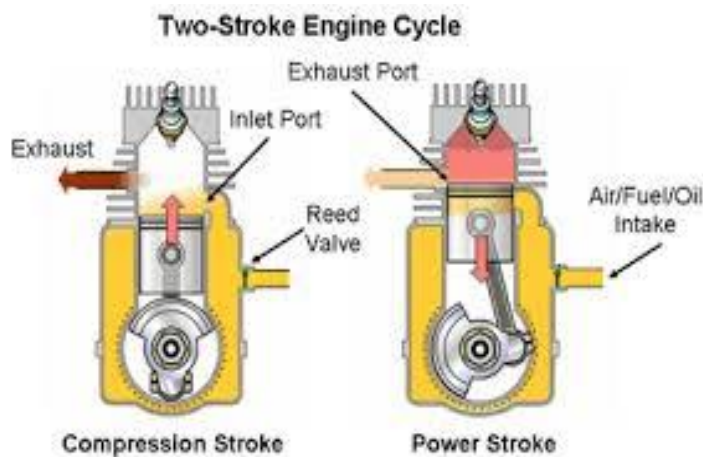


Figure (7)

✓ **Tractor systems**

There are many systems operating within the engine and the engine cannot work and continue to work without it.

1- Fuel system

The engine needs fuel for work and this fuel may be diesel, gasoline or bio-fuel (from plant residues). We will explain the two most

important systems used in agricultural tugboats, namely the gasoline fuel system and the diesel fuel system

2 - Diesel fuel system:

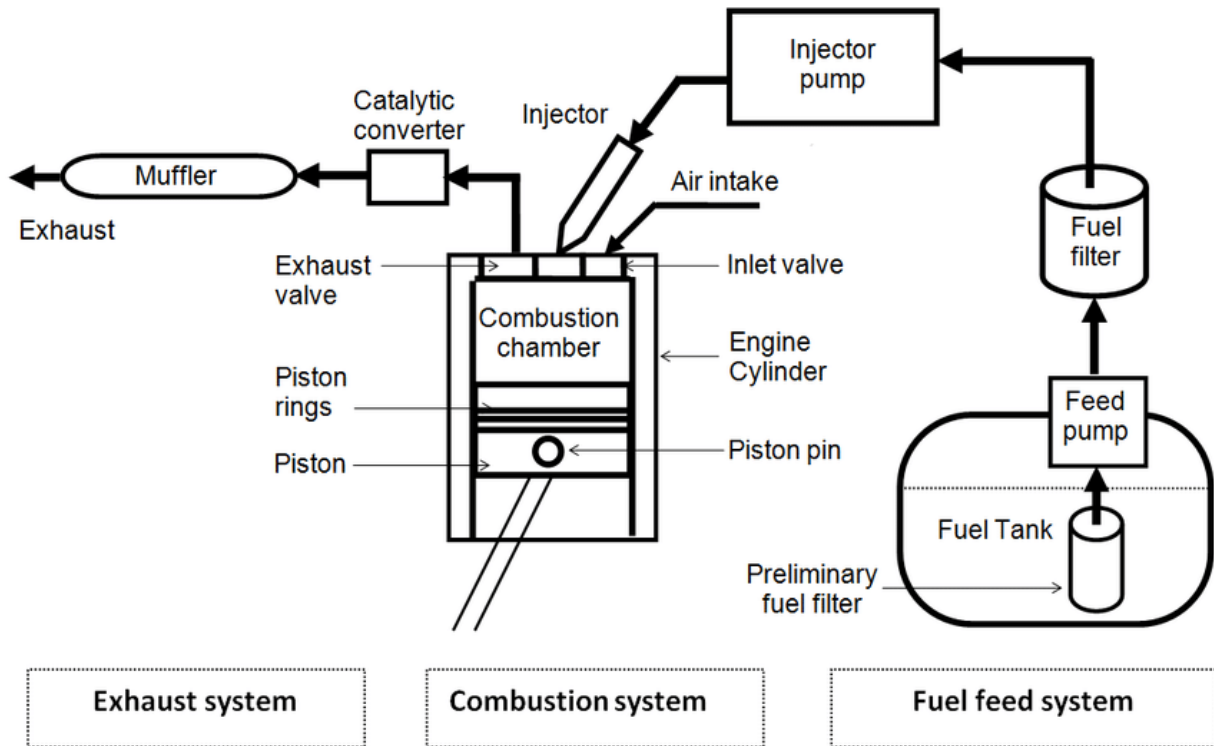


Figure (8) Diesel fuel system

The diesel engine fuel system consists of the following

1. Fuel tank

The fuel system must contain a tank to put enough fuel to operate the engines. for known working hours and the tank is mostly placed above the engine to ensure fuel flow. The fuel tank contains a hole at the top to fill the tank with fuel and a slot at the bottom for passage Fuel. Most of the fuel tanks contain a measure of the amount of fuel in the tank and may contain a faucet (tap) placed at the bottom of the fuel leak when the maintenance of the system or when repairing any system failure.

