

2. Machine Installation & Preventive Maintenance



SCMS

Unit 2.1 - Tools and equipment's

Unit 2.2 - Install machine and assemblies

Unit 2.3 - Performing preventive maintenance



MIN/N0309

Key Learning Outcomes

At the end of this module you will be able to :

1. To clean the work area and assist the Technician in conducting daily inspection and check of different machine.
2. Carry out preliminary & visual checks. Observe any unusual noise, vibration, leak, spillage, accumulation etc. and communicate the same to supervisor .
3. To check gauges, indicators, and sensor are fully functional. Observe any alarm message and report the same to Technician or Operator.
4. Identify right machine spares, tools and tackles required for the repair and maintenance job on the machines.
5. To get the items issued from store and carry right tools and tackles required to attend the breakdown.
6. Execute preventive maintenance schedule.
7. Assist mechanic in overhauling of subassemblies like engine, transmission, final drive etc.
8. To dispose of waste material and broken parts at appropriate place.
9. Know right lubricants for conveyors, drives, gearboxes, chain and sprocket drives and greasing point of different machines
10. Know the right set of tools and tackles required for Maintenance.
11. Procedure of acquisitions of tools and tackles from store and return policies.
12. How to operate compressors and mine machinery with or without load.
13. Effectively communicate to Operators, Technicians and others about job completion and any observations

UNIT 2.1: Tools and Equipment's

Unit Objectives

At the end of this module you will be able to :

1. Generally used machines and equipment in mining.
2. Maintenance of generally used mining machine.
3. To clean the machine components and assist the technician/mechanics in fitment of the right components.
4. Carry out preliminary & visual checks. Observe any unusual noise, vibration, leak, spillage, accumulation etc. and communicate the same to Technician / Operator.
5. To check gauges, indicators, and sensor are fully functional. Observe any alarm message and report the same to Technician or Operator.
6. Follow all the work instruction from Fitter / Technician related to routine maintenance.
7. To get the items issued from store and carry right tools and tackles required to attend the breakdown.
8. Assist Technician / Fitter to execute preventive maintenance schedule

2.1.1 Machines used in Mining

There are various types of machines used in mining according to mining site. This earthmoving and mining equipment section lists equipment that has been designed primarily remove earth and minerals in giant earthmoving and mining projects. a number of this equipment finds it place in different applications, however, and also the use of bulldozers and articulated trucks on road and highway projects are just some of examples.

One area of surface mining includes large machines like drills, electrical shovels and large draglines, some of which have buckets that are capable of moving a hundred and sixty cubic yards of material in one scoop. although somewhat smaller than the electrical shovel or particularly the large dragline, the mass excavator also fits here, that is generally a large version of the excavator that's used more for mass excavation than for more restricted exaction or trenching.

Underground mining equipment is aimed toward moving material during a} very headroom and space environment. you'll notice similarities with some of the surface mining equipment likewise as some very specialized pieces developed specifically for the underground mining application.

ARTICULATING TRUCKS

An articulated dump truck has a hinge between the cab and the dump box, but is distinct from semi-trailer trucks in that the cab could be a permanent fixture, not a dissociable vehicle. Steering is accomplished via hydraulic rams that pivot the complete cab, instead of rack and pinion steering on the front axle. This vehicle is extremely flexible to rough terrain.



Figure 2.1 Articulating Trucks

TRACK TYPE BULLDOZER

The term bulldozer technically refers only to a shovel-like blade, over the years people have come to associate the term bulldozer to the complete vehicle both blade and crawler tractor combined.

Bulldozers are a strong tracked piece of equipment and the tracks offer them wonderful ground hold and quality through very rough terrain. Wide tracks facilitate distribute the bulldozer's weight over an oversized area (decreasing pressure), so preventing it from sinking in sandy or muddy ground.



Figure 2.2 Track Type Bulldozer

WHEELED BULLDOZER

Many wheel bulldozers were developed from wheel loaders by fitting a dozer blade in place of the loader arms and bucket. This adaptation was solely a success wherever the machine was used for light-duty tasks.

