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Energy Headlines

The Energy Newsletter of MNIT Jaipur

This Issue :

Amazing Energy Usage Facts

- Every time you open the refrigerator door, up to 30 percent of the cold air can escape.
- A heavy coat of dust on a light bulb can block up to half of the light.
- A crack as small as 1/16th of an inch around a window frame can let in as much cold air as leaving the window open three inches!
- When you turn on an incandescent light bulb, only 10 percent of the electricity used is turned into light. The other 90 percent is wasted as heat.

Source : www.ocoee.org

Soil : A Solution to Global Warming

Soil holds vastly more carbon than trees. In fact, of the 3,170 gigatons of carbon that's stored in terrestrial ecosystems around the world , a whopping 80 percent is in the soil itself . We already know that soils are a hotbed of biodiversity, meaning they are full of fungi, bacteria, nematodes, insects and other kinds of beasties — all carbon based life forms. Soil is also where the plants and animals above ground are destined for when they die. The remains of these organisms become food for other living things, primarily fungi and bacteria. As they get broken down, some of the carbon escapes back into the atmosphere as carbon dioxide, and some gets stored in the soil, both as humus, and within the bodies of the soil organisms themselves. Whenever we disturb soil, whether we are paving over a meadow or cutting down a forest, we are disrupting the ecosystems hidden in the earth. These disruptions can have profound implications.

When a farmer ploughs and cultivates a paddock it releases CO_2 into the atmosphere. The vast majority (95 percent) is released from soil with the other 5 percent coming from tractor exhausts. The amount of CO_2 released by cultivation during reseeding can be approximately three tonnes per hectare. When you look at it from a global level, you realize that 15-20 percent of the CO_2 in the world's atmosphere comes from ploughing.

Arable land is not the only place where soil management makes a difference. There's a big debate going on about how we manage grazing lands too.

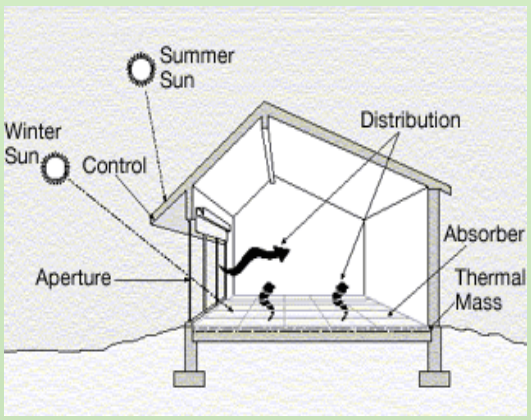
The practice of feeding cattle grain, instead of grass, reduces methane emissions, and requires less water, land and fossil fuels.

We must rethink our culture's relationship to soil. If we are ever going to get a handle on climate change, we're going to have to not only slash our fossil fuel use dramatically, but restore the ecosystems which we rely on for survival. And that means understanding that soil is not dirt, but rather a complex, living ecosystem that we are only just beginning to understand — and which we ignore or abuse at our peril.

Source: *http://www.mnn.com*

Passive solar building design

In passive solar building design, windows, walls, and floors are made to collect, store, and distribute solar energy in the form of heat in the winter and reject solar heat in the summer. This is called passive solar design or climatic design because, unlike active solar heating systems, it doesn't involve the use of mechanical and electrical devices.



The key to designing a passive solar building is to best take advantage of the local climate. Elements to be considered include window placement and glazing type, thermal insulation, thermal mass, and shading. Passive solar design techniques can be applied most easily to new buildings, but existing buildings can be adapted or "retrofitted".

Passive solar technologies use sun light without active mechanical systems (as contrasted to active solar). Such technologies convert sunlight into usable heat (water, air, thermal mass), cause air-movement for ventilating, or future use, with little use of other energy sources. Passive cooling is the use of the same design principles to reduce summer cooling requirements.

Some passive systems use a small amount of conventional energy to control dampers, shutters, night insulation, and other devices that enhance solar energy collection, storage, and use, and reduce undesirable heat transfer.

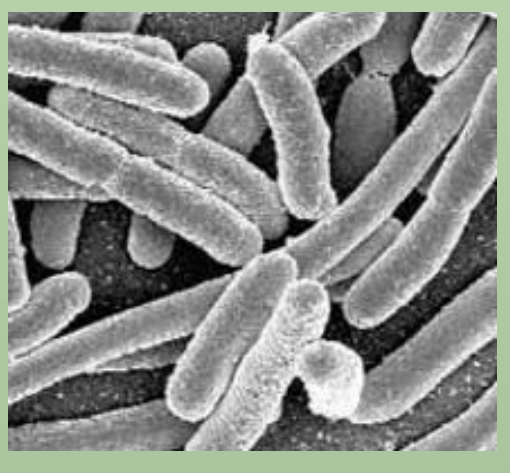
Passive solar technologies include direct and indirect solar gain for space heating, solar water heating systems based on the thermosiphon or geyser pump, use of thermal mass and phase-change materials for slowing indoor air temperature swings, solar cookers, the solar chimney for enhancing natural ventilation, and earth sheltering.

The scientific basis for Passive Solar Building Design has been developed from a combination of climatology, thermodynamics, fluid mechanics natural convection and human thermal comfort based on heat index, psychrometrics and enthalpy control for buildings to be inhabited by humans or animals, sunrooms, solariums, and greenhouses for raising plants.

Source: *www.energy.gov*

Next generation super powerful fuel from bacteria

The next generation of super powerful fuel, capable of arming missiles and space rockets may come from an engineered bacterium. Researchers at the Georgia Institute of Technology have engineered a bacterium to synthesize pinene - a hydrocarbon produced by trees that could potentially replace high-energy fuels such as JP-10 in missiles and other aerospace applications. By inserting enzymes from trees into the bacterium, Georgia Tech scientist Stephen Sarria boosted pinene production six-fold over earlier bio-engineering efforts. To be competitive, the researchers will have to boost their production of pinene 26 fold. Though a more dramatic improvement will be needed before pinene can compete with petroleum based JP-10, the scientists believe



they have identified the major obstacles that must be overcome to reach that goal.

They say it may be possible to produce pinene at a cost lower than that of petroleum-based sources. If that can be done - and if the resulting bio-fuel operates well in these applications - that could open the door for lighter and more powerful engines fueled by increased supplies of high energy fuels. Pinene dimers which are result from the dimerization of pinene have already been shown to have an energy density similar to that of JP-10."Fuels with high energy densities are important in applications where minimizing fuel weight is important. The gasoline used to power automobiles and the diesel used mainly in trucks both contain less energy per litre than the JP-10," the scientists said. The molecular arrangement of JP-10 accounts for its higher energy density. The amount of JP-10 that can be extracted from each barrel of oil is limited and sources of potentially comparable compounds such as trees can't provide much help. The limited supply drives the price of JP-10 to around $25 per gallon.

Source*: The Times Of India*

Unexpected Effects of Climate Change

Sunlight floods polar seafloor

As sea ice melts, more sunlight will bathe shallow coastal regions around the poles. Seafloor communities of worms, sponges, and other invertebrates accustomed to existing in darkness will begin to experience longer periods of sunlight each summer. Recent research has shown that this shift could significantly alter these communities, by allowing seaweeds and other marine plant-life to smother invertebrates. This transition from invertebrate dominated communities to algae dominated communities has already been observed in pockets of both the Arctic and Antarctic coastlines, and could significantly decrease biodiversity in these regions.

- **Allergies worsen**

As climate change causes springtime to spring out earlier in the year,

sneeze-inducing pollen will ride the airwaves that much earlier in the year as well. This will increase the overall pollen load each year, and could make people's allergies worse. Some temperature and precipitation models have shown that pollen levels could more than double by the year 2040.

- **Oceans darken**

Climate change will increase precipitation in some regions of the world, resulting in stronger-flowing rivers. Stronger river currents stir up more silt and debris, which all eventually flows into the ocean and makes the ocean more opaque.

- **Volcanic eruptions**

As glacial melt water floods into oceans and the global sea level rises with climate change, the distribution of weight on the Earth's crust will shift from land to sea. This shift in weight distribution could cause volcanoes to erupt more often, some studies suggest.

- **Desert bacteria dies**

Desert soil may appear desolate and void of life, but it actually teems with bacteria. Bacterial colonies can grow so thick that they form sturdy layers called biocrusts that stabilize soil against erosion. As temperatures become more erratic with climate change, desert bacteria may struggle to adapt, leaving desert soil more prone to erosion.

Source: *www.livescience.com*

Advancements in Wind Turbine Technology

Wind power capacity has increased dramatically recently and accompanying that, the turbines that produce it have become more powerful, more efficient and more affordable for power producers. Those differences come in many different areas — rotors, controls, electronics and gearboxes — but the advancing technology used in wind power production have always aimed for the same goal: making wind power a better choice for power generation. While a previous focus of the industry was increasing the total nameplate capacity of wind turbines, the focus has shifted to the capacity factor of the turbine, which helps keeps energy cost low by providing the most possible power. One of the deciding forces so far for increasing capacity factors has been an increase in the size of the rotors used on wind turbines. Increasing the size of the turbine rotors creates new challenges

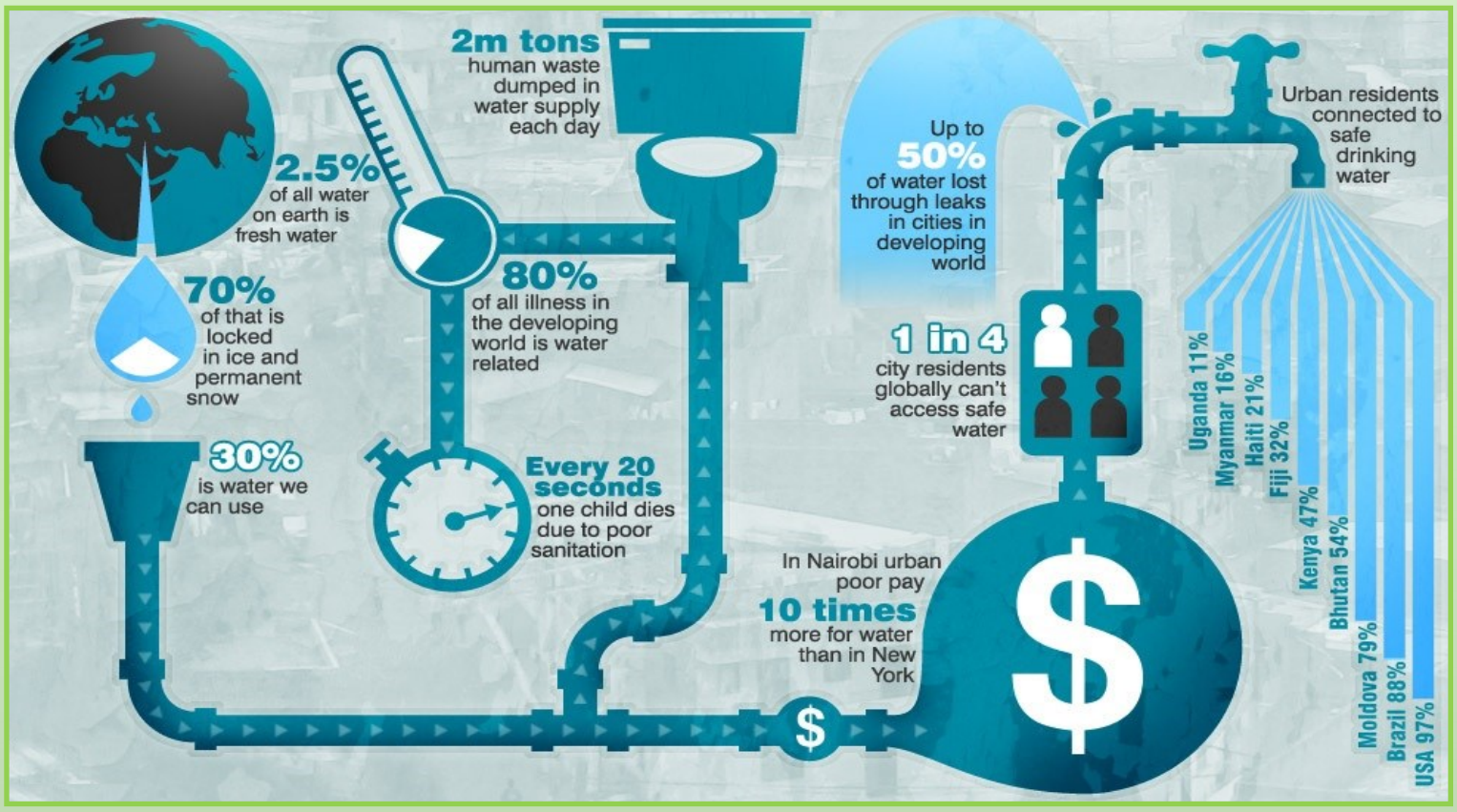
for manufacturers. Turbine rotors are affected by two different forces: torque, which turns the rotors and creates energy, and thrust, which pushes against the turbine. Dealing with thrust can be difficult when designing a rotor.

While the focus on increasing the power produced from wind turbines may be on the capacity factor, another way is to make sure wind turbines are operational and available. While companies used to take the same wind turbine used on land and installed it offshore. Companies are also looking at the use of floating wind turbines, which use floating structures instead of requiring wind towers be set into a foundation under water.

Computer simulation can be useful to companies as they look to increase the capacity factor of turbines. .Companies are able to use software to create a virtual lab and set up the blade in the lab. The simulations will allow designers to see the coefficient of lift and drag across the blade on both the top and bottom surface.

The technological advances made with wind turbines have resulted in clear bottom line: Wind power is more efficient and affordable than it has ever been, which has helped drive its popularity along with power prices and incentives.

Source: *renewableenergyworld.com*



As the year draws near, we bid farewell to our beloved seniors Navdeep Agarwal and Ibrahim A. Katthawala .Wishing you great success in all the avenues of life.

CONFERENCE ALERT

- **1st National Power & Energy System Conference (NPESC-2014)**

  Date: 25th April 2014

  Location: Sultanpur, India

- **International Research Conference on Engineering, Science and Management 2014 (IRCESM 2014)**

  Date: 4th June 2014

  Location: Dubai, United Arab Emirates

QUIZ

1.How much energy(%) from a coal power plant makes it to customers as electricity?

2.What country is the premier source of steel for nuclear power plants?

3.Solar cells are simple photovoltaic devices that convert solar energy directly into electricity and are manufactured from the second-most abundant element in the earth's crust. Name it.

Send your entries to *mnit.energyheadlines@gmail.com*

The winners of last quiz are :

Rahul Verma (IIIrd Year, Computer Engg.)

CREDITS

- **Amit Kumar Aman** (II Year, Civil Engg.)
- **Bhupendra Pratap Singh** (II Year, Mechanical Engg.)
- **Kundan Kumar Gupta** (II Year, ECE)
- **Mayank Singhvi** (II Year, ECE)
- **Rupesh Kumar** (II Year, Metallurgical & Materials Engg.)
- **Dr. –Ing Jyotirmay Mathur**

(HOD , Centre for Energy and Environment)

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