

EQUIPMENTS USED FOR DEREDGING

By:- Harsh Badyal 2014134



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Types



What Is Dredging?

- A dredger is a piece of equipment which can dig, transport and dump a certain amount of underwater laying soil in a certain time.
- The quantity of soil moved per unit of time is called Production.



- Dredgers can dig hydraulically or mechanically.
- Hydraulic digging make use of the erosive working of a water flow.
- For instance, a water flow generated by a dredge pump is lead via suction mouth over a sand bed. The flow will erode the sand bed and forms a sand-water mixture before it enters the suction pipe.
- Hydraulic digging is mostly done with special water jets.
- Hydraulic digging is mostly done in cohesionless soils such as silt, sand and gravel.
- Mechanical digging by knives, teeth or cutting edges of dredging equipment is apply to cohesive soils.
- The transport of the dredged soil can be done hydraulically or mechanically too, either continuously or discontinuously.

	Hydraulically	Mechanically
Continuously	Transport via pipeline	Transport via conveyor belts
Discontinuously		Transport via grab, ship, car

- Deposition of soil can be done in simple ways by opening the grab, turning the bucket or opening the bottom doors in a ship.
- Hydraulic deposition happens when the mixture is flowing over the reclamation area.
- The sand will settle while the water flows back to sea or river.
- Dredging equipment can have these three functions integrated or separated.
- The choice of the dredger for executing a dredging operation depends not only on the above mentioned functions but also from other conditions such as the accessibility to the site, weather and wave conditions, anchoring conditions, required accuracy and so on.



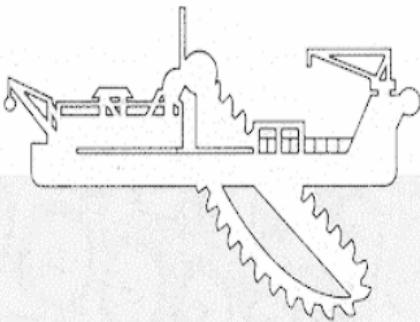
01

TYPES

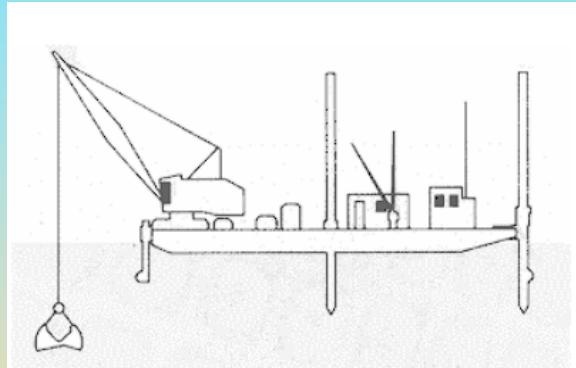
- Mechanical Dredger
- Hydraulic Dredger



