Power at Work

Compare three devices in an industrial recycling plant

PHS.9.2 "Distinguish between magnets, motors, and generators, and evaluate modern industrial uses of each."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline what each device does, circle its energy input or power source, and write B beside one benefit and L beside one limitation of each device.

Inside a Metal Recycling Plant

1. At a metal recycling plant, a crane lifts steel from a pile that also contains aluminum. Its electromagnet is a coil of wire that becomes magnetic when current flows. The field pulls iron-rich steel toward the crane but does not pull aluminum. Switching off the current lets the crane release its load. A permanent magnet could attract steel without electricity, but releasing a heavy load would be harder. The electromagnet helps workers separate metals quickly, though it needs electrical power while operating. A magnet alone does not power the plant's conveyor.

2. Beside the crane, an electric motor turns the conveyor belt that carries sorted metal to storage bins. Current flowing through coils in the motor interacts with magnetic fields, producing a turning force on a shaft. The motor changes electrical energy into mechanical motion. Its magnets help it work, but the motor is not just a magnet. Operators can adjust belt speed to match the sorting rate, which reduces spills and delays. A motor cannot supply its own electrical energy: it needs power from the grid or another source. If power fails, the belt stops unless backup power is available.

3. Near the plant, a wind turbine spins a generator when the wind blows. Inside the generator, motion between magnets and coils induces an electric current. Unlike the conveyor motor, the generator changes mechanical motion into electrical energy. It does not create energy from nothing: moving air provides the input. The electricity can help run the conveyor, reducing purchases from the grid. But wind speed varies, so the generator cannot be the plant's only reliable supply. Grid power or stored energy must cover calm periods, especially when the sorting line needs to run on schedule.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why can the crane's electromagnet separate steel from aluminum, and why is switching it off useful?

2. Why does the conveyor use a motor rather than a magnet alone? Include the motor's energy change.

3. A worker says the wind generator and conveyor motor do the same job because both contain magnets. How do their energy changes differ?

4. Should the plant rely only on its wind generator to power the sorting line? Give one benefit and one limitation from the passage.

3 YOUR TURN

Your own words

Design a system for a hospital laundry plant that uses a magnet, a motor, and a generator in roles not described in the passage. In four or five sentences, explain each role, identify the motor's and generator's energy changes, and evaluate one practical limitation with a solution.

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PART 1 · READ AND MARK

Underline what each device does, circle its energy input or power source, and write B beside one benefit and L beside one limitation of each device. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why can the crane's electromagnet separate steel from aluminum, and why is switching it off useful?	**Its magnetic field attracts iron-rich steel but not aluminum. Switching off the current lets the crane release the steel.**
2	Why does the conveyor use a motor rather than a magnet alone? Include the motor's energy change.	**The motor turns the belt by changing electrical energy into mechanical motion. A magnet alone does not power the conveyor.**
3	A worker says the wind generator and conveyor motor do the same job because both contain magnets. How do their energy changes differ?	**The motor changes electrical energy into mechanical motion. The generator changes mechanical motion from the turbine into electrical energy.**
4	Should the plant rely only on its wind generator to power the sorting line? Give one benefit and one limitation from the passage.	**No. Its electricity can reduce purchases from the grid, but wind varies. The plant needs grid power or stored energy during calm periods.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

In a hospital laundry plant, a permanent magnet on a tool rack holds steel repair tools in place. An electric motor turns a dryer drum, changing electrical energy into mechanical motion. During a power outage, a diesel engine spins a generator, which changes mechanical motion into electrical energy for essential machines. The generator needs fuel that could run out. Staff should store enough diesel and check the supply regularly.

Accept other accurate industrial roles and practical tradeoffs. The motor must use electrical input to produce motion, and the generator must use mechanical input to produce electricity.