

# Mining Technology: Simple Machines

Welcome to the mining machine lab. Today, we're going to learn about some of the machines we use in mining, who uses them, what they do, and how they work!

Start by choosing a machine. Circle the one you want to learn more about:

- I. Drills
- II. Excavators
- III. Front-End Loaders
- IV. Haul Trucks
- V. Rock Trucks

Read over the one-pager about your machine.

1. Machinery is a type of system. What is the input in the machine you chose?

Answers will vary. The input is generally energy, and the output is generally motion.

2. What is the output?

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3. Can you name some simple machines used in that system? The options are screw, wheel and axle, inclined plane, wedge, pulley, and lever.

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4. Draw a picture of your machine and label the simple machines in it.

Drill: drill bit is a screw, wheels use wheel and axle, the drill is moved and angled with levers

Excavator: the teeth of the bucket are wedges, the hinges and wheels are both wheel and axle, levers are used in the cab to move the arm

Front-End Loaders: The wheels and hinges are a wheel and axle, the teeth of the bucket are wedges, levers are used in the cab to move the parts. A grouser uses gears, which are a wheel and axle, an inclined plane to achieve better grip from the track, rollers which are a pulley system, and a spring, which is an additional type of simple machine.

Haul Trucks: levers are used to lift and angle the dumper, the wheels are on a wheel and axle, when the dumper is angled, it becomes an inclined plane.

Rock Trucks: same as the haul trucks.

5. Potential energy is energy stored in an object which has the potential, based on its properties, to become kinetic energy. For example, the ball of a wrecking machine has potential energy. How does your machine use or generate potential energy?

All of the machines have an electrical charge or the pressure in the pneumatic system.

6. Kinetic energy is energy used in motion. How does your machine use or generate kinetic energy?

Most machines can be driven. The drill rotates and moves with a forward motion. The loader can lift and lower its shovel. The excavator can bend its arm and use its scoop. The trucks can lift and move their dumpers.

7. Mechanical advantage is the term used to describe how a machine manipulates or changes a force to make a task take less effort. How does your machine generate mechanical advantage?

Answers will vary.

Levers help reduce the work needed to lift a load.

A wheel and axle reduces the work needed to produce movement or to move a load.

A pulley uses a wheel in a similar fashion – by turning a big wheel, smaller movement becomes easier.

An inclined plane downwards can use gravity to help move a load, and moving in smaller increments at an angle is less work than moving in large increments directly upwards.

A screw is an inclined plane around a cylinder which makes the digging of holes easier.

A wedge is a small inclined plane which makes separating two parts from each other easier.