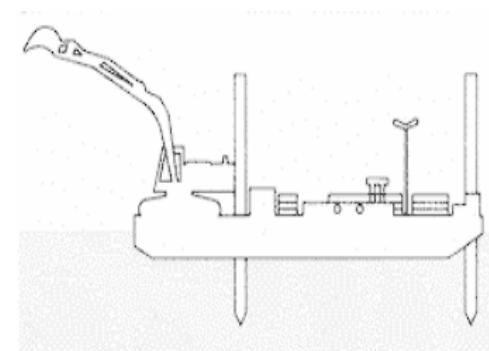
Mechanical Dredgers



Bucket ladder dredge

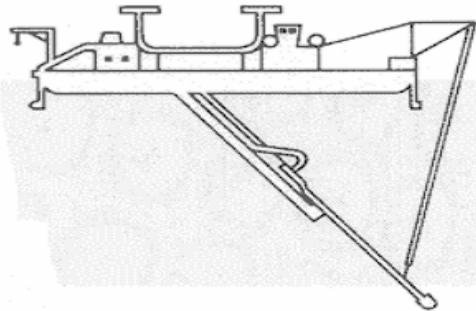


Grab dredge

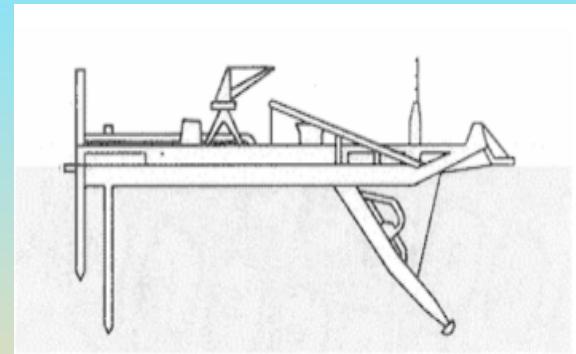


Dipper and backhoe dredge

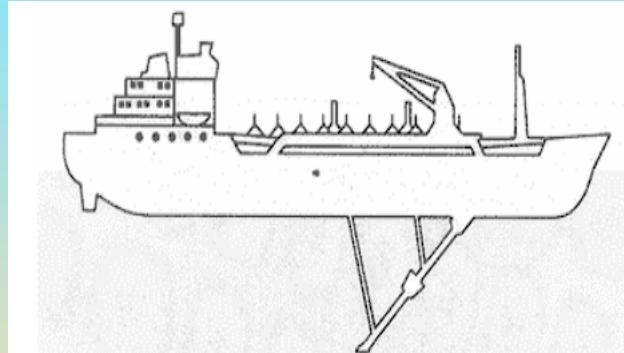
Hydraulic Dredgers



Plain suction dredge



Cutter dredge



Trailing suction hopper dredge

Bucket Ladder Dredge

The bucket ladder dredge or bucket chain dredger is a stationary dredger, which has an endless chain of buckets carried by the so-called ladder, positioned in the well of a U-shape pontoon. The loop of the bucket-ladder dredger is powered causing the buckets to travel downwards in such a way as to scoop the material from the bottom, and then carry the material in the upright buckets up the ladder to the top. At the top the buckets rotate into an upside down position and their contents falls into a chute. The material is then sent through the chute to barges or scows alongside the dredger. Bucket sizes vary from 30 liters to 1200 liters. Rock bucket dredgers do have a double set of buckets; a small rock bucket and a bigger soft soil bucket.



Limitations

- Bucket ladder dredgers have been almost entirely replaced by backhoe dredger or trailing suction hopper dredger and cutter section dredger.
- They are less frequently used because they have relatively low production rates and need to have anchor lines, which often interfere with navigation traffic.
- They also have relatively high noise levels.
- Their maintenance costs tend to be high and most importantly their production has not kept pace with the increase in scale that has taken place in the suction dredgers.



<https://youtu.be/R91bukDzqk8>

Grab Dredge

- The grab dredger is the most common used dredger in the world, especially in North America and the Far East.
- It is a rather simple and easy to understand stationary dredger with and without propulsion. In the latter the ship has a hold (hopper) in which it can store the dredge material, otherwise the material is transported by barges.
- The dredgers can be moved by anchors or by poles (spuds) The capacity of a grab dredger is expressed in the volume of the grab.
- Grab sizes varies between less than $1 m^3$ up to $200 m^3$.
- The opening of the grab is controlled by the closing and hoisting wire or by hydraulic cylinders.



Limitations

- They are not particularly effective in fine silts, which have a tendency to run out of the bucket.
- However, they are used for this purpose in smaller jobs or when fitted with special sealed buckets.

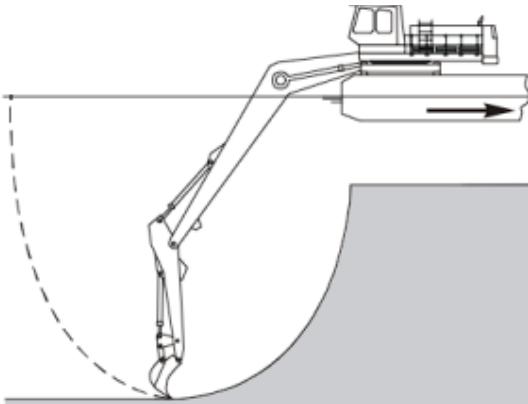


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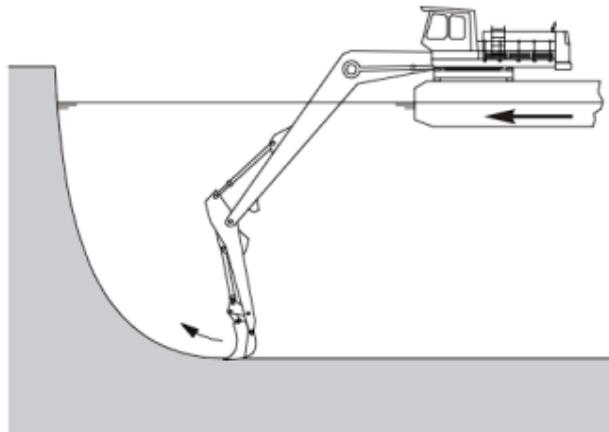
Dipper and Backhoe Dredge

- Hydraulic cranes are available in two models the backhoe and the front shovel. The first is used most. The difference between those two is the working method. The backhoe pulls the bucket to the dredger, while the front shovel pushes. The last method is only used when the water depth is insufficient for the pontoon. These stationary dredgers are anchored by three spud poles; two fixes to the front side of the pontoon and one movable at the aft side. This means that the dredging depth is limited to about 15 m. (maximum 25 m). At the front of the pontoon is normally a standard cranes mounted. Here pontoon deck is lower to increase the dredging depth. Bucket sizes vary from a few m³ to 20 m³ .

