TECHNOLOGY ROUNDUP

A NEWS BULLETIN FROM
Technology Information Section (TIS)
Pakistan Scientific & Technological Information Centre

PASTIC

Jan-Feb, 2011 Vol. 3, No. 1

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Tech News

Indigenous Technology

Solar Still Technology for Potable Safe Water in Rural Areas

Supply of fresh and clean drinking water is a basic need for all human beings. Many people throughout the world do not have access to clean water and the problem of availability of adequate supplies of safe drinking water is worsened with increase in human population.

The presence of high level of salts in water is a great threat to human life. About eighty percent of all illnesses in the developing world results from waterborne diseases. Since majority of people live in rural areas where the low population density and remote locations make it very difficult to install the traditional clean water solutions. Due to high cost to treat contaminated water by the current technological processes it is not considered suitable to utilize these technologies. The locally developed solar still technology could provide one of the possible solutions to this problem. A research was conducted to develop a cheaper solar still which could be easily fabricated with less technical expertise. The effectiveness of sand bed as base energy absorbing surface to evaporate brackish water was studied and its performance was compared with those obtained from conventional basin type solar still.

Scientists at Mechanical Engineering Department of Quaid-e-Awam University of Engineering, Science & Technology, Shaheed Banazirabad, Nawabshah carried out a research to determine effectiveness of common sand bed for desalination of brackish water. A locally manufactured basin type solar still having equal angled double slope covers with an effective area of 1.5m^2 using common sand as solar energy absorber medium was used. Various samples of water with different degree of hardness were collected from the different areas in the vicinity of QUEST (Quaid-e-Awam University of Engineering, Science & Technology, Shaheed Banazirabad, Nawabshah). The system under study showed good performance in terms of quality of water. It was observed that concentration of salts was reduced at remarkable level. The chemical analysis of the desalinated water showed significant reduction in TDS and pH values. The present set-up showed identical performance as compared to the conventional basin type solar still.

Sand bed system provides cheaper system for application in rural areas for getting potable water. Solar still could be an attractive option to overcome potable water shortage problems in remote areas. An optimum brine depth of 20mm was determined for maximum water production in the solar still. Maintenance, energy costs, reliability, water quality are the advantages of solar distillation system. Hike in energy prices and scarcity of fresh water seem bound to create early market for small manufactured solar water distilling units. Although the input of one still is not sufficient for daily requirement of average family comprising of four members, it could be enhanced by increasing surface area of the solar still.

Courtesy:

Prof. Dr. Abdul Hameed Memon
Dean Faculty of Engineering
Quaid-e-Awan University of Engineering Sciences & Technology, Shaheed Banazirabad, Nawabshah

Nanoscale Iron for cleaning the Environment; Ultrafine Particles destroy Toxic Compounds

Arlington, VA An ultrafine, nanoscale powder made from iron, is turning out to be a remarkably effective tool for cleaning up contaminated soil and groundwater. Lehigh University environmental engineer Wei-xian Zhang said that Iron's cleansing power stems from the simple fact that it rusts, or oxidizes. Ordinarily, the only result is the familiar patina of brick-red iron oxide. But when metallic iron oxidizes in the presence of contaminants such as trichloroethene, carbon tetrachloride, dioxins, or PCBs, these organic molecules get caught up in the reactions and broken down into simple carbon compounds that are far less toxic. Likewise with dangerous heavy metals such as lead, nickel, mercury, or even uranium,: The oxidizing iron reduces these metals to an insoluble form that tends to stay locked in the soil, rather than spreading through the food chain. Iron itself has no known toxic effect just as well, considering the element is abundant in rocks, soil, water, and about everything else on the planet. For all those reasons, many companies now use a relatively coarse form of metallic iron powder to purify their industrial wastes before releasing them into the environment.

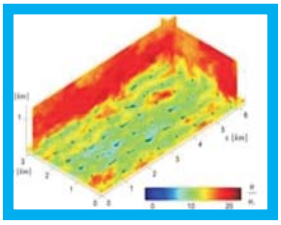
Zhang told that they are some 10 to 1000 times more reactive than conventional iron powders, because their smaller size collectively gives them a much larger surface area, but they can be suspended in a slurry and pumped straight into the heart of a contaminated site like an industrial-scale hypodermic injection. Once there, the particles will flow along with the groundwater to work their decontamination magic in place, a vastly cheaper proposition than digging out the soil and treating it shovelful by shovelful, which is how the worst of the Superfund sites are typically handled today.

