

Reflection ia - a quarterly musing

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Dear Reader,

It is a great achievement for **iAes** as it has crossed the 4th year successfully. It is thus a pleasure in bringing out "**Reflection ia**".

i@es is an organization which provides consultancy services ranging from climatic design, HVAC, PHE, Fire, Electrical and plumbing.

As we enter 2008, we realize that the scientific and environmental challenges of 21st century loom on the horizon like a threatening storm that could impact quality of life and even life on earth. Renewable energy, climate change, global warming, water crisis, urbanization and industrialization, food safety, disaster and security are few of the issues talked about at Environmental forums. But the question is how many of us are taking a step towards eradicating these global problems?

A simple yet innovative technology is being used by us at Hyderabad for cooling the hot interiors of a building during summers. It is known as passive downdraft evaporative cooling and has been explained in detail in karma. Our guest column,

Athithi exemplifies the use of wind energy to produce electricity in the form of micro wind turbines. It also states usage of alternatives in creating a GREEN building. Finally Bimba illustrates the different physiochemical processes which are an integral part of our environment and emphasizes on some harmful elements and various water borne diseases that affect human beings.

Sustainable buildings:

Buildings are the most important source of greenhouse gas emissions. The good news: no other sector offers a cheaper way to cut emissions and save energy. In a layman's language, Green buildings means a structure that does not pollute. It has been formulated that about fifty percent of all carbon dioxide emissions results from cooling, heating and generating electricity for buildings. The United Nations Environment Programme (UNEP) released a report in April 2007 highlighting the importance of energy efficient buildings in the global campaign to combat climate change.

"By some conservative estimates, the building sector worldwide could deliver

emissions reductions of 1.8 billion tons of CO₂," says UNEP. "A more aggressive energy efficiency policy might deliver over two billion tons or close to three times the amount scheduled to be reduced under the Kyoto Protocol."

The UNEP report, entitled "Buildings and Climate Change: Status, Challenges and Opportunities" said that applying ambitious standards could yield quick results. Europe, for example, could reduce a fifth of its energy consumption and 45 million tons of CO₂ per year by 2010 through better efficiency in new and existing buildings.

It's the building sector that is rising at one and a half to two percent a year in terms of carbon emissions.

There are already a few high-profile projects focused on cutting emissions from buildings. In May 2007, the Clinton Climate Initiative launched the Energy Efficiency Building Retrofit Program, a five billion-dollar project that will reduce energy consumption in existing urban buildings with the involvement of city governments and corporate investment.

Let us foresee the future and open doors to welcome efforts that make Mother Earth a much better place to live in.

Company highlights

Some of the energy efficient buildings designed by i@es are (energy consumption cut down by 20% to 50% whilst not more than overall 10% extra investment)

HAREDA: office space for Haryana renewable energy development authority. Chandigarh:
Architect: The Elements / Sanjay Prakash & Associates

Conzerv-4: office space for Conzerv systems pvt ltd. Bangalore
Architects: Gayathri and Namith pvt ltd

Soundarya: office space for Soundarya Decorators pvt ltd, Chennai
Architect: Anand & Associates

Shopping Mall for Deccan mining: A shopping mall project at Bangalore
Architect: DKA, Bangalore

Codissia Trade fare centre: An internal trade fare centre at Coimbatore.
Architects: Gayathri and Namith pvt ltd

We hope this newsletter helps you to get a better insight to environmental problems and its solutions.



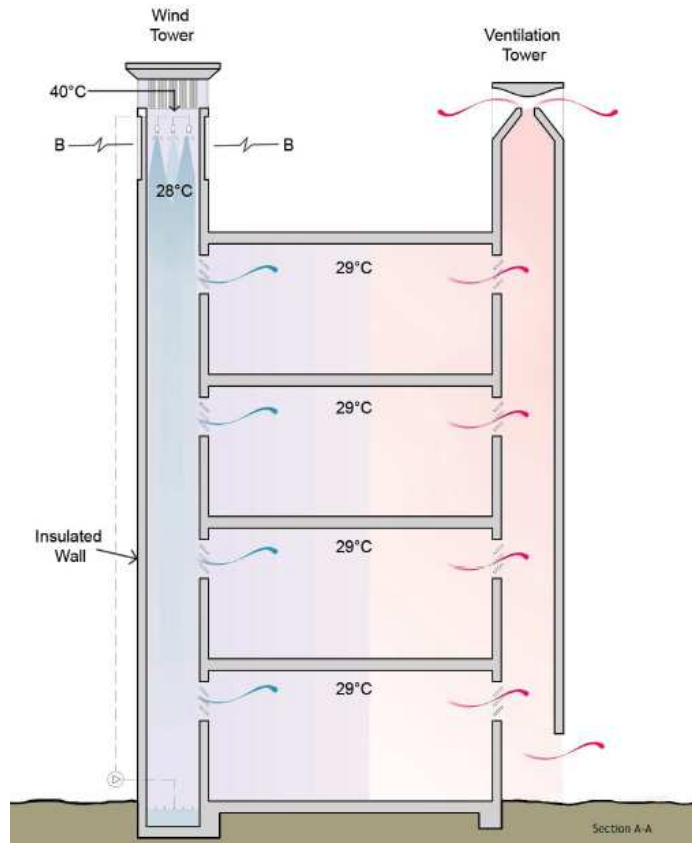
Passive down draft evaporative cooling (PDEC)

At ROYAL COLLEGE OF ENGINEERING AT MEDCHAL, HYDERABAD. This project is designed by i@es

Passive down draft evaporative cooling is a technique that has been used for many centuries in parts of the middle east, notably Iran and Turkey. In this tradition, wind catchers guide outside air over water filled porous pots, inducing evaporation and bringing about a significant drop in temperature before the air enters the interiors. The most common contemporary application of evaporative cooling is what is popularly known as the desert cooler or swamp cooler. A perforated box with wet pads on three sides through which outside air drawn by means of an electric fan. The air introduced into the interior space may only be cooled to above 3-6 °C above the ambient wet bulb temperature, so that large quantities of

air are required to achieve thermal comfort, if the ambient humidity is fairly low.

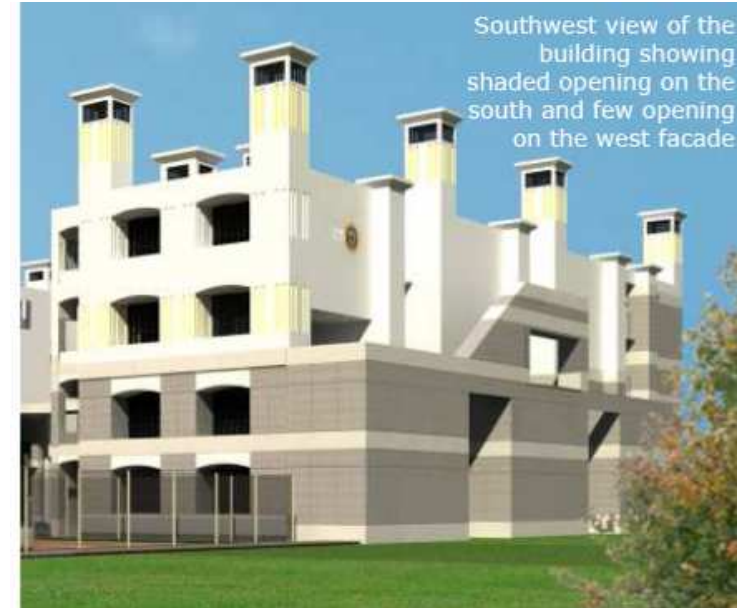
Where summers in Hyderabad are hot and dry with a mean average daytime temperature of 35 °C and relative humidity of 20-25%. Therefore the design for the building could incorporate an evaporative cooling system. The proposed system comprises of a down draft evaporative cooling tower to provide cooling. The fine drops of water will be sprayed vertically downwards with the help of



micronise rs.

The cooling tower capitalizes on the vertical flows generated by thermal conduction: the cooled air, both denser and moister than its surroundings,

tends to sink and draw an ambient air in its wake. The rate of air exiting the down draft tower, then, is ideally controlled by the temperature differential b/w the cooler air inside the tower and warmer outdoor air. Such a thermosiphonic process is based on free convection which occurs in the presence of local thermal imbalance, which subsequent differences in air density leading to the movement of air from a zone of high pressure to one of lower pressure. The thermal force driving the air through an evaporative cool tower is created by the introduction of water spray at the top of the tower. The magnitude of the thermosiphonic force thus depends on the temperature difference b/w the air at the inlet at the top of tower and the outlet at the bottom. The temperature difference is greatest if the ambient air is warm and very dry and when enough water is added to the airflow to



produce saturation condition throughout the length of the tower.

The stale air in the room is then exhausted through the high level outlets located across the class room. These outlets will lead the air through the perimeter shafts to exhaust the air. The perimeter shafts which allow stale air to either fall (in still air conditions) or rise (in windy conditions). Since the prevailing wind is also from the southwest, this approach avoids the potential problems of positive pressure on the exhaust air vents.

This project has got rated by LEED, USGBC and first educational building to get LEED rating.

Architects: INERTIA, Hyderabad
Sustainability Consultants: Price & Myers, UK
Building services consultants: i@es, Bangalore.



Athithi Micro Wind Turbines

By Manu Sharma

A new invention in wind turbine design promises to revolutionize distributed generation of wind power.

Wind power is one of the fastest growing renewable energy technologies with its worldwide capacity having quadrupled between 2000 and 2006. Denmark, Spain and Germany are the leaders with wind power contributing to 18%, 9% and 7% of electricity use in each of the respective country. Although in India it does not make up a significant share but we have been quite successful in entrepreneurial sphere with Suzlon now being world's fifth-largest producer by installed megawatts of capacity in projects around the world¹.

Micro Wind Turbines for Distributed Power Generation

Recently a breakthrough has been achieved that brings down the cost of wind power dramatically. Lucien Gambarota, a French inventor and product developer, in association with University of Hong Kong has developed micro wind turbines which he claims can reduce initial capital investment for electricity generation to as low as US\$200 per kilowatt as compared to US\$600 for coal and



US\$1500 for conventional wind turbines.

The main innovation lies in using a number of small turbines together in combination rather than a single large one. While traditional wind turbines can be as large as 114 m diameter (world record by Enercon E112), Gambarota's micro turbines are only 25 cm in diameter. When hundreds of these are linked with each other mounted on frames, they generate as much power as a traditional large turbine. Groups of these turbines can be arranged in an array of shapes and sizes, ranging from about two up to thousands of square meters, depending on how much energy is needed and how much space is available. The energy generated by the turning of the plastic wheels is converted into electricity by a generator attached at the end of a row. This is then stored in a battery, which powers electrical appliances.

A big advantage with these turbines is that while large wind turbines need wind speed in excess of 5-10m/s, micro turbines can generate power at extremely low wind speeds of 2m/s. "We never stop this machine and they never stop because there is always one meter per second wind - 365 days, 24 hours a day, they keep working," said Gambarota in an interview. "They deliver different levels

of energy because the wind changes but these turbines they keep moving, they keep spinning."

Micro turbines are also perfect for installing on rooftops and balconies at windy locations. According to Gambarota, someone with an annual electric bill of 1500 kWh (units) can eradicate their entire bill by installing just 10 square meter of micro turbines at a location with an average 4m/s wind velocity.

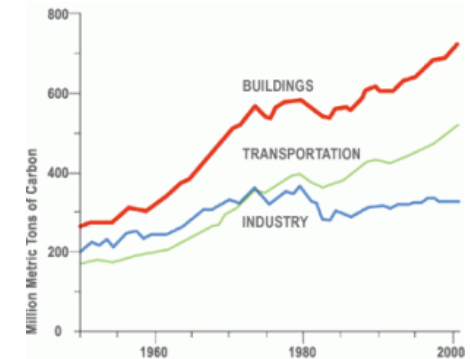
Unlike a traditional turbine, micro turbines don't have to turn to face the wind as they can take wind from both front and back as well as with a wide acceptance angle from the sides. Traditional large turbines have sensors placed in them that measure wind direction and have motors to turn them to face incoming wind. They must stand perpendicular to the wind direction to perform. Micro turbines are also easy to maintain since they are low and accessible.

Renewable Energy and Building Industry

Few people in building sector realize that **buildings are the single largest contributor to global warming**². If

² "Unknowingly, the architecture and building community is responsible for almost half of all U.S. greenhouse gas emissions annually. Globally the percentage is even greater": U.S. Energy Information Administration statistics (For more information visit:

<http://architecture2030.org/>



you combine the embodied energy of building materials such as cement, tiles, glass, iron etc and the energy required for operating residential, commercial and industrial buildings, then buildings are the largest greenhouse gas emitting sector.

Therefore it's important that the building sector takes the lead to prevent climate change by adopting sustainable practices. This can be done in three ways simultaneously:

- Using less material for construction and selecting material with reduced embodied energy
- Dramatically limiting energy consumption over lifetime of a building by employing green architecture design
- Promoting use of renewable sources of energy such as solar PV, geothermal and micro wind turbines

It is high time that architects, engineers and developers around the world adopt sustainable practices in every project

Manu Sharma is a user experience consultant with an active interest in energy future and climate change. He manages an online discussion group called Green-India on this topic. He can be reached at manu@orangehues.com.

¹ The Ascent of Wind Power: New York Times <http://tinyurl.com/328lyh>
P-8



Bimba

Water borne diseases and treatment

Water Borne Diseases

Caused by **Bacterial** Infections:

- Typhoid fever and Paratyphoid fever- Salmonella typhi bacteria.
- Cholera- Vibrio Cholera Bacteria.
- Bacillary dysentery- Shiga bacillus or Flexner bacillus or Sonne bacillus.

Caused by **Viral** Infections:

- Infectious Hepatitis or Infectious Jaundice- Hepatitis Virus.
- Poliomyelitis-Polio Virus

Caused by **Protozoal** infections:

- Amoebic Dysentery- Entamoeba Hystolytica

Diseases due to chemicals present in the water

Arsenic, As	Acute or chronic toxicity to humans. Arsenic poisoning (Arsenicosis) can range from pigmentation, skin hardening and development of raised wartlike nodules, and skin cancer. Other
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	forms of cancer, such as bladder, lung and kidney may also result. Other resulting problems are peripheral vascular disease, resulting in gangrene, hypertension and ischemic heart disease, liver damage and diabetes mellitus.
Chlorine, Cl⁻	Eye, nose irritation; Stomach discomfort.
Fluorine, F⁻	Excessive fluoride levels in drinking water are the cause of mottled enamel (dental fluorosis). At decreasing levels, dental caries becomes a serious problem.
Lead, Pb	Highly toxic and probable carcinogen. Causes brain and kidney damage. In youngsters it may result in mental retardation and even convulsions in later life.
Nitrate, NO³⁻	Toxic to infants at higher concentrations.
Nitrite, NO²⁻	More toxic than nitrate, but less stable.
Sodium, Na	Harmful to some persons with cardiac problems.
Sulfide, S²⁻	Undissolved hydrogen sulfide (H ₂ S) is the toxic entity.
Zinc, Zn	Relatively non-toxic to humans and animals. Essential nutrient for life.

Antimony, Sb	Exhibits toxic effects- major toxic symptoms involve the gastrointestinal tract, heart, respiratory tract, skin, and liver. Some evidences implicate antimony in reproductive problems for women.
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Water treatment process

Process	Description
Coagulation	Coagulation is the process of destabilizing colloidal particles so that particle growth can occur as a result of particle collisions, using chemicals which effectively glue small suspended particles together, so that they settle out of the water or stick to sand or granules in case of Filter media.
Sedimentation	It is the process of allowing suspended particles get collected at the bottom, by providing suitable time of detention. The process is efficient when specific gravity of the particles is considered.
Filtration	The process of passing the water through the beds of filtering media of granular materials to remove the suspended particles. Filtration may help in removing color, odor, turbidity and

	pathogenic bacteria from water.
Neu-tralization	This is the process of adding the acidic/alkaline solutions to the water to bring neutralize the pH of the water, suitable for treatment processes.
Softening	Softening is the method of removing the hardness caused due to ions (Mg ²⁺ , Ca ²⁺ salts) from the water.
Reverse Osmosis	A mechanical pressure is applied to the impure solution to force pure water through a semi-permeable membrane.
Distillation	The contaminated water is heated to form steam. Inorganic compounds and large non-volatile organic molecules do not evaporate with the water and are left behind. The steam then cools and condenses to form purified water.
Ion-exchange	It is the process of removal of TDS or mainly hardness causing ions using proper resins depending upon the charge of the desired pollutants to be removed.