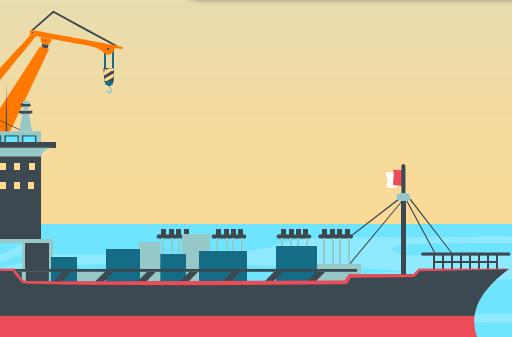




Backhoe dredge



Front shovel



Limitations

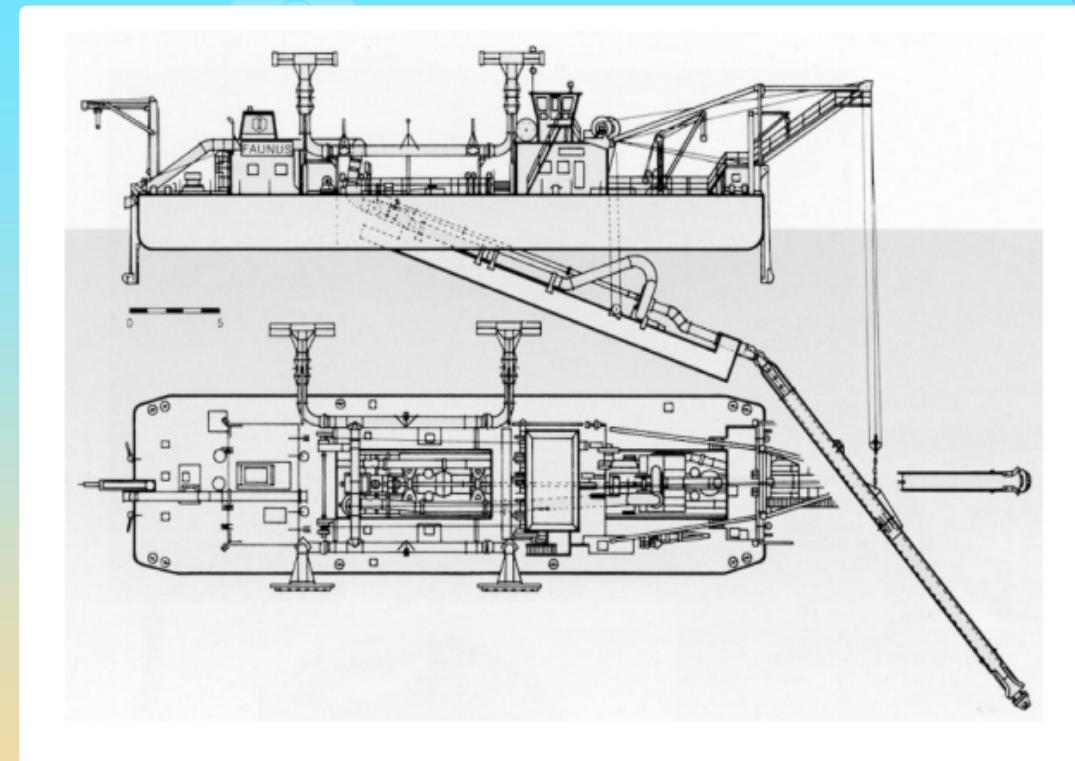
- A dipper dredger can cause substantial sediment disturbance and resuspension when dredging fine-grained material.
- A significant loss of the fine-grained material will occur from the bucket during the hoisting process.
- They are also limited on the dredging depths that can be achieved.



https://youtu.be/HnJ_pw2RuMc

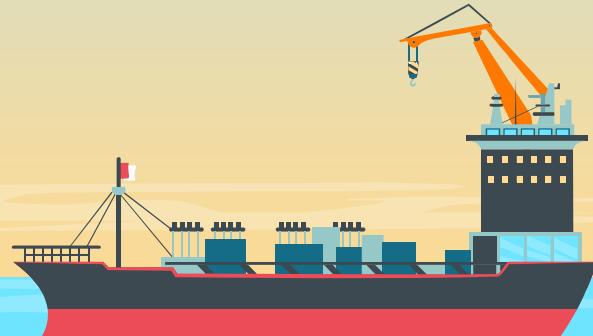
Plain Suction Dredger

- A plain suction dredger is a stationary dredger that position on one ore more wires, with at least one dredge pump, which is connected to the suction pipe and the delivery pipe. The suction pipe is situated in a well in front of the pontoon



Limitations

- The only limitations of these dredgers are their **low production**, the requirement of more anchor lines and high level of noise, which made them obsolete these days.
- They can be used for a wide variety of materials including soft rock material and are powerful enough to rip out the corals as well.



Cutter Dredge

The cutter suction dredger is a stationary dredger equipped with a cutter device (cutter head) which excavate the soil before it is sucked up by the flow of the dredge pump(s). During operation the dredger moves around a spud pole by pulling and slackening on the two fore sideline wires. This type of dredger is capable to dredge all kind of material and is accurate due to their movement around the spud. The spoil is mostly hydraulically transported via pipeline, but some dredgers do have barge-loading facilities as well. Sea going cutter suction dredgers have their own propulsion, however this is only used during (de) mobilization. Cutter power ranges from 50 kW up to 5000 kW, depending on the type of soil to be cut.



Limitations

- Cutter suction dredges are sensitive to rough seas and are not easily moved whilst working.



<https://youtu.be/Ho427Fixap8>

Trailing Suction Hopper Dredge

A Trailing Suction Hopper Dredger (TSHD) is a self-propelled sea-going or inland vessel equipped with a hold, called hopper, and a dredging installation by which it can fill and/or empty the hopper. The basic operations of a THSD are:

- One or more suction tubes provided with suction mouths (drag heads) which are dragged over the seabed during dredging.
- One or more dredge pumps to suck the material from the seabed.
- A hopper in which the dredged material can settle.
- Easy operational bottom doors or valves in the hopper to dump the dredge material.

The size of a TSHD is expressed in the hopper volume and varies between a few hundred m³ up to 33000 m³.



Limitation

- A trailing suction hopper dredger **can only suck relatively loose substance** because the steel teeth are not so big.
- Harder substances such as rock or iron based rock must be destroyed by a cutter.



<https://youtu.be/GVS0gfTNMhQ>

Questions.

1. What is Dredging?
2. Types of Dredging?
3. Purposes of Dredging?
4. Working of any one type of Dredging Equipment's.



THANKS!

EQUIPMENTS USED FOR TRENCHING

BY- HARMINDER SINGH AND JAGMEET SINGH BEDI

SUBMITTED TO- PROF. YUVRAJ SINGH

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- ▶ Introduction
- ▶ Types of Trenching Machine
- ▶ Diagram of wheel trencher and chain trencher
- ▶ Companies of Trenching Machine
- ▶ Capacity
- ▶ Advantages and Disadvantages

INTRODUCTION

Trenchers or Ditchers as they are sometimes called, are similar to excavators in the sense that they penetrate the earth, breaking soil and rock, and remove it from the ground. They differ from excavators in that the soil is removed in one continuous movement. Trenchers are specifically used for digging trenches for pipes, but other machines have been involved in the past to serve this purpose.

TYPES OF TRENCHERS

Trenchers come in different sizes and may use different digging implements, depending on the required width and depth of the trench and the hardness of the surface to be cut.

- ▶ Wheel Trencher
- ▶ Chain Trencher
- ▶ Micro Trencher
- ▶ Portable Trencher
- ▶ Tractor Mount Trencher

1. Wheel Trencher

A Wheel Trencher or rock wheel is composed of a trolley metal wheel. It is cheaper to operate and maintain and can cut harder ground than chain-type trenchers.

Due to its design the wheel may allow to reach with the same tool variable cutting depths while keeping a constant soil working angle with a relatively small wheel diameter.

These tools which can be easily changed manually allow adjusting different cutting width on the same wheel.

They are also used to cut pavement for road maintenance and to gain access to utilities under rocks.



2. Chain Trencher

This type of trencher can cut ground that is too hard to cut with a bucket-type excavator. This type of trencher can cut narrow and deep trenches. The angle of the boom can be adjusted to control the depth of the cut. To cut a trench, the boom is held at a fixed angle while the machine creeps slowly.

The chain trencher is a great tool for trenching for large diameter networks (telecommunication, electricity, drainage, water, gas, sanitation...) especially in rural areas. The excavated materials can be removed by conveyor belt reversible either on the right or on the left.



3. Micro Trencher

A Micro Trencher is a “small rock wheel” specially designed for work in urban area. It is fitted with a cutting wheel that cuts a micro trench with smaller dimensions that can be achieved with conventional trench digging equipment. Micro Trenchers are used to minimize traffic or pedestrian disturbance during network laying. Indeed, a Micro Trencher can work on sidewalks or in narrow streets of cities, can cut harder ground than a chain trencher, including cutting through solid stone. They are also used to cut pavement for road maintenance and to gain access to utilities under roads.



4. Portable Trencher

Landscapers and lawn care specialist may use a portable trencher to install landscape edging and irrigation lines. These machines are lightweight and are easily manoeuvrable to other types of trenchers. The cutting implement may be a chain, or a blade similar to a rotary lawn mower blade oriented so that it rotates in a vertical plane.



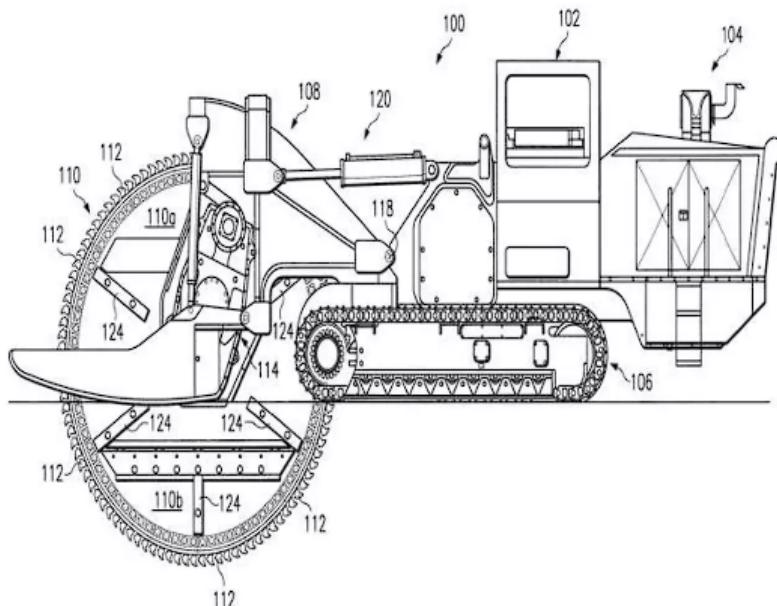
5. Tractor Mount Trencher

A Tractor Mount Trencher is a trenching device which needs a creeping gear tractor to operate. This type of trenchers is another type of chain trencher. This tractor should be able to go as slowly as the trenchers trenching speed.



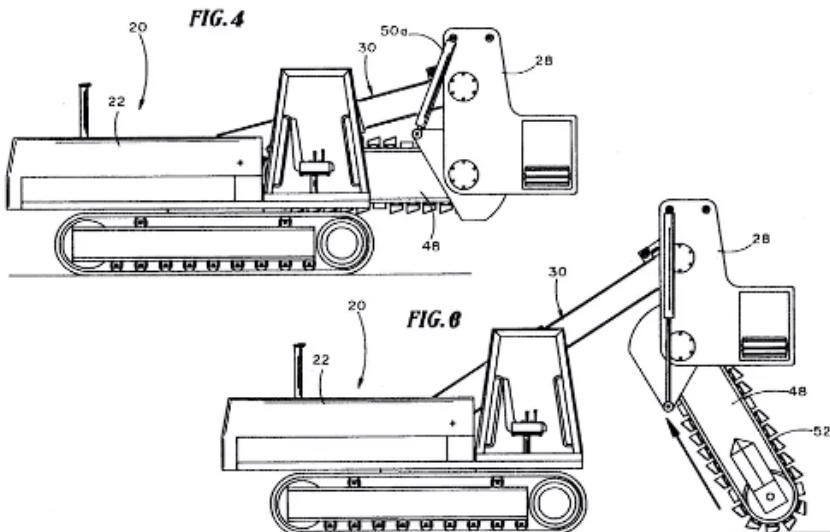
Diagram of Wheel Trencher

- 100- Trenching Machine
- 102- Cabin
- 104- Motor
- 106- Crawlers
- 108- Pivoting boom
- 110- Rock Saw
- 112- Cutting Tools
- 114- Gear train
- 118- Axis
- 120- Cylinder
- 124- Set of bars



Chain Trencher

- 20- Chain Trencher
- 22- Tractor Unit
- 28- Remote drive unit
- 30- Extension of boom
- 48- Cutter bar
- 52- Cutter chain



Companies of Trenching Machine

Some of the major manufacturing companies are:

- AFT
- New Holland
- Simesx25
- Bob Cat
- Rivard
- UNAC

Capacity

Austin Trenching Machine, Illinois

Size of the trench- 8ft 5", 4ft wide, 2974ft long.

Volume of excavation- 2863 m³

Time of digging- 72 hrs. 30 mins

Time of excavation per day 9 hrs

Rate of digging time- 357.81 m³.

Rate of total time- 168.20 m³.

Advantages and Disadvantages

Advantages

- ▶ Minimize trench excavation volume.
- ▶ Maximize the reuse of trench soil.
- ▶ Continuous excavation of soil.
- ▶ Width of excavation is adjusted.

Disadvantages

- ▶ Replacing of bucket in hard rock.
- ▶ Cutting chains are always moving so it need adjustment.
- ▶ Need regular maintenance.



Thank You.

Down

Equipment's used for Tunnelling

Made By-
Amandeep (2014130)
Amandeep (2014131)
Harsh (2014134)



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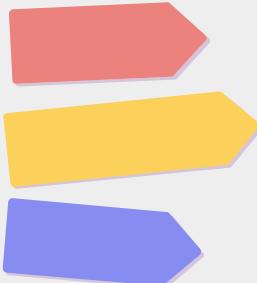
Introduction

Equipment's
Used for
Tunnel's

Types of
Tunnel's



Introduction



Tunnel's are artificial underground
passages opened at both ends
constructed for different purposes.

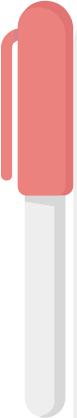
Driv

Highways, Railways, Sewerages,
Water Supply, Public Utilities and
Canals.

Used for-



Driv



Purposes of Tunnels

- To avoid an obstacle such as Mountains.
- To Overcome a water obstacle.
- To connect the roads which are not possible on the ground surface.
- Built for infrastructure like electricity cables, water supply lines, communication lines, and sewerage to avoid damage and disruption above ground.



Types of Tunnels and their methods

Mountain Tunnel

- Drilling and Blasting Method
- Tunnel Boring Machine Method



Shallow-Buried Tunnel

- Cut-cover Method
- Shield Method

Underwater Tunnel

- Immersed-Tube Method
- Shield Method



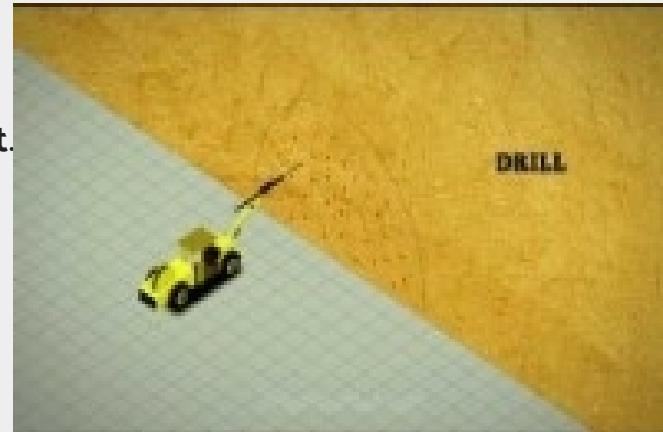
Drilling and Blasting Method

Drilling and blasting is the controlled use of explosives and

other methods, such as gas pressure blasting pyrotechnics, to break rock for excavation. It is practiced most often in mining, quarrying and civil engineering such as dam, tunnel or road construction. The result of rock blasting is often known as a **rock cut**.

Procedure:-

- A blast pattern is created
- A number of holes are drilled into the rock, which are then partially filled with explosives.
- Stemming, inert material, is packed into the holes to direct the explosive force into the surrounding rock.
- Detonating the explosive causes the rock to collapse.
- Rubble is removed and the new tunnel surface is reinforced.
- Repeating these steps until desired excavation is complete.



<https://youtu.be/wAjWkvK45so>

Tunnel Boring Method

Bored tunnel method is modern technology. In this case, tunnel boring machines are used which automatically work and makes the entire tunneling process easier. It is also quicker process and good method to build tunnel in high traffic areas. Tunnels boring machines (TBM's) are available in different types suitable for different ground conditions. These machines can be used in difficult conditions such as below the water table etc. A special pressurized compartment is provided for TBM to work in below water table conditions. The workers should not enter that compartment except for repair works. Care should be taken while TBM is in working conditions. The only difficulty with this TBM is its heavy weight. So, transportation is difficult and costlier.



<https://youtu.be/sGEMHn01p4g>

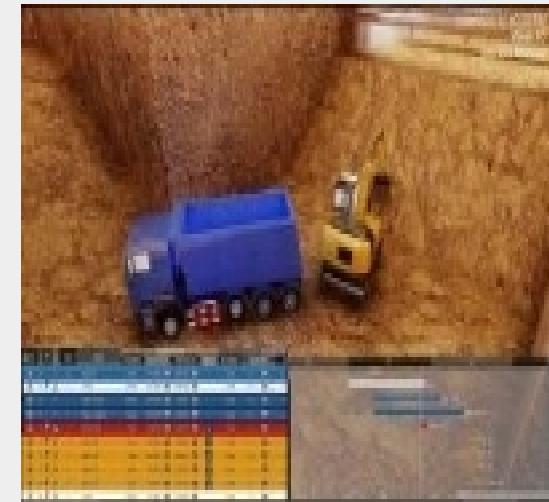
Tunnel Boring Method

Advantages and Disadvantages

- A specific excavation profile can be achieved.
- Higher advance rates are achievable.
- The work is completely automated and continuous.
- Low labor expense.
- Better operating conditions.
- Complete mechanization and automation of the drive is possible.
- High financial investment.
- Specific and detailed geological information is a must for TBM.
- Longer preparation time is required for the design of the machine.
- TBM has limitations on curve radii, especially, on tight radius curves; it is difficult to rotate the whole setup of TBM.
- Adjustment to different rock types and high-water inflow is limited to a certain level.
- The transportation cost of the TBM to the tunnel site is very high.

Cut-Cover Method

Cut and cover method of tunnel construction is generally used to build shallow tunnels. In this method, a trench is cut in the soil and it is covered by some support which can be capable of bearing load on it. The cutting can be done by two methods. One is bottom up method in which a tunnel is excavated under the surface using ground support. Another method is top-down method in which side support walls are constructed first by slurry walling method or contiguous bored piling. Then roof is located on the top of the walls and excavation is carried out. Finally, base slab is constructed. Most of the Underground metro rail stations are constructed using cut and cover method.



<https://youtu.be/ENo0X9UUQG4>

Shield Method

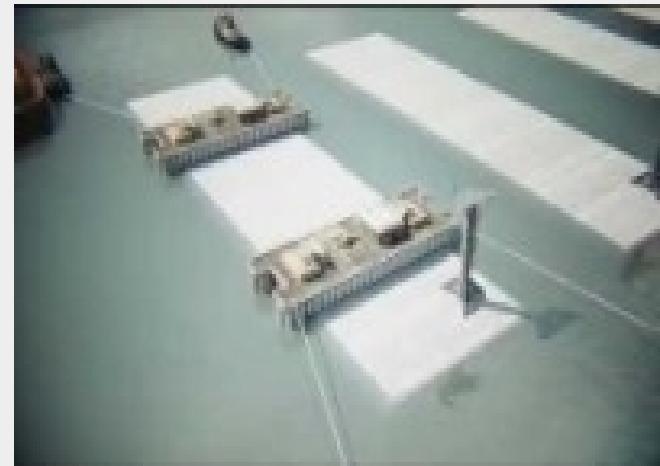
Shield method tunneling refers to the trenchless technique by where a shield is used to cut through the earth to create a bore while providing safe cover during the excavation of soil and the advance of casings behind the shield. The shield serves as a barrier that prevents soil collapse on personnel or equipment involved in excavation.



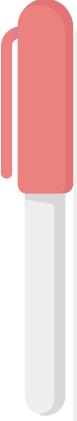
<https://youtu.be/6sYbdKCLnfY>

Immersed-Tube Method

Immersed tube, also called Sunken Tube, technique of underwater tunneling used principally for underwater crossings. This method has been widely used for about 100 years, and more than 150 immersed tunnels have been constructed worldwide. They mainly serve as road or rail tunnels, but immersed tunnels are also used for water supply and electric cables. The traditional European method for constructing an immersed tunnel is to establish one or more casting basins as open excavations, where the individual tunnel elements are constructed. Each tunnel element is composed of several segments. When the elements are completed, they are sealed this temporary bulkheads are the casting basin is flooded one by one to their intended location, immersed into their final position on the seabed, are linked together. The tunnel is normally placed in in a pre-dredged trench in the seabed of the waterway. The connection to the land surface is normally connected to a cut and cover tunnel to overcome the level between the water and the land surface.



<https://youtu.be/7dPrPKZmn74>



Equipment's

1. Roadheader

- A roadheader, also called a boom-type roadheader, road header machine, road header or just header machine, is a piece of excavating equipment consisting of a boom-mounted cutting head, a loading device usually involving a conveyor, and a crawler travelling track to move the entire machine forward into the rock face.



2. Drilling Jumbo

- A drilling jumbo consists of one, two or three rock drill carriages, sometimes a platform, which the miner stands on to load the holes with explosives, clear the face of the tunnel or do something else. The carriages are bolted onto the chassis, which supports also the miners cabin and of course the engine.
- Modern drilling jumbos are relatively large, there are however smaller ones for use in cramped conditions.

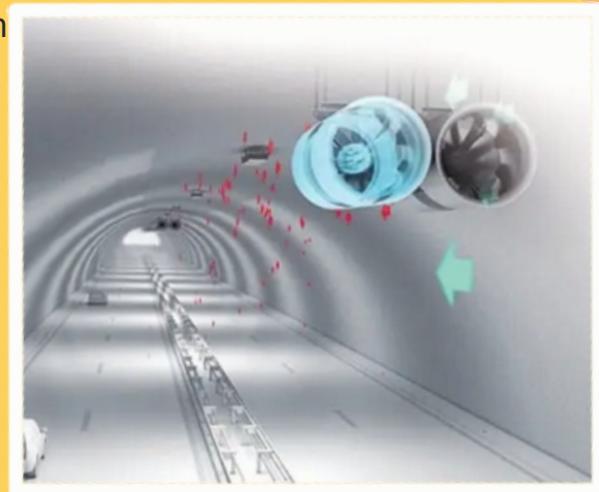


3. Air Ventilators

Ventilation systems in tunnel construction are provided to remove dust and poisonous gas during its construction and operation. The main objectives of providing ventilation systems in tunnel are:

- To provide the working crew an environment of fresh air.
- To exhaust out fumes and gasses, that is injurious to health and explosive in nature.
- To remove the drilling, mucking and blasting gasses emitted.

Ventilation during construction and after completion of tunnel construction is an essential feature that a tunnel should own to facilitate functional, comfortable and a safe tunnel environment for both the road and railway tunnels.



4. Crawler Excavator

- The modern crawler excavator is designed to dig or grade, or move earth and large objects, and is classified by its mode of locomotion. There are many types of excavators include wheeled, walker, towed, and rail excavators.
- This equipment are used to create cross-tunnels when explosives are being used for secondary profiling, and, of course, for direct excavator tunneling.



5. Wheel Loader

Used for lifting almost everything such as :-

- Debris
- Gravel
- Soil
- Dirt
- Pallets, etc.

Newer wheel loader models are equipped with a 28.5 kilowatt / 38.8 engine as standard.



6. Dumper

- A dumper or dump truck is a truck designed for carrying bulk material, often on building sites. A dumper has a body which tilts or opens at the back for unloading and is usually an open 4-wheeled vehicle with the load skip in front of the driver.



7. Rock Breaker

- Designed to break large rocks, rock breakers or generally called as hydraulic hammers, as an attachment to backhoe loaders, excavators etc., are generally used in the mining industry where oversized rocks are too large or hard to be reduced in size by a crusher.



8. Telehandler

- These are used in construction sites, allowing us to reach out and over obstacles, and are also majorly used in repair and maintenance.



9. Batching Plant

- Concrete batching plant is a professional concrete production equipment, it can produce concrete efficiently and evenly. It has wide application in tunnel, bridge, railway, highspeed, airport, port, wharf, water engineering, etc. And batching plant plays an important role in industry.



<https://youtu.be/aqfgka5ChcE>

10. Transit Mixer

- The integration of mixing of concrete, and transport through tunnels makes tunnel transit mixers to be ideal for a range of construction projects. Whether you're considering for hydro-electric tunnel projects or high-speed rail tunnel construction, or in road tunnel construction or in mines, this is one machine that will make your work to flow efficiently. Due to its unique 3 meter height, the four-wheel-drive & steering, and the reversible driver seat, it can easily move in any kind of confined spaces such as tunnels, mines, caves, underground railways, hydroelectric projects, and canal works.



11. Shotcrete Machine

- Shotcrete machines are available which control the complete process and make it very fast and easy. Manual and mechanical methods are used for the wet spraying process but wet sprayed concrete is traditionally applied by machine. The high spray outputs and large cross-sections require the work to be mechanized. Concrete spraying systems with duplex pumps are mainly used for working with wet mixes. Unlike conventional concrete pumps, these systems have to meet the additional requirement of delivering a concrete flow that is as constant as possible, and therefore continuous, to guarantee homogeneous spray application'.



12. Tunnel Boring Machine (TBM)

- A tunnel boring machine (TBM), is used to excavate tunnels with a circular cross-section through a variety of soil and rock strata. They may also be used for micro tunneling. They can be designed to bore through anything from hard rock to sand. Tunnel diameters can range from one meter (3.3 ft) (done with micro-TBMs) to 17.6 meters (58 ft) to date. Tunnels of less than a meter or so in diameter are typically done using trenchless construction methods or horizontal directional drilling rather than TBMs. TBMs can also be designed to excavate non-circular tunnels, including u-shaped or horseshoe and square or rectangular tunnels.



<https://youtu.be/sGEMHn01p4g>



THANK YOU.