# Smart Environs

*a quarterly musing of McD BERL* *April– June 2010 Issue*

**Inside this issue:**



# VANI

**Dear Reader,**

Earthday is celebrated on 22nd April 2010, It's a day to elate consciousness and perceptiveness of our Earths environment. Conservation of endangered species is crucial on Earths day. However, circumspection of our day to day activities to protect our planet is equally important.

**Impact of mining on the environment:** The environmental responsibility of mining operations is protection of the air, land, and water. But in practice it is very different, it has severe impact on **Air, water and land.** Suspended particles in the air such as arsenic, cadmium, and lead affects the human health adversely by contributing to illnesses relating to the respiratory tract, such as emphysema, but they also can be ingested or absorbed into the skin. Land mining declines the wild life plant species, and damages the buildings and roads. Water pollution problems caused by the mining include acid mine drainage, metal contamination and increased sedimentation levels in streams. The siltation affects fisheries, swimming, domestic water supply, irrigation, and other uses of streams. Eg: The Iron Mountain mine in California, USA has been closed since 1963 but continues to drain sulfuric acid and heavy metals (such as cadmium and zinc) into the Sacramento River. The river's bright orange water is completely devoid of life and has a pH of -3, which is 10,000 times more acidic than battery acid. Experts say the pollution may continue for another 3,000 years.

The Govt. of Karnataka in its cabinet meeting held on 20/02/2010 took a decision to permit the mining activity at Bolegowdanakatte in Mysore district, it is a catchment area for Kabini and Nugu dams. The area's earmarked for mining is 813 sqkm. This place is also declared as Reserved Tiger Forest by Ministry of Environment and Forest. Mr. M Lakshmana is an environmentalist and educationist and he is fighting against the environmental impacts of the proposed mining. Few statistics are given below about the impacts of mining,

**Land Affected**

| Causes | Affected area (Sq KM) |
|---|---|
| Coal mining (Jharia) | 71.27 sqkm |
| Coal mining in Chandrapur | 2139 hectares were lost |
| Total land lost in Karnataka | 10598 hectares |

**Tailing problems**

| | |
|---|---|
| 490 million tones of tailings | Silesian Coal Basin |
| 200 million tones of tailings | Shallow bay of calancan |
| 50100 tonnes of Cyanides solution from Tailings were released in somes, Danube rivers | Thousands of tones of fish were killed. |

**AMD Statistics:** Acid mine drainage

| | |
|---|---|
| 20MLD of AMD is released to one river | South Africa |
| 9 MLD to Brahmani River | India |

Highlights of the key projects we are associated with,

**Taj Kanha**

Architects: Sanjay Prakash & Associates.
Kanha National park, Madhyapradhesh.
McD Berl scope: PHE and HVAC works.

Scope in details: HVAC: Design of energy efficient air condition system. The tent is designed to reduce the air condition load by

60%. This is achieved through insulating the tent and cooling the external envelope by innovative mist cooling system. The occupant space is conditioned using energy efficient heat pump system. Winter temperature in Kanha drops to 1 °C, Occupant space is heated using radiant floor heating system along with heat pump.

PHE: Complete rain water is harvested and sewage is treated using Innovative Reed Bed system.

*"Smart Environs—quarterly musing" is a voice of McD Built Environment Research Laboratory Pvt Ltd. Sustainability & Building services consultancy company.*
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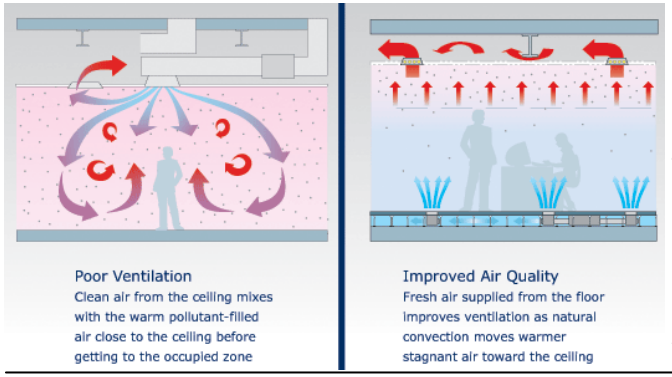
KARMA

# Under floor air distribution system for Mphasis– an HP company at Bangalore,

**Client: Mphasis, Bangalore.**
**Architect: Maya Praxis.**
www.mayapraxis.com
**Challenge**: Is to design under floor air distribution system to reduce the cooling energy.

Under floor air distribution (UFAD) is a method of delivering space conditioning in offices and other commercial buildings. UFAD being increasingly considered as a serious alternative to conventional ceiling-based air distribution systems because of the significant benefits that it can provide. This technology uses the open space (under floor plenum) between the structural concrete slab and the underside of a raised access floor system to deliver conditioned air directly into the occupied zone of the building. Air can be delivered through a variety of supply outlets located at floor level (most common), or as part of the furniture and partitions. UFAD systems have several potential advantages over traditional overhead systems, These include improved thermal comfort, improved indoor air quality, and reduced energy use. Significant improvements can be realized in terms of increased flexibility and reduced costs associated with reconfiguring building services. These can be accomplished by buildings heating, ventilating and air-conditioning (HVAC) system with all major power, voice and

| | Conventional system | Under floor Air distribution |
|---|---|---|
| Description | Diffusers are located in the ceiling, delivers air at13 °C | Diffusers are located in the floor, delivers air at 18 °C |
| Velocity (FPM) | 400—700 | 75-100 |
| Architectural requirements | Space above ceiling for duct work and ceiling diffusers | No false ceiling required or minimum false ceiling required. False Floor height of 300 mm required. |
| Thermal comfort | OK | Better |
| Ventilation effectiveness | Average or poor | Very good, Effective use of 100 % fresh air is possible. |
| Floor height | Can not be reduced due to false ceiling | Can be reduced , due to no false ceiling minimum false ceiling |




Data cabling into one easily accessible service plenum under raised floor.


These raised floor systems are particularly appropriate for office buildings housing today's businesses with their typically extensive use of information technologies and high churn rates.
With UFAD systems, conditioned air from the air handling unit (AHU) is ducted into the under floor plenum where it typically flows freely to the supply outlets. Under floor systems are generally configured to have a relatively large number of smaller supply outlets, many in close proximity to the building occupants, as compared to a conventional overhead system. Air is returned from the room at ceiling level . This produces an overall floor-to-ceiling air flow pattern that takes advantage of the natural buoyancy produced by heat sources in the office and more efficiently removes heat loads and contaminants from the space, particularly for cooling applications. In contrast to the well-mixed room air conditions of the conventional overhead system, stratification is actually encouraged above head height where increased temperatures and higher levels of pollutants will not affect the occupants.

| Description | Conventional | UFAD | % of Saving |
|---|---|---|---|
| Air conditioned area (sqft) | 28000 | 28000 | |
| Air-condition load (TR) | 120 | 84 | 30% |
| Dehumidified CFM | 52000 | 52500 | -1% |
| Supply air temperature (°C) | 13 | 18 | -13% |
| Air distribution cost (Lakhs) | 30 | 26 | 13% |
| False ceiling cost (lakhs) | 28 | 0 | 100% |
| False floor cost (lakhs) | 0 | 49 | -100% |
| Fresh air pre cooling (Lakhs) | 0 | 3.6 | -100% |
| **Total capital cost (Lakhs)** | **58** | **78.6** | **-26%** |
| Energy consumption (kWhr) - HVAC | 259200 | 181440 | |
| Energy cost (6 Rs per unit) - Lakhs | 15.55 | 10.89 | |
| Maintenance cost | 2.40 | 1.68 | |
| Total operational cost | **17.95** | **12.57** | **30%** |
| Simple payback | | | **3.8 years** |

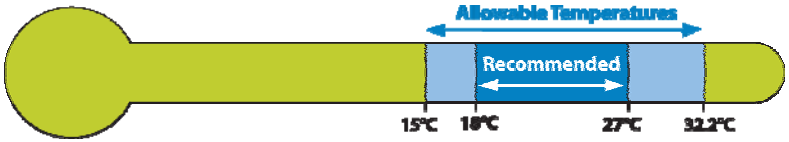
# Green Data centre- Design Tips by ECO-III

Article from ECO3

**Continued from previous issue.**

- Meter, Measure, Manage!

***Measuring where you are now is a good place to start.***




***Energy Benchmarking and Continuous Monitoring***

Energy benchmarking can be effective in helping to determine the efficiency of your current Data Center and to identify better-performing designs and strategies. As new strategies are implemented, energy benchmarking will enable tracking of performance.

The benefits of measuring, monitoring, and taking steps to optimize your energy efficiency also will enable you to extend the life and capacity of your existing Data Center infrastructure, as well as avoid millions of metric tons of carbon emissions that would result from expansion.

***Lowering PUE (Total Facility Energy/IT Equipment Energy)***

In a study of 25 Data Centers conducted by LBNL, roughly 87% of the site energy reaches the IT equipment in the best case, while in the worst case only 33% makes it to the IT equipment. The lower your Power Usage Effectiveness (PUE), the more efficient is your Data Center infrastructure (power distribution and cooling).

***Environment and Airflow***

You want to maintain your Data Centers at a comfortable temperature for your servers (not your staff). Recommended and allowable airflow, filtration, humidity, and temperature limits are all described in ASHRAE publications such as "Thermal Guidelines for Data Center Environments".

***Air Management Opportunities***

If you feel cold in your Data Center, you have an opportunity!

- Arrange racks in a hot aisle/cold aisle configuration and isolate the two. Your cold air supply could be in the mid -20s°C and your hot air return could be as high as 32-38°C. That is why you want to keep them separate.
- Consider using computer room air handlers (CRAHs) rather than computer room air conditioners (CRACs) for improved performance. Get variable speed fans to match server flow requirements.
- Optimally configure floor tile perforations, plug floor leaks, and install blanking plates in every unfilled rack.
- Continuously monitor temperature, humidity, and under floor pressure.

***Key Best Practices***

**Optimize the Central Plant**

- Typically, a central cooling plant and air handlers are more efficient than distributed air conditioning units. Begin with an efficient water – cooled variable speed chiller, add high efficiency air handlers, low-pressure drop components, and finish with an integrated control system that minimizes unnecessary dehumidification and simultaneous heating and cooling.
- Use temperature resets to allow use of medium-temperature chilled water (12.8°C or higher). Warmer chilled water improves chiller plant efficiency and eliminates the need for the chiller during many hours of operation (tower cooling).

***Free Cooling***

Can you design your Data Center for free cooling? Can you retrofit the outside air supply? Can you retrofit a water side economizer (use cooling tower to pre-cool return "chilled" water)? It is all about humidity and temperature.

***Right Sizing***

When the ultimate load is uncertain, Data Center cooling systems are often oversized and operate at inefficient part loads. Therefore, it makes sense to pre-install fixed elements such as ducts and pipes, but design for modular growth of the mechanical equipment. Include variable speed fans, pumps and compressors. Right size all your plant equipment; overbuilding in advance of actual needs makes many subsystems operate inefficiently.

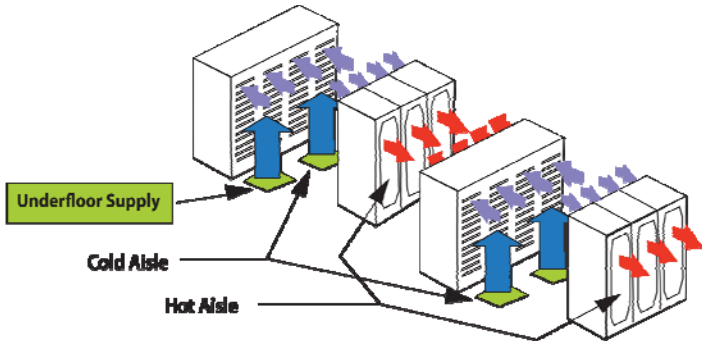
***Use Liquid Cooling of Racks and Computers***

Water is 3,500 times more effective than air on a volume basis; so it cools servers and appliances more efficiently than air conditioning! Today, you can purchase liquid cooled racks. Manufacturers are prