RENEWABLE ENERGY TECHNOLOGIES

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INCREDIBLE WIND POWER FACTS

Wind Power Accounted for 1.9 Percent of U.S. Electricity Production in 2009

Interest in wind has been outpacing other renewable methods for new electrical power generation for a few years, increasing more than 31 percent in the US between 2008 and 2009 alone [source: U.S. Energy Information Association].

Less than 2 percent doesn't sound like much, but when you consider the rate at which it's gaining popularity, wind has the inside track to becoming a much more viable alternative for large-scale energy production.

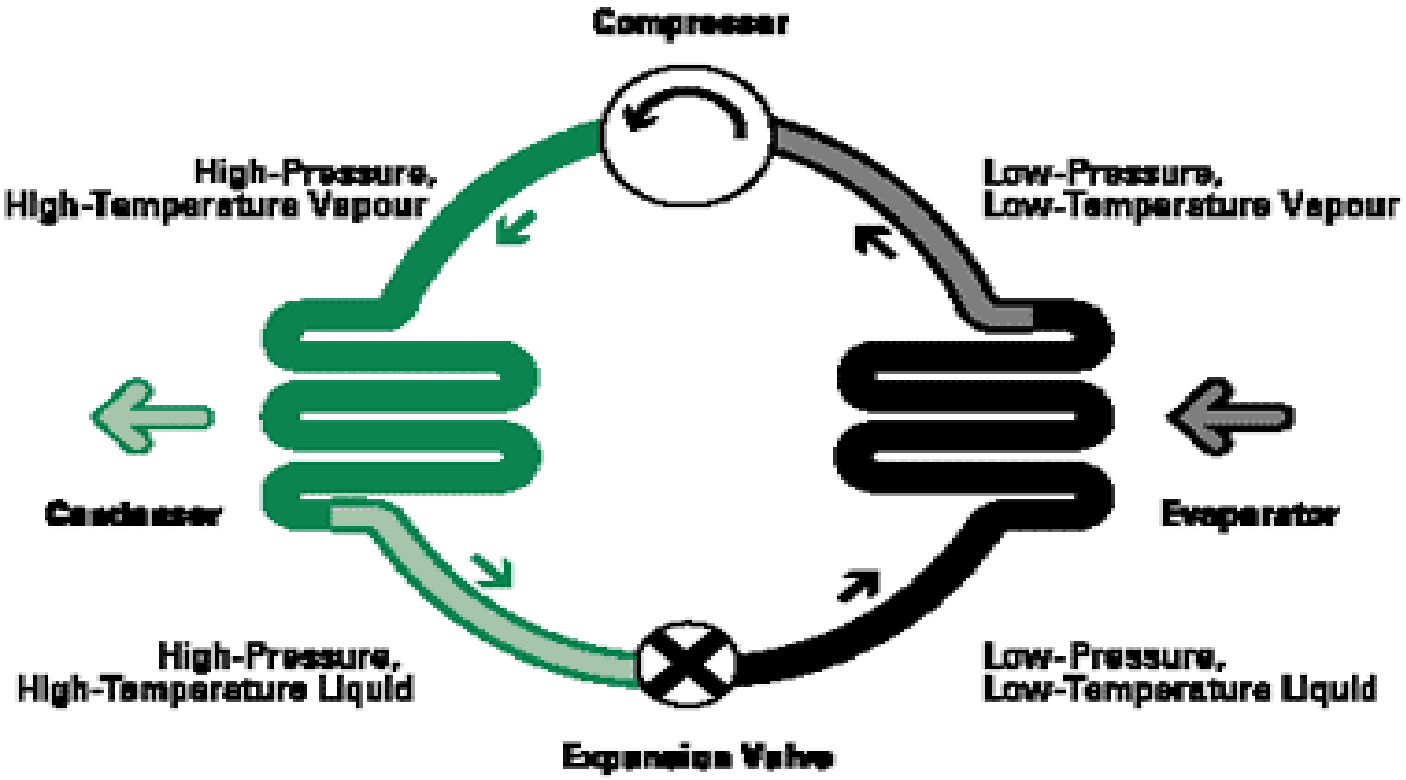
WHAT IS A HEAT PUMP AND HOW DOES IT WORK?

A heat pump is a device that extracts heat from one place and transfers it to another.

The heat pump is not a new technology; it has been used in Canada and around the world for decades.

Refrigerators and air conditioners are both common examples of this technology.

BASIC HEAT PUMP CYCLE



BASIC HEAT PUMP CYCLE

Heat pumps transfer heat by circulating a substance called a refrigerant through a cycle of evaporation and condensation. A compressor pumps the refrigerant between two heat exchanger coils. In one coil, the refrigerant is evaporated at low pressure and absorbs heat from its surroundings. The refrigerant is then compressed en route to the other coil, where it condenses at high pressure. At this point, it releases the heat it absorbed earlier in the cycle.

BASIC HEAT PUMP CYCLE

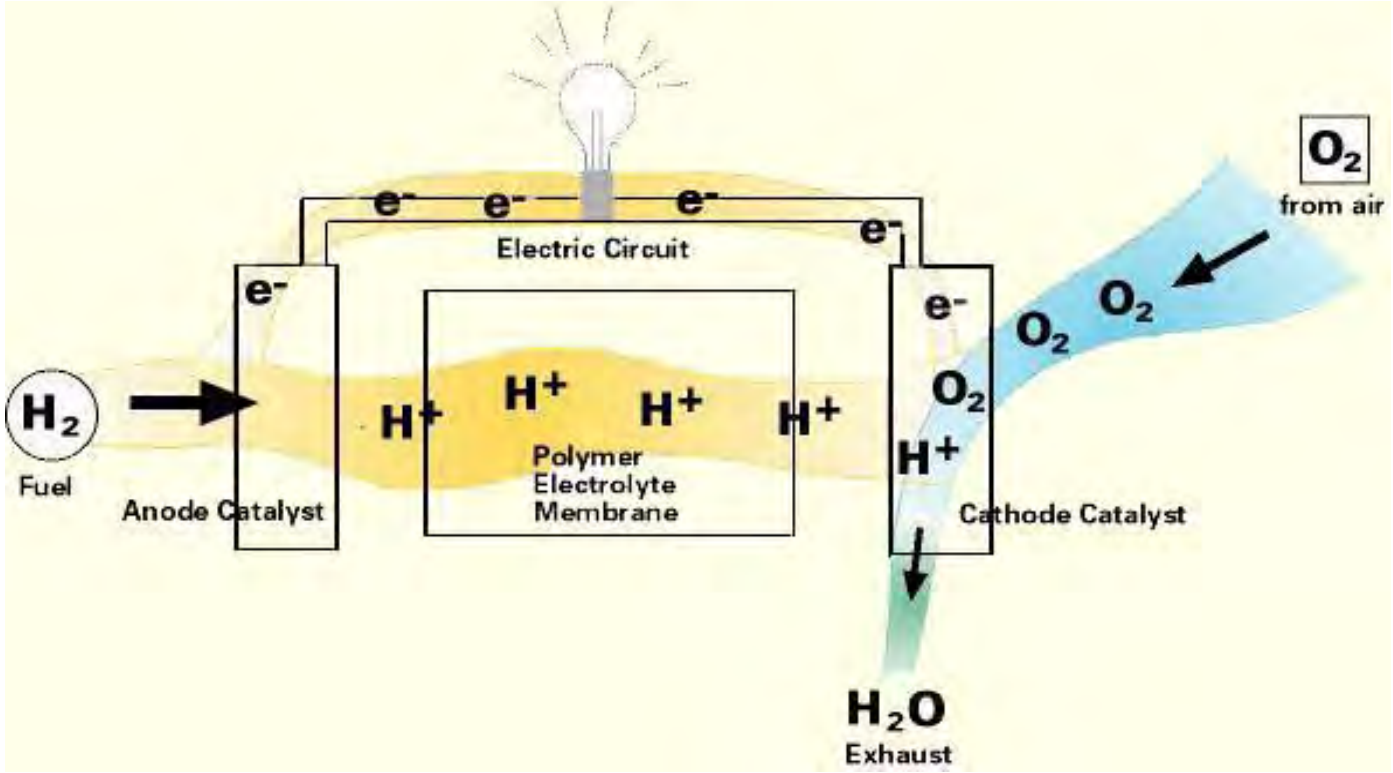
The heat pump cycle is fully reversible, and heat pumps can provide year-round climate control for your home – heating in winter and cooling and dehumidifying in summer. Since the ground and air outside always contain some heat, a heat pump can supply heat to a house even on cold winter day.

WHAT IS A FUEL CELL?

In principle, a fuel cell operates like a battery. Unlike a battery, a fuel cell does not run down or require recharging. It will produce energy in the form of electricity and heat as long as fuel is supplied.

A fuel cell consists of two electrodes sandwiched around an electrolyte. Oxygen passes over one electrode and hydrogen over the other, generating electricity, water and heat.

WHAT IS A FUEL CELL?



WHAT IS A FUEL CELL?

Hydrogen fuel is fed into the "anode" of the fuel cell. Oxygen (or air) enters the fuel cell through the cathode.

Encouraged by a catalyst, the hydrogen atom splits into a proton and an electron, which take different paths to the cathode.

The proton passes through the electrolyte. The electrons create a separate current that can be utilized before they return to the cathode, to be reunited with the hydrogen and oxygen in a molecule of water.

A fuel cell system which includes a "fuel reformer" can utilize the hydrogen from any hydrocarbon fuel - from natural gas to methanol, and even gasoline.

Since the fuel cell relies on chemistry and not combustion, emissions from this type of a system would still be much smaller than emissions from the cleanest fuel combustion processes.

APPLICATIONS

There are many uses for fuel cells.

automakers are working to commercialize a fuel cell car. Fuel cells are powering buses, boats, trains, planes, scooters, forklifts, even bicycles.

There are fuel cell-powered vending machines, vacuum cleaners . Hospitals, credit card centers, police stations, and banks are all using fuel cells to provide power to their facilities.

Wastewater treatment plants and landfills are using fuel cells to convert the methane gas they produce into electricity.

STATIONARY

More than 2500 fuel cell systems have been installed all over the world .

Fuel cell power generation systems in operation today achieve 40 percentfuel-to-electricity efficiency utilizing hydrocarbon fuels.

Since fuel cells operate silently, they reduce noise pollution as well as air pollution and when the fuel cell is sited near the point of use, its waste heat can be captured for beneficial purposes (cogeneration).

Fuel cells have proven to be up to 99.999% (five nines) reliable.

PLASTIC RECYCLING

Plastic products are just shapes of plastic, and to recycle them you just have to melt them and change the shape. In a similar way you can melt square ice cubes by taking them out of the freezer turning them into water then refreezing them into round ice cubes. Same water, same ice but different shapes. The difference with plastics is we use special equipment and temperatures

PLASTIC RECYCLING

All plastics may look the same – but they are not, the appearance is deceptive. They vary like shapes and in order to recycle them you have to make sure are all the same shapes fit together.

We recycle the plastic by putting them in to the correct group. Each group can identified by a number on the bottom of the product. Each number corresponds to a type of plastic.

Plastic Identification Code	Type of plastic polymer	Properties	Common Packaging Applications
	Polyethylene terephthalate(PET)	Clarity, strength, toughness, barrier to gas and moisture.	Soft drink, water and salad dressing bottles; peanut butter and jam jars.
	High Density polyethylene (HDPE)	Stiffness, strength, toughness, resistance to moisture, permeability to gas.	Water pipes, milk, juice, and water bottles; the ocassional shampoo/toiletry bottle.
	Polyvinyl chloride (PVC)	Versatility, ease of blending, strength, toughness.	Packaging for non-food items; cling films for non-food use. Not used for food packaging as usually toxic. Non-packaging uses are electrical cable insulation; rigid piping; vinyl records.
	Low density polyethylene (LDPE)	Ease of processing, strength, toughness, flexibility, ease of sealing, barrier to moisture.	Frozen food bags; squeezable bottles, e.g. honey, mustard; cling films; flexible container lids.
	Polypropylene (PP)	Versatility, clarity, easily formed	Egg cartons; packing peanuts; disposable cups, plates, trays and disposable take-away containers.
	Polystyrene (PS)	Versatility, clarity, easily formed	Egg cartons, packing peanuts; disposable, plates, trays and cutlery; disposable take-away containers.
	Polycarbonate	Dependent on polymers or combination of polymers	Beverage bottles; baby milk bottles, compact discs; "unbreakable" glazing; electronic apparatus housings; lenses including sunglasses, prescription glasses, automotive headlamps, riot shields, instrument panels.

PLASTIC RECYCLING

These are the ‘standard’ plastics, however there are over 270 other types. You will also notice the plastics have properties which are designed to match up to the application or product.

Having separated the plastics we grind them in to flake.

This makes them small enough to be stuffed into a melting machine called an extruder.

The extruder is designed to melt and mix the plastic flake together and it comes out like a long piece of spaghetti. It is then cooled and cut it into an evenly formed pellets.

The pellets are then feed into our Remarkable machines and turned into a product giving them a whole new life… An eco resurrection.

Q & A

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Chancellor Professor

- Ph.D. in Mechanical Engineering, Birmingham University, UK, 1972
- M.S. in Mechanical Engineering, Al-Azhar University, Cairo, Egypt, 1969
- B.S. in Mechanical Engineering, Cairo University, Egypt, 1965

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Biography

Professor Sherif D. Elwakil joined the University of Massachusetts Dartmouth in September 1987 as a full professor. He was promoted to the rank of Chancellor Professor in September 1995, one of two professors only in the College of Engineering

Professor Elwakil served as the Chairman of the Mechanical Engineering Department from June 1995 to June 1999. He also served as the Interim Dean of the College of Engineering from December 1999 to September 2000.

Since he joined UMass Dartmouth (formerly SMU), Professor Elwakil developed and taught several courses in the area of Materials and Manufacturing at both the graduate and undergraduate levels. These include: Design of Manufacturing, Computer-Aided Manufacturing, Materials and Manufacturing Labs, Continuum Mechanics, Plasticity and Metal Forming Theory, and Theory of Elasticity

Areas of interest

- Advanced Solid Mechanics
- Computer-aided manufacturing
- Design for Manufacturing
- Material Science and Engineering

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