The first giant rubber-tired bulldozer appropriate for earthmoving applications were those created by none other than earthmoving pioneer R.G. LeTourneau, beginning in 1947. He developed four sizes known as the Models A, B, C, and Tournadozers.



Figure 2.3 Wheeled Bulldozer

CABLE/HAMMER TRACTOR

A cable tractor is a machine used for pulling cables which either can be an electrical cable for a mine shovel or wire ropes during a shovel rope change.



Figure 2.4 Cable/Hammer Tractor

GIANT DRAGLINE

A dragline excavator is a piece of equipment utilized in civil engineering and surface mining. In civil engineering the smaller types are used as pile driving rigs. The larger types are utilized in strip-mining operations to move overburden higher than coal, and for tar-sand mining. Draglines are amongst the biggest mobile equipment ever designed on land, and weigh within the locality of 2000 metric tonnes, although specimens weighing up to 13,000 metric tonnes have additionally been created.



Figure 2.5 Giant Dragline

DRILLS

The purpose of drilling into rock is to produce a “blasthole” into that explosives is loaded, and detonated to create the location easier to work in.



Figure 2.6 Mining Drills

HAUL TRUCK END DUMP

Off-road dump trucks are used strictly for off-road mining and heavy dirt trucking jobs. There are 2 primary forms of these trucks: rigid frame and articulating frame.

The term 'Dump' truck isn't usually utilized by the mining industry, or by the manufacturers that build these machines. The additional appropriate term for this strictly off road vehicle is "haul truck" and also the equivalent European term is 'dumper'. This is classified on the basis of discharging the material loaded in the Haul Truck and from where the material is discharged back or centre.



Figure 2.7 Haul Truck End Dump

HAUL TRUCK CENTER DUMP

An off-highway hauler that dumps its load through longitudinal gates in the bottom of the bottom dump wagon.



Figure 2.8 Haul Truck Centre Dump

TRACK LOADERS

Track loaders are capable in nearly each task, however master of none as a bulldozer, excavator, or wheel loader will out perform a track loader below a set of conditions. the power of a track loader to perform nearly every task on a job site that's why it remains a part of the many companies' fleets.



Figure 2.9 Track Loaders

WHEEL LOADER

A loader is a machine usually employed in construction, primarily used to load loose material (dirt, snow, feed, gravel, logs, etc.) into or onto another kind of machine, like a dump truck, conveyer belt, feed-hopper, or railcar.



Figure 2.10 Wheel Loaders

MOTOR GRADER

A grader, also usually mentioned as a road grader, a blade, a maintainer, or a motor grader, is a machine with an extended blade used to create a flat surface. Graders are usually used in the construction and maintenance of dirt roads and gravel roads. Within the construction of paved roads they're used to prepare the base course to make a large flat surface for the asphalt to be placed on. In civil engineering, the grader's purpose is to "finish grade" (refine, set precisely) the "rough grading" performed by heavy equipment or engineering vehicles like scrapers and bulldozers.



Figure 2.11 Motor Grader

MASS EXCAVATOR

Mass Excavators are massively designed to permit the use of the biggest buckets in the industry by weight class. These attachments are courageously built for power. The machines are specifically designed for quickly loading trucks with the fewest passes.



Figure 2.12 Mass Excavator

SINGLE-ENGINE WHEELED SCRAPER

Scrapers are giant motorized machines used for excavation, hauling and leveling out materials in a type of construction jobs. Running on large rubber tires, motorized scrapers quickly move large quantities of earth around a construction site, unlike the less standard pull-type scraper.

A standard motor scraper is comprised of a bowl, an apron to drop down over a load of material so as to retain it, and an ejector to hydraulically push the load. Because of its hydraulic system, these components can all operate independently.



Figure 2.13 Single Engine Wheeled Scraper

ELEVATING SCRAPER

Instead of an apron, these scrapers include a hydraulically- or electrically-driven elevator made of 2 chains equipped with a series of crossbars. The elevator's purpose is to help in loading material into the scraper's elevating bowl. Dumping material is achieved by sliding the ground of the bowl backwards; the elevator will be reversed so as to help in dumping the load equally.



Figure 2.14 Elevating Wheeled Scraper

ELECTRIC SHOVEL

Generally, a shovel is used for digging and loading earth or fragmented rock and for mineral extraction. An electric mining shovel is a bucket-equipped machine consisting of a revolving deck with a power plant, tracks, a counterweight, and a front attachment, like a boom. The excavation phase consists of crowding the dipper into the bank, hoisting the dipper to fill it, then, retracting the complete dipper from the bank. The swinging phase happens once the dipper is clear of the bank each vertically and horizontally. The planned swing path of the dipper is planned by the operator and dump height until it is positioned over the Dump truck .Dumping involves opening the dipper door to dump the load, whereas maintaining the proper dump height. When the dipper swings back to the bank is known as returning and lowering the dipper in the specified tuck position , for closing the dipper door.



Figure 2.15 Electric Shovel

HYDRAULIC SHOVEL

The hydraulic mining shovel has been widely used for coal and rock loading since the Nineteen Seventies. The hydraulic system of power transmission greatly simplifies the ability train, eliminates variety of mechanical parts that are present within the shovel.



Figure 2.16 Hydraulic Shovel

CONTINUOUS MINER FOR UNDERGROUND MINING

A machine with a large rotating steel drum equipped with tungsten carbide teeth that scrape coal from the seam. operating in a “room and pillar” system – where the mine is split into a series of 20-to-30 foot “rooms” or work areas cut into the coal bed – it could mine as much as 5 tons of coal a minute – more than a mineworker of the 1920s would produce in a whole day.



Figure 2.17 Continuous Miner

HAUL TRUCKS

Most haul trucks have a two-axle design, however 2 best-known models from the 1970s, the 350T Terex Titan and 235T Wabco 3200/B, had 3 axles. Haul truck capacities vary from 40 short tons (36 t) to 496 short tons (450 t).

Large quarry-sized trucks vary from 40 to 100 tons. A good example of this is the Caterpillar 775 (rated at 70 short tons (64 t)). Quarry operations are usually smaller than, a gold/copper mine, and require smaller trucks



Figure 2.18 Haul Trucks

REMIX TRUCK

The remix truck is especially designed for the underground transport of the wet shotcrete/Concrete with a tramming height of only 235 mm.



Figure 2.19 Haul Trucks

SCALER

Scaling is a key part in the mining cycle. The Scaling is process used to remove or take down loose material from the surface of hard rocks in mining.



Figure 2.20 Scaler

SCOOPTRAM

A rubber tired, battery or diesel-operated piece of equipment designed for cleaning runways and hauling supplies.



Figure 2.21 Scooptram

SHUTTLE TRUCK

In room-and-pillar systems, electric-powered, rubber-tired vehicles called shuttle cars haul coal and mining material from the face to the intermediate haulage system.



Figure 2.22 Shuttle truck

WATER TRUCK

The water truck is designed to carry water from reservoir to mining site.



Figure 2.23 Water Truck

DIAMOND WIRE SAW

A wire saw is a machine-powered saw that uses diamond embedded beads on a metal wire to cut through stones. It uses continuous scratching or rubbing to cut hard stones into large blocks. The wire passes around a fly wheel and is carried on pulleys to the part of the quarry where the cutting is to be done.



Figure 2.24 A diamond wire saw

AIR COMPRESSOR

In mines, air compressors are used as a source of electricity for powering drilling machines, conveyor belts or other machines. They are also used for supplying oxygen in underground mines. The following figure shows an air compressor.