2- Fuel pump

A small pump that drives the fuel and passes it through the filters to reach the injection pump in the system. This pump is a membrane type, piston or gear that takes its movement from a column located on the injection pump or camshaft located in the engine.

3. Filters

"Because of the importance of fuel purification as most of the tugboats operate in a dusty atmosphere and when the full tank may lead to degeneration inside the tank so it must be purified fuel complete purification may need more than one filter where there is a primary filter and a secondary filter These filters show resistance The fuel pump drives the fuel to overcome this resistance, delivering the fuel to the injection pump.

4. High pressure pump: This pump is the two main processes are to determine the amount of fuel and fuel injection with high pressure and spray inside the rooms or rooms of the cylinders There are many types of fuel injection pumps cannot be mentioned here

5 - pipes to return the surplus fuel: The amount that reaches the injection pump is not all pumps where a section of it back to the tank by a pipe or return to the pump delivery of fuel. The injection pump pipes must be strong and thick to withstand the large pressures of fuel and must be so as not to leak out of fuel As well as ensure that the air does not enter the system and thus stop the engine

Output air from a fuel system or so-called vent diesel system

When the diesel fuel system is opened or the fuel is activated, the amount of air will enter the system. If this air is left in the pipe, it is expected to form an aerobic barrier that prevents fuel from reaching

the injection pump. Therefore, the engine is unlikely to work or work Regularly result in loss of capacity.

✓ Fuel system for petrol engines

In most cars, its engines are powered by gasoline. In the tug, most of its engines are powered by a diesel engine, but some small tugs or small equipment may run on gasoline. The old gasoline fuel system uses the so-called carburetor or carburetor. This carburetor is based on air drag or suction of air into the cylinder when its engine is dislocated as the piston is lowered down and the motor pump receives the fuel from the pump

Connect any moving place inside the engine such as camshaft or jealousy. So the main parts

1 - Fuel tank 2 - Fuel pump 3 - Connecting pipes 4 – Capretor

The intake and exhaust system deals with the inflow of fresh air and the outflow of used gases in the engine.

AIR INTAKE SYSTEM

This system allows fresh air to enter the engine. Its main parts are: (i) air cleaner, (ii) supercharger (auxiliary unit), (iii) intake manifold, (iv) intake port and (v) intake valve.

- i) **DRY AIR CLEANER:** This type of air cleaners contains three main parts, pre-cleaner, main housing and cleaning element. The paper filter element is cleaned after 50-100 hours of service. Dry air cleaners are mounted (i) vertically in front of the tractor radiator and (ii) horizontally on the overhead engine.

The following are the advantages of the dry air cleaner:

1. Easy to service.
2. Good performance in gradient and in rough fields.
3. More efficient at high speeds.
4. Straw and chaff cause less restriction to air passage.

Main disadvantages are:

1. It is costlier to maintain than an oil bath because the filter elements require replacements very often.
2. Sometimes, dust particles enter the cylinder

SUPERCHARGERS

A supercharger is a device for increasing the air pressure into the engine so that more fuel can be burnt and the engine output increased.

Supercharged air is provided either by positive displacement rotary blowers or by centrifugal blowers.

EXHAUST SYSTEM

The exhaust system collects exhaust gases from the engine and expels them out. The system consists of: (i) exhaust valve, (ii) exhaust port (iii) exhaust manifold, (iv) turbo charger (auxiliary unit) and (v) muffler.

EXHAUST MANIFOLD

The exhaust manifold collects exhaust gases from the exhaust ports of various cylinders and conducts them from each end to a central exhaust passage.

TURBOCHARGER

This is an exhaust driven turbine, which drives a centrifugal compressor wheel. The compressor passage is usually located between the air cleaner and engine intake manifold, while the turbine is located between the exhaust manifold and muffler.

✓ **Cooling system**

Internal combustion engines generate high heat at work and this heat generated is transferred to other parts and causes damage to these parts. About 40% of the heat generated by the ignition inside the cylinders passes through the exhaust run. The rest are expelled by cooling systems.

Heat causes damage can be summarized as follows

1 - sabotage of power runs

Excess heat causes damage to the runs, especially the power step. When the engine heat rises, there is a bang and we may hear non-nature sounds of the engine due to early combustion levels in the engine cylinders, which spoils the sequence of the runs.

2 - eat the walls of engine cylinder and expose them to crack and break pistons and piston rings.

High heat leads to cracking of pistons, scratches and even cracking of liner walls

3 - Minimize the oil qualities of oil and grease used in engines

4 - may cause the engine to completely malfunction and thus the exchange of high cost to be repaired

An important note that some drag drivers may be unaware of is that the tug engines must operate at optimum temperatures and not cold. Cooling the motor more than the course is counterproductive, such as low tug efficiency and fast consumption of engine cylinders and compressors. Temperatures above 75 ° C and less than 90 ° C for cooling system in diesel and gasoline engines are considered suitable working temperatures

Cooling systems There are two main types

1- Cooling systems operated by (water) 2- Air cooling systems.

We will explain the simplified for each type:

1 - Water cooling system (liquid) liquid cooling system

We see the main parts of a water-cooled system consisting of

1- Radiator

It absorbs the hot engine water from the inner pockets around the engine cylinder and cooled it by heat exchange with the external air passing through the radiator tubes.

2- Pump water

The pump acts as water circulating in the engine and is a centrifugal pump type.

3- fan

The function of the fan to pull or push the air through the radiator (radiator) to expel the excess heat from the radiator and thus reduce the high water temperature coming from the engine.

4- Thermostat

For the purpose of controlling the water temperature within the system and thus maintaining a constant degree of the engine.

In the absence of the regulator passes water through the radiator and this leads to the delay in the temperature of the engine, especially in winter and may not contact the required heat even after hours of work so the regulator is placed in the path of water to the radiator and there is a pipe (Gwen) opens in conjunction with the closure of the course

The water that leads to the radiator by the heat regulator, which makes the water return again to the engine without entering the radiator and this is called the cycle of water. When the water temperature rises, the valve opens and allows the water to enter the radiator and return to the engine again after the temperature has decreased (note the sessions in Figure 20)

In some engines (especially cars), the fan of the system, which moves from a conveyor belt to an electrically operated fan, has been replaced by an increase in engine efficiency due to the lack of energy required from the engine to rotate the fan

5. Water

Water is used in most liquid-powered systems. Mix water with ethylene or any non-freezing material to ensure that water is not contained in the system. Freezing the water in the engine causes the engine to break or crack

Air cooling system

In some engines, an air-cooling system is used instead of liquids. The system contains a high-discharge air pump that strongly drives the cylinder block, which is a single cylinder with a large surface area and fins (Figure 21)

There are advantages and disadvantages of air cooling compared to water cooling

1. Air-cooling engine is less weight "
2. The air-cooling engine is relatively longer "

3 - does not need water and there is no risk of extinction

4. Pneumatic pump in air cooling needs high capacity to generate strong air current

5 - air cooling parts less maintenance and less cost of water cooling

Figure 21 Pneumatic cooling cylinder

✓ Lubricating system in tractor

Lubrication system: The process by which lubrication to reduce the direct friction between these parts and support during the movement of rotation and high temperature, this process will reduce consumption and reduce the temperature and use the lubrication in internal combustion engines for the following purposes.

1. To reduce friction between different moving parts and thus reduce consumption.
2. Cooling the engine parts to reduce the temperature.
- 3 - absorption of part of the force affecting the supports of rotational axes.
- 4 - cleaning the engine parts such as cylinder walls and oil passages and streams.
- 5 - reduce friction, which leads to increase the engine capacity.

Properties of lubricating oil

- 1 - Viscosity: - The amount of cohesion between the oil molecules and its ability to resist flow and therefore less as the temperature of oil and vice versa
- 2 - the degree of ignition of oil: - the degree at which the oil begins to evaporate and get out of flammable gases when the temperature of the engine over the limit.
- 3 - Oxidation resistance: - Using oils resistant to the interaction with oxygen during high temperature.

- 4 - Resistance to the formation of carbon: - By using oils resistant to chemical reactions and not allow the formation of carbon in the streams and corridors of oil
- 5 - Resistance of foam materials: - Using foam-resistant materials.
6. Good heat conduction: - The oil used should be well connected to the heat.
7. Insulation resistance: - The use of oil with a large stand to behes at low temperatures.

Methods of lubrication in engines:

- 1 - Lubricating pressure: - We use a special pump to push the oil and pressure to all the parts and surfaces that should be reached by the oil through pipes and pipes designed for this purpose. Where the oil is withdrawn from the oil tank and pushed to the oil cooler and then to the oil filters to clean it from impurities and thus to the engine parts.
- 2 - The method of lubrication dispersion: - This method is used in engines that are a small speed and small size where the oil is collected in the oil basin and the axis of the flip on the oil dispersion during the rotation on the rotating parts of the engine.
- 3 - The method of lubrication of dispersion and pressure: - This method is used in most modern engines to ensure the arrival of oil to all parts of the engine and this method combines the two previous methods where we use the oil pump to push oil to the engine parts and at the same time the oil is scattered on other parts

4 - The method of oil lubrication mixed with the fuel charge:- This method is used in the lubrication of two-stroke petrol engines, which do not have an independent lubrication system, where a certain amount of oil is mixed with a certain amount of fuel inside the fuel tank, mixed fuel works on lubricating the moving parts of the engine during the work. There are separate two-stroke engines where a stream of oil vapor is formed and sprayed as a result of the high rotational motion of the torque axis and the oil vapor is mixed with the air going to the combustion chamber. The oil vapor moves to the sewer and the moving surfaces of the engine and lubricates it.

The main parts of the lubrication system are:

1 - Oil pump

The oil pump is used to lubricate the moving parts of the engine and is mostly placed down the engine has the lowest point. Most of the engine oil pumps are of the cast type. This pump is characterized by its efficiency, maintenance and low maintenance. The pump contains an oil extraction tube that contains a filter and a tube to drive the oil. The pump operates under a certain pressure depending on the type and size of the engine. It may contain a safety valve that opens at a certain pressure when the filter or the oil stream is blocked and works to return it to the oil basin.

On a pressure valve that connects to the driver's dashboard in the control panel to alert the driver when there is a problem in the lubrication system. The oil pump is composed of the casing. Gears. Inlet tube, exit pipe and wire filter

2- Oil filters

Oil filters are used to purify oil from impurities and may be wire mesh. The system may contain more than one filter (primary and secondary).

3 - Tubes conveying oil to all moving parts in the engine 4 - oil basin case it is the place where oil gathers.

5 - Measuring stick

There should be a stick to measure the level of oil and the stick marked with two flags at the top showing the amount of oil at the maximum allowed and the mark below shows the oil level at the minimum. When oil is filled with oil, add the oil between the two marks and close to the upper mark. It is not recommended to increase the addition of oil more than the upper mark as well as not to drop the oil level from the lower mark.

6- Oil cooler

In some of the tug machines there is an oil cooler / consisting of thin metal tubes surrounded by metal fins, which are intended to increase the surface area for oil cooling purposes.

Electric system for tractors

The electrical system of the simple and non-complex systems, especially diesel, is measured by the electrical system of cars, where the system uses electric fans to operate the engine and generate lighting for the tractor. The electrical system of the trawlers consists of

Two main parts:

1 - Sources of power supply

2 - Consumables of electricity supply sources of electricity: a
alternator

The generator is a device that converts kinetic energy into electrical energy that is used by the motor and the vehicle. The current used in tug and cars is DC. The base of the Dynamo generator is the appearance of a magnetic induction in a moving conductor that intersects a magnetic field (Fig. 25)

Figure (25) Principle of the work of the generator (Dinamo)

Diagram of a simple alternator with a rotating magnetic core (rotor) And stationary wire (stator) also showing the current induced in the stator by the rotating magnetic field of the rotor

Figure (24) illustrates the idea of a simple AC generator consisting of a rotating magnetic rod and a fixed file. The current current in the coil is due to the magnetic field consisting of rotation of the rod pole. There are two kinds of electric generators. The first type is called the DC and the other AC is the current AC, which generates an alternating current that is converted by diode (24) to DC, Fixed (coil) and magnetic pole rotor part

And diaphragm, electric carbons and wheelchairs on which the generator is seated, and Poly connects the belt conveyor belt, which is less than the diameter of the main polycarbonate on the motor, to increase its speed (Figure 26)

Figure (26) Alternator Electric Alternator

The parts of the generator and its maintenance are explained in practical terms

Battery: The battery converts its chemical reactions to electricity from the tractor (Figure 27)

Figure (27) Battery

The battery is composed of a series of positive panels and a number of negative plates. These plates are immersed in electrolyte solution consisting of concentrated sulfuric acid (water of fire) and distilled water. For example, the six-volt battery consists of three columns of voltage = 2 volts. These poles reach each other until the total voltage of the battery is 6 volts.

The 12-volt battery is made up of 6 columns of voltage= 2-volt power cords that connect to a 12 volt battery. Each column of the battery consists of a number of positive panels and negative panels. The panels are all immersed in the electrolytic solution and the panels and solution are placed in a container that is not affected by acid, usually from glass or dried rubber, and covered with a cover of the same material.

Battery Capacity: -

The amount of electricity that can be stored in the batteries varies according to the panels, the working unit and the practical unit to measure the capacity of the battery on storage called the capacitance. This is the sum of the current voltage multiplier that can be taken from the battery x The amount of time that can be discharged legally Before the voltage between poles reaches 1.8 volts. If we assume that a battery has given 87 amperes for 10 hours. Causing a reason for not having a battery.

- When replacing the battery after charging, make sure that the terminals of the negative and positive battery have been tightened and connected.

2 - Consumers of electric current

Engine Operating Device (Starter)

The engine start-up device converts power to kinetic energy that rotates the engine when the tug engine is turned on. It is used in spark motors (petrol) and diesel alike (Figure 28 and 29)

Figure (28) PADI engine running device

Figure (29) PADI parts engine operation (predecessor)

1. Main Housing (yoke) 2. Overrunning clutch 3-Armature 4-Field coils 5-Brushes

2. Solenoid

Parts of the advances: 1- Covers the front and back advances on which the parts of the advances are mounted

2 - Sliding separator (Clegg) 3 - magnetic rod 4 - carbon brushes 6- Solonlite

How does the initiator of the movement (the predecessor)

The predecessor in his work also depends on the generation of a magnetic field when the power switch is opened. A current is applied to the solenite to push the gear lever forward to align with the gears on the steering wheel.

It rotates the armerger which rotates the small gear gear and thus manages the crankshaft

And roll the cylinder presses to start the four runs

3 - Illumination includes headlights, backlight, acoustic and optical alarms and others

Agricultural trawlers need lighting and sound stimulation (sometimes)

The dynamo generates the current. When the car's engine is not working, the lighting depends on the battery

3- Combustion Candle (in Spark Engines ie Gasoline)

An electric device used in internal combustion engines to help ignite fuel

Where the combustion candle creates an electric discharge between its poles to trigger an electric spark at the specified time when the high-voltage power supply to it and the impact of this spark fuel is delivered to the point of conviction in the spark engines

4 - Electrical measurements in the control panel

The control panel is equipped with a number of electrical measurements such as oil pressure temperature measurement. Time scale and other devices.

*Transmission power systems

2 - Transmission systems: The devices necessary to transfer torque from the engine to the rear wheels of the agricultural buckthorn consists of the following parts

CLUTCH Clutch

The agricultural tuggers that are the source of power are equipped with the internal combustion engines of the separator. This device is usually placed between the engine and the gearbox. To facilitate its operation, this device is connected to the pilot wheel. The torque is moved from the engine by the friction forces between the compressor and the pilot And friction disc from the other side.

When the pedal is pressed, the pirate breaks apart. The power transmission ceases and when the pressure on the pedal stops, the pirate returns to the connection mode and the power moves from the engine to the gearbox. Here is the difference with driving where there is one friction disc and in the tugs that contain two disks, the pressure on the pedal separator in two stages:

The first stage is to press the pedal for about half the distance "and separate the first disk

As for the continuation of the pressure to the end separates the second disc so we find that the pressure on the pedal separator duo is somewhat strong, but why there are two disks, when driving the tug on the roads and when not using the PTO, we use the first interval, which separates the movement between the engine and transmission parts, PTO You must press the end of the break until we are able to separate and guide the lever that operates the PTO and then raise the foot to connect the movement to the PTO

The ear separator functions are

1. Progressive plug-in: The clutch ensures smooth movement between the engine and the gearbox by pressing the clutch pedal
- 2 - Rapid movement: When the tug and the desire to stop the tug temporarily or when the speed change must be separated movement

3 - gradual movement of the cyclone from sleep to movement

4 - Protection of the transport system at the time of overload

Clutch Parts

The single-disc separator is composed of two main parts (Fig. 30 and 31)

A friction disc (Fig. 30), which is responsible for moving the movement to other parts and has two sides of a piece of metal installed on two pieces of friction material (Benz)

Figure (31) Pressure Disc Shape (30) Friction Disc

The friction disc works as long as the engine works and is connected to transmitters and is free to draw

(Alkir Bush), which is separated from the movement and from the transmissions, which revolves with the engine only

Clutch Pressure Pressure Form (31)

The pressure disc separates and connects the movement through the friction disc and is connected to the steering wheel with strong screws and springs that press the friction disc strongly from the work. When pressing the pedal, the pressure moves on the fingers on the pressure disc to pull the pressure out. Pilot wheel

2 - GEAR BOX Fund

The speedbox performs the following functions (shapes 32) changing the force of the circular force given to the rear wheels

1 - the possibility of moving the tug back

2 - the possibility of stopping the tug for a long time without stopping the engine

Most agricultural tugboats use pacemaker boxes containing different speeds

Up to 14 speed forward and 3-4 speed backlighting

Gearboxes are a large and small gears and each gear contains a number of teeth and must be well made to withstand the transport of heavy weights. Most tugboats contain two moving sticks synchronized with each other to interlock gears with each other, a stick for slow speed and a stick for relatively high speed. Contain synchronous gears

(Trips) and responsible for compatibility when switching the speed during the walk (as in cars) so in the tugs can choose the speed of the walk and not necessarily start at the first speed and then the second and third. In the tugs possible

Figure (32): Quicken Box Used in cars

Figure (33) Mode of motion of the speed fund (speed fund management levers)

Figure (34) Change the direction of the back of the back to return

The velocity fund consists of two columns (two lips) on which the gears are mounted

The Main shaft which receives the movement of the engine and its bipot number of gears and the second bottom also contains a number of gear gears (33 and 34) showing the gears, the main column and the second column.

For the tug of return in the gearbox there is a third gear in the gearbox that changes the direction of the opposite, which makes the tug backward (in figure 34)

Differential Gear: Differential Gear

The advantage of the device is the ability to rotate the tug and walk in a circular manner and at a different speed without this device, the tug is moving one way forward or backward

Figure 35 shows the parts of the elastomer device, which consists of two side beams 7 and 1 in figure (35). Each spray is connected to a shaft that goes to the rear frame and there is a gear that receives the main movement from the speedbox. (2) When the equal pressure is applied on both sides, the whole group moves forward as quickly as the turn, for example on the right, will push the ruler 3 and will delay the walk, making the gear 2 start walking on it. And takes with him the ruler 1 and vice versa. As well as in the slopes and bumps and muddy lands we see a disparity

When the trawlers may occur a slip so there is a device added to the boat that stops the process during the tillage in a timely manner to prevent the sliding tires. It should not be used when the tug runs out of the field. This is called lock differential gear

Figure (35) shows the device of the acceleration.

Final Conveyor System: FINAL GEARS

When an additional reduction is required for the speed, and when the speedbox does not give the desired speed ratio, the final transfer device is placed. This device may be placed close to the tire or near the accelerometer. In such cases as Antar 70 and Antar 71 this device is placed near the tires. (2) One receives the motion of a device of varying acceleration and is engaged with another gear that is larger in size to reduce the speed (Figure 36)

Form 36 is the complete transmission device
wheels

The wheeled tug is based on two large front wheels to which the movement reaches

Of the final reduction and are considered leading wheels and in the front there are two smaller wheels "linked to the router and the rotation (Alastern) to guide the tug in different directions

The most common types of wheels are the rubber wheels and the rubber wheels are supplied with deep rivets surrounding them to increase their sliding.

In spite of the good construction of these rubber wheels, it is noticed in some cases a slip

In some special drawers there may be one front frame and the front tires may be large

Loose tugs

Zanjil trawlers may be used instead of special tugboats (tires) in softlands. the shape

(35) illustrates the unit running the tug of lading

Figure (37) Expensive drag

Interlock with the soil is much more lavish with tugboats

*The hydraulic system of the boat

The hydraulic device of the boat is part of the power tools in the agricultural haulers

In the past, most of the machines were pulled by the farm, while at the present time most of the machines were in the area

The hydraulic system of the trawler can be obtained from the hydraulic system of the boat. It is possible to obtain more than one work in the hydraulic system of the boat. Before the functions and functions of the hydraulic system,

Figure (38) shows the parts of the hydraulic device of the boat

Parts of the hydraulic system of agricultural winch

1- Oil tank

Most agricultural tugboats contain an oil tank and this reservoir may be used for the accelerator

And for the hydraulic tank and for the device of the variation of the speed and in this case we use the same quality of oil

2- Oil pump:

There must be an oil pump for the hydraulic system connected to an oil filter and may contain a safety valve in case of increased pressure. The pump must be close to the oil source so that the oil reaches even in the case of lack of oil most of the hydraulic pumps in the Altersi type as in Antarctica and may be of the type Almkbsi as in the mines of Massey Forks

2- Oil Purification:

The oil filter (filter) is used in the hydraulic system and it may be metal wire as in the Antarctic pullers where it contains a magnetic wire filter to hold the solid metal particles

3. Hydraulic control device:

A device that has several manipulators near the driver that can be controlled to handle the machine (Figure 39)

We will explain its work later. "

A-b-

Figure (39) Hydraulic control unit a 71-inch Antarctic puller

4 - cylinder system

Most hydraulic systems for trawlers contain a hydraulic cylinder consisting of a cylinder

B - piston moves inside the cylinder c - an arm connected to the piston on the one hand and the arm of the lifting arms (Fig. 4038)

On the other hand (No. 15, 14 and 16)

Figure (40)

How the hydraulic system works in agricultural tugs

There are two major hydraulic courses in the two tugboats

1- The external circuit

When connecting the equipment hydraulically to the agricultural hook, which contains cylinder presses for lifting or lowering or any other hydraulic process, as in the case of linking a tipper with a piston (jack lifting) Figure (43) When you need to raise the box of the vehicle to the top or to one aspect we need the hydraulic system 43) and there is a coupling to connect the hydraulic device of the pipe with the piston of the machine and this is called a single action cylindrical system Figure (41) There may be two system system and called a system of work Double or single acting. Form (42) Back or descent of the piston may be due to The weight of the raised part (in the case of single action) or reduced by Boa Plan other discs or the same cylinder and connected to it from both sides Onpoptan) (Figure 42)

Figure (41) single act cylinder

Figure (42) Double act cylinder

Figure (43) Exploitation of the hydraulic system in the lifting of machines and boxes of vehicles

2. Internal course: inner circuit

These are within the same tug used to raise and lower machines. This system is somewhat complex and few have full knowledge of its work and we will focus only on the main parts of the work of the system.

As we explained earlier, "there is a part called the hydraulic control device, which is by which we control most of the hydraulic system, which generally contains the following parts

A) The control of the drawing of the clouds under the surface of the soil and the work of the machine with the soil (definitions, filters, disk harrows, rotary plows, etc.)

draft control or depth control

B - Control position above the soil surface position control

When we use the machine above the surface and be at a specific height exactly (70 cm height of the significance

On the surface of the earth for example) we use this lever shape (39)

C - mixed situation: the possibility of pairing between the two currencies when we want to plow at a constant depth

(D) the oil pressure transfer lever of the external circuit and shall be in one of the two levers where the lever is directed to a location where the pressure is written

In addition to these two devices there are other catalysts to increase the control of the system. There is a lever that determines the amount of hydraulic fluid transferred (No. 4 in Fig. 39) and a lever that increases or decreases the depth of the system of the soil machine.

When the machine is behind the tug in the soil and when the depth of the resistance increases or when there is a big obstacle such as the existence of a large room inside the soil or the presence of plant residues, the machine may be broken unless there is a procedure to prevent the break of the machine or stop the tug. Where there is a situation called the condition of the swimmer allows the machine to rise and overcome the obstacle and return to the previous situation and without the need to lift Depth Depth or work under the surface of the soil and this by special mechanism attached to the upper arm of the boat can not be mentioned in detail, but works under the soil.

*Power source: power take off (P.T.O)

Figure (44) P.T.O.

In agricultural work, some machinery and equipment need to be rotated with different parts, such as the Aldorani plow, the grouting

machine, the straw pressing machine, etc. In most agricultural tugboats, there is a serrated rod that moves from the speed box. Cycle per minute or 950 cycles per minute. There is a spindle and a clegg to control the separation and binding of the T. It is also possible to connect the P.T.O to the speed of the speed box or the speed of the engine. The power outlet source may be independent, independent, or synchronous. There is a connection (cardin) as in Figure (44) that connects the machine and the socket and is of a telescopic type that can be shortened or extended to connect the movement

Note: The hydraulic system of the workpiece is inspected and hydraulic control levers are seen in the tug and the machine is connected to lift and reduce the machines available at the institute

Traction bar: draw bar

The towing rod is used to pull down the hydraulic machinery and place it under the hydraulic system. It can be organized according to the need in terms of lengthening or shortening. It is possible to lift from the tug and be careful when using the PTO. It may occur when lowering the hydraulic arms to break the tractor so it is possible to lift (remove the tractor from the tug) . Figure (45)

*Steering group and stops in agricultural tug

Steering and Leadership Group:

Figure 46 shows how to rotate in the tug. When the steering wheel rotates, the rotary gear rotates. The steering gears then the steering lever, the towing arm and the steering lever rotate the front tire to the right or left

Figure (46) router parts and driving

There are other less common types. "For extruders, the stoppers are used to increase the tug of the tug and the position pedal (albric) can be moved to the point of rotation. This reduces the radius of rotation.

For the traction positions there are two pedal positions or pedals for each hand and Aldan Alastan tethered joint joint and can be separated when needed and pressing the pedal strongly to the destination to turn to when necessary (not always)

Suspensions:

Figure (47) Detachable system type

The position device (fig. 47) stops the tug and reduces rotation as explained.

There are two types of suspensions at present. Stands called Disc pad or brake shoe as in Fig

(48) This is a type that is not used in the tugboats widely. It is a piston that presses firmly on the piston and presses the flange for each wheel (Figure 48)

Figure (48) Positioning device in cars and similar to traction in terms of brake shoes

This type is the common type in agricultural tugboats. The brakes may operate mechanically or hydraulic. When the pedal is pressed, the movement moves to the rear torso of the drum, as in the shape of the brake shoe, Step by step stop any tug stops.

In the case of the hydraulic system of suspensions, the tug is equipped with a stand oil box under which a cylinder, piston, booster brake and oil pressure transmission pipes are placed in the drum with piston. When pressing the brake pedal, the pressure from the main cylinder moves to the cylinders in the side Push the shoes firmly towards the tambours to act on the tug stop as in Figure (48)

Manual position: The tug is equipped with a manual position (as in the bars). The manual position function works on the tug stop when it is on a slope or when the tug is turned on. The manual position is very necessary and must be used when the tug is stopped and the tug is connected with the machine or when the tug is left and the second driver Or when a person goes up for a ride and a lover is working

The engine is operational and is considered to be of public safety. The hand brake is close to the driver and is fastened with a wire with the stoppers. Pulling it up will pull the extended wire from the hand lever to the stacks and push the shoes to stop the tug and prevent movement.

*

ADJUSTABLE WHEELS

Our adjustable waffle wheels minimize wheel wobble and hop that can occur with demountable wheels. Its locating pins orient the demountable disk to the rim, which provides accurate concentricity. It offers 8 wheel offset positions, which reduces the hassle of offset changes. Its waffle disc features a continuous circumferential weld to withstand heavy-duty applications.

*Maintenance of agricultural tugs

Maintenance:

Maintenance means the set of periodic procedures that are carried out on the tug, which works to increase the maintenance of the tugboat economically and highly qualified so in the subject of the maintenance of tugboats we depend on the number of working hours for the boat, which is usually every 8 working hours and 100 hours work, 250 hours work and 500 hours work And 1000 hours of work so that all agricultural tugs are equipped with a Tachometer dimension (fig. 51) in front of the driver and be bie

Engine speed and speed counter (cycle / min) and ground speed (km / h or mph)

Figure 51 shows the number of hours and the speed of the engine

Routine daily inspection before running the tug

1. Check oil level: Pull the oil stick and note the oil level and the oil level is close to the top point Max and not above it and not under the mark Min

2. Check fuel level

Note The oil gauge is when the power switch is opened. Or opening the fuel cover slot

3. Check the level of cooling water

3. Check the battery fluid level

A line on the battery box shows the level of the liquid in the battery

4- Examining the conveyor belt of the fan and the generator

5. Rotate the tug and observe the front and rear tires and take a look at all the systems in the tug

Maintenance of the tug after 8 working hours

1 - cleaning the air purifier primary 2 - cleaning dry air purifier

3. Cleaning the air purifier with the oil bath Figure (54) 4 - Pressure pressure test Figure (55)

5. Examination of the fuel filter vessel Figure (52) 6. Check the conveyor belts for the generator

Maintenance every 100 working hours

1 Lubrication - All parts recommended in the agricultural tug manual for maintenance. Figure (55)

Especially highly mobile when driving and using tug-like joints, axles, front wheels and tug steering

Acetylene), clutch and hydraulic lifting arms as in figure (55)

2 - Clean or replace all the filters in the system of air purification and the fuel system and the lubrication system

And the hydraulic system in Fig. 52 and 57

Figure 52 Figure (53)

Figure (54) Air Filters Oil bathroom

3 - In some manual tugboats recommend changing the oil lubrication system every 250 hours of work, but through experience

In the working conditions in Iraq of high temperatures and frequent dust in the atmosphere and the use of oils

Not by scientific standards, we prefer to switch engine oil every 100 hours

Figure (55)

Figure (56) lubrication of some lubricating points at maintenance 100 working hours

Maintenance every 250 working hours: 1- Perform all operations in maintenance 100 hours work 2 - oil oil bath oil exchange

Maintenance every 500 working hours: 1. Lubrication of all lubricants
2. Switch fuel filter

3 - switch oil filter 4 - switch air filters 5 - switch hydraulic pump 6 - adjust the front wheel hubs shape

Maintenance every 1000 working hours: 1 - All points in maintenance every 500 hours 2 - Switching water cooling system

3 - switch oil steering wheel 4 - brake examination 5 - cleaning the primary pump of the fuel system

Figure (57) Switch or clean every 100 hours

Recent developments in tugboats

During the past two decades and the forerunner of technological development in all areas of life, there have been developments in the trawlers, most notably

1 - The maintenance of the tugboats and maintenance and continuation of work coupled with the cleanliness of their systems in general, especially for the fuel system and the lubrication system and the electrical system and the hydraulic system and the cooling system has been developed some sensors and alarms that are in the form of a light alarm, the driver and in the control panel and when block fuel filters there is a light alarm It ignites or lights up in front of the driver to alert the driver as well as the same for the lubrication system and when oil filters are blocked as well as filters or air purifiers.

2 - a written position or structure of the driver to maintain it at the turn of the tug

These are made of iron columns and a seat with a belt. During the tug, the driver must cling to the steering wheel

And stay in the seat in Figure 59 and 59

(58) Protective equipment for bikers (59) Seat belts

3. Exploitation of air navigation systems:

Air navigation systems have been used in some new tug-ups such as GBS for positioning and distances

And make calculations of the areas covered by the tug

4 - the use of computer systems and software in the tugboats

Computers have been connected in some agricultural drawers to fuel expense accounts and the calculation of distances and spaces