According to Zhang, nanoscale iron is similar biological treatments that use specialized bacteria to metabolize the toxins. But unlike bacteria, the iron particles aren't affected by soil acidity, temperature, or nutrient levels. Moreover, because the nanoparticles are between 1 and 100 nanometers in diameter, which is about ten to a thousand times smaller than most bacteria, the tiny iron crystals can actually slip in between soil particles and avoid getting trapped.

Laboratory and field tests have confirmed that treatment with nanoscale iron particles can drastically lower contaminant levels around the injection well within a day or two, and will eliminate all within a few weeks reducing them so far as to meet federal groundwater quality standards. The tests also show that the nanoscale iron will remain active in the soil for 6 to 8 weeks, or until what is left of it dissolves in the groundwater. And after that, it will be essentially undetectable against the much higher background of naturally occurring iron.

http://www.nsf.gov

Optimizing large Wind Farms



Wind farms around the world are large and getting larger. Arranging thousands of wind turbines across many miles of land requires new tools that can balance cost and efficiency to provide the most energy for the buck. Charles Meneveau at Johns Hopkins University, and his collaborator Johan Meyers from Leuven University in Belgium, have developed a model to calculate the optimal spacing of turbines for the very large wind farms of the future. The optimal spacing between individual wind turbines is actually a little farther apart than what people use these days.

The blades of a turbine distort wind, creating eddies of turbulence that can affect other wind turbines

farther downwind. Most previous studies have used computer models to calculate the wake effect of one individual turbine on another. Starting with large-scale computer simulations and small-scale experiments in a wind tunnel, Meneveau's model considers the cumulative effects of hundreds or thousands of turbines interacting with the atmosphere.
The energy a large wind farm can produce, depends less on horizontal winds and more on entraining strong winds from higher in the atmosphere. A 100-meter turbine in a large wind farm must harness energy drawn from the atmospheric boundary layer thousands of feet up.
In the right configuration, lots of turbines essentially change the roughness of the land much in the same way that trees do and create turbulence. Turbulence, in this case, is not a bad thing. It mixes the air and helps to pull down kinetic energy from above.
Using as example 5 megawatt-rated machines and some reasonable economic figures, Meneveau calculates that the optimal spacing between turbines should be about 15 rotor diameters instead of the currently prevalent figure of 7 rotor diameters.
http://www.aip.org/

Cell Phone Sensors detect Radiation to Thwart Nuclear Terrorism

Researchers at Purdue University are working with the state of Indiana to develop a system that would use a network of cell phones to detect and track radiation to help prevent terrorist attacks with radiological "dirty bombs" and nuclear weapons. Professor Ephraim Fischbach working with Jere Jenkins, Director of Purdue's Radiation Laboratories told that such a system could blanket the nation with millions of cell phones equipped with radiation sensors able to detect even light residues of radioactive material. Because cell phones already contain global positioning locators, the network of phones would serve as a tracking system. According to Fischbach the ubiquitous nature of cell phones and other portable electronic devices give this system its power. It is meant to be small, cheap and eventually built into laptops, personal digital assistants and cell phones
The system was developed by Andrew Longman, a consulting instrumentation scientist, who developed the software for the system and then worked with Purdue researchers to integrate the software with radiation detectors and cell phones. Tiny solid-state radiation sensors are commercially available. The technology is unlike any other system, particularly because the software can work with a variety of sensor types. Cell phones today also function as Internet computers that can report their locations and data to their towers in real time. So this system would use the same process to send an extra signal to a home station. The software can uncover information from this data and evaluate the levels of radiation. The researchers tested the system, demonstrating that it is capable of detecting a weak radiation source 15 feet from the sensors.
Long before the sensors would detect significant radiation, the system would send data to a receiving center. Fischbach told that the sensors do not really perform the detection task individually. The collective action of the sensors, combined with the software analysis, detects the source. The system would transmit signals to a data center, and the data center would transmit information to authorities without alerting the person carrying the phone. If radioactive material is transported through a car the cell phones of the people around that area individually would send signals to a command center, allowing authorities to track the source.The signal grows weaker with increasing distance from the

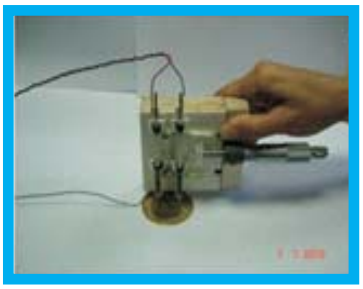
source, and the software is able to use the data from many cell phones to pinpoint the location of the radiation source.
In addition to detecting radiological dirty bombs designed to scatter hazardous radioactive materials over an area, the system also could be used to detect nuclear weapons, which create a nuclear chain reaction that causes a powerful explosion. The system could also be used to detect spills of radioactive materials.
The system could be trained to ignore known radiation sources, such as hospitals, and radiation from certain common items, such as bananas, which contain a radioactive isotope of potassium.
The team is working with Karen White, Senior Technology Manager at the Purdue Research Foundation, to commercialize the system.
http://www.purdue.edu/

Creating 'Living' Buildings

The University of Greenwich's School of Architecture & Construction is poised to use ethical synthetic biology to create 'living' materials that could be used to clad buildings and help combat the effects of climate change.

Researchers from the University of Greenwich are collaborating with others at the University of Southern Denmark, University of Glasgow and University College London to develop materials that could eventually produce water in desert environments or harvest sunlight to produce biofuels.
In collaboration with an architectural practice and a building materials' manufacturer, the idea is to use protocells bubbles of oil in an aqueous fluid sensitive to light or different chemicals to fix carbon from the atmosphere or to create a coral-like skin, which could protect buildings.
Professor Neil Spiller, an architect and the head of the University of Greenwich's School of Architecture & Construction, said the research team was looking at methods of using responsive protocells to clad cities in an ethical, green and sustainable way. Protocells made from oil droplets in water allow soluble chemicals to be exchanged between the drops and their surrounding solution.
The Center for Fundamental Living Technology at the University of Southern Denmark has managed to get cells to capture carbon dioxide from solution and convert it into carbon-containing materials. Such cells could be used to fix carbon to create ways of building carbon-negative architecture.
An installation displayed in the Canadian Pavilion in the Venice Biennale 2010, Hylozoic Ground, created by Canadian architect Philip Beesley, provides an example of how protocells may be used to create carbon-negative architectures. Protocells situated within the installation recycle carbon dioxide exhaled by visitors into carbon-containing solids. Similar deposits could be used to stabilise the city's foundations by growing an artificial limestone reef beneath it. Professor Spiller said that they want to use protocell bubbles to fix carbon or precipitate skin that they can then develop into a coral-like architecture, which could petrify the piles that support Venice to spread the structural weight-load of the city.
http://www2.gre.ac.uk/

Forensic Metal Fingerprinting: Simple, Handheld Device can measure Corrosion on Machine Parts



Dr John Bond's method of identifying fingerprints on brass bullet-casings, even after they have been wiped clean, was based on the minuscule amounts of corrosion which can be caused by sweat.Now, working with scientists in the University of Leicester Department of Chemistry, Dr Bond has applied the technique to industry by developing a simple, handheld device which can measure corrosion on machine parts. Corrosion leads to wear and tear and needs to be carefully monitored so that worn parts are replaced at the appropriate time so this invention should prove a boon to the manufacturing sector. This is a new, quick, cheap and easy way of measuring the extent of corrosion on copper and copper based alloys, such as brass. Dr Bond, an Honorary Research Fellow in the University's Forensic Research Centre and Scientific Support Manager at Northamptonshire Police told that it works by exploiting the discovery made during the fingerprint research that the corrosion on brass forms something called a 'Schottky barrier' and is used to see how much the metal has corroded. Such measurements can already be made but this is quick cheap and easy and can be performed 'in the field' as it works off a nine-volt battery.Dr Bond said that measuring corrosion of metal such as brass is important to ensure that machinery does not operate outside its safe limits. This could be anything from checking that a water pipe will not burst open to ensuring that the metal on an airplane is not corroded. This could lead, for instance, to the wheels falling off a jet. Having a corrosion measurement means for copper and alloys such as brass that is quick portable and cheap enables metals to be tested in situation with no prior set up of a corrosion measuring device. Also, rather than simply saying that the brass is corroding this technique enables the type of corrosion to be determined. As to which one it gives clues as to how severe the corrosion is. This can be done already with something like X-ray Photoelectron Spectroscopy (XPS) but that is lab based and very expensive to use. Our technique works off a 9-volt battery. In that sense, it won't tell you any more than XPS can, it is just quicker, cheaper and easier. A common use of brass in industry is heat exchangers as brass is a good conductor of heat. If these are water based, then seeing how the water is corroding the brass is useful. Also, you simply need to be able to touch the brass with a probe; there is no other setting up required. It's as easy as taking your temperature with a thermometer. There is much research on inhibiting the corrosion of brass because of its use in heat exchangers and industrial pipe work, this technique enables the degree of corrosion to be easily measured.A description of the prototype device has been published in the journal Review of Scientific Instruments. Dr Bond and his colleagues are now looking for a company which could exploit the invention and place it on the market.
http://www.alphagalileo.org

Satellite Data for monitoring Groundwater in Agricultural Regions

Scientists at Stanford have found a way to cheaply and effectively monitor aquifer levels in agricultural regions using data from satellites that are already in orbit mapping the shape of Earth's surface with millimeter precision. The amount of water in a groundwater system typically grows and shrinks seasonally. Rainfall and melted snow seep down into the system in the cooler months, and farmers pull water out to irrigate their crops in the warmer, drier months. In agricultural regions, groundwater regulators have to monitor aquifer levels carefully to avoid drought. They make do with direct measurements from wells drilled into the aquifers, but wells are generally few and far between compared to the vast size of most groundwater

systems.
Groundwater regulators are working with very little data and they are trying to manage these huge water systems based on that. But now, Reeves has shown how to get more data into the hands of regulators, with satellite-based studies of the ground above an aquifer.
As the amount of water in an aquifer goes up and down, specialized satellites can detect the movements of the land above the water system and hydrologists can use that information to infer how much water lies below. Previously, accurate elevation data could only be acquired on barren lands such as deserts. Plants -- especially growing crops, whose heights change almost daily -- create "noise" in data collected over time, reducing their quality. A team of scientists led by Jessica Reeves has found a way around this growing problem.
Reeves and Rosemary Knight, a geophysicist in collaboration studied groundwater systems, and Howard Zebker, a geophysicist and electrical engineer used satellite-based remote sensing techniques to study the Earth's surface. Knight and Zebker hoped that the combination of their expertise, and the efforts of their graduate student, would lead to new ways of using satellite data for groundwater management.
Reeves analyzed a decade's worth of surface elevation data collected by satellites over the San Luis Valley in Colorado. Although the valley is rich with growing crops, Reeves and her advisers hoped that recent advances in data-processing techniques would allow to gain an understanding of the aquifer that lay below. As part of analysis, Reeves produced maps of satellite measurements in the valley and saw a regular pattern of brightly colored high-quality data in a sea of dark, low-quality data. After overlaying the maps with a Google Earth image of the farmland, the team realized that the points of high-quality data were in the dry, plant-free gaps between circles of lush crops on the farms.In the San Luis Valley, the majority of irrigation is done by center-pivot irrigation systems. Like a hand on a clock, a line of sprinklers powered by a motor moves around, producing the familiar circles seen by airline passengers.
The circles do not overlap, leaving small patches of arid ground that don't receive any water and so don't have any plants growing on them. Reeves confirmed that these unvegetated data points were trustworthy by comparing the satellite data to data collected from wells in the area exactly the kind of proof that would be important to hydrologists studying aquifers.

The satellites use interferometric synthetic aperture radar, known as InSAR. It is a radar technique that measures the shape of the surface of Earth and can be used to track shape changes over time. Earth scientists often use InSAR to measure how much the ground has shifted after an earthquake.While continuously orbiting, a satellite sends an electromagnetic wave down to the surface. The wave then bounces back up and is detected by the satellite. The properties of the wave tell scientists how far the wave traveled before it was reflected back. This distance is directly related to the position of the ground.
After the satellite completes a circle around the globe, it returns to the same location to send down another radar wave and take another measurement. Measurements are taken every 35 days and data collection can go on for years.Compared to drilling wells for monitoring groundwater aquifers, using InSAR data would be much cheaper and provide many more data points within a given area. Traditional methods rely on wells that were not built with scientific data sampling in mind and their results can be inconsistent. Moreover, the number of wells drilled into any particular aquifer is much too small to be able to cover the entire groundwater system. Reeves told that it really has potential to change the data collected to manage our groundwater.
http://www.stanford.edu

Forthcoming Tech Events

2nd International Conference on Environmental Science and Technology 2011

26-February, 2011
Singapore
www.icest.org

Symposia on Building Effective Coordination between R&D and Industry for Enhancing Innovations, Competitiveness and Productivity of Indigenous Technologies

12 February, 2011
Faislabad, Pakistan
www.pastic.gov.pk

1st National Conference on Soft Computing and Information Technology

3-4 March 2011
Mahshahr, Iran
http://ncscit.ir/2011

Health Asia

22 - 24 March 2011
Karachi, Pakistan.
www.health-asia.com

8th Engineering Asia International Exhibition and Conference

28 - 30 March 2011
Karachi Expo Centre, Karachi
www.engineeringasia.net

ITIF Asia (International Trade & Industrial Machinery Show)

28 - 30 March 2011
Karachi, Pakistan.
www.itifasia.com

BIT`s 2nd Annual World Congress of Petromicrobiology 2011

25-27 April, 2011

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Specification:
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color-LVD
Rendering index: Ra 80
Efficiency: 90 lumen per watt
Operating voltage: 280 volts.

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