Figure 2.25 A Air Compressor

JACK HAMMER

This is an electrical tool that includes a hammer along with a chisel. With electricity, the hammer strikes the chisel back and forth. Sometimes jack hammer also use compressed air supplied by an air compressor. The jack hammer is used for breaking rocks. The following figure shows a jack hammer

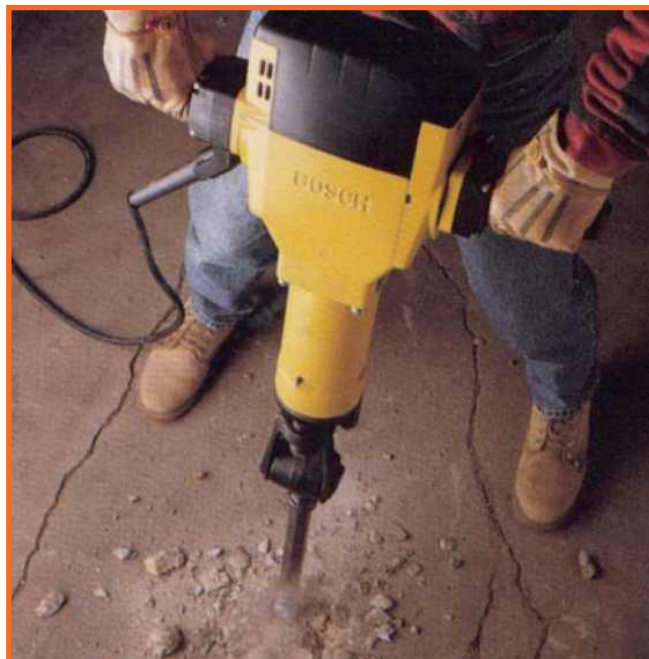


Figure 2.25 A Air Compressor

WATER PUMP

Most mines use a water pump to supply high pressure water for cutting and flushing rocks. Following figure shows a water pump:



Figure 2.27. A Hydraulic Drill

WATER PUMP

Most mines use a water pump to supply high pressure water for cutting and flushing rocks. Following figure shows a water pump:



Figure 2.28 A Water Pump

WAGON DRILLS

This is a machine that uses air pressure for rock drilling and blasting. The following figure shows a Wagon Drill.



Figure 2.29 A Wagon Drill

DIAMOND BELT SAWS

This is a huge cutting or sawing machine for making vertical or horizontal cuts. The tool has a special plastic belt with diamond segments.



Figure 2.30 A Diamond Belt Saw

CHAIN SAW

A machine with a toothed blade that can cut rocks vertically or horizontally. Chainsaws can be of various kinds. Mines use a type which has cutting edge of the blade embedded with diamond. The chain is lubricated with water. The following figure shows a diamond belt saw.



Figure 2.31 A Chain Saw

TIPPER

A tipper is a truck used for transporting loose material. The following figure shows a tipper.



Figure 2.32 Tipper

2.1.2 Types of Tools

Spanners

Common types of spanners include:

- open-end
- ring
- socket
- tube or box
- adjustable.

Open-end spanners

Most open-end spanners are double-ended. To use this spanner correctly and safely, turn the spanner by pulling on the shank. Pulling is the safest because there is less chance of hitting your knuckles if the spanner or the nut gives suddenly.

If you have no choice but to push the spanner, use the palm of the hand and keep your hand open.



Figure 2.33 Open-end spanners

Ring spanners

Ring spanners will not slip and therefore, where possible, should be used to break loose a tight nut. Their offset shanks provide clearance for knuckles or obstructions alongside the nut. They may also be used where there is an obstruction close to the sides of a nut.



Figure 2.34 Ring Spanner

Socket spanners

Socket spanners are used on nuts that are in recessed positions. Socket spanners come with a variety of accessories allowing them to gain access to places where a normal spanner may not fit.



Figure 2.35 Socket Spanners

Tubular or box spanners

Tubular or box spanners are also used on nuts that are in recessed positions. Long projecting bolts usually require the use of a hollow tubular spanner.



Figure 2.36 Box or Tube Spanner

Allen keys (Hex keys)

Allen keys are hexagon bars of tool steel bent to an L-shape and are usually in sizes ranging from 1.5mm to 19mm across the flats. They can also be in the form of a socket spanner or screwdriver.

Allen keys are used to turn set screws that have internal hexagon sockets.

When using allen keys:

- make sure socket and keys are clean before use
- use the correct size
- insert to full depth.

Don't use the key if the ends are worn or rounded, it is likely to slip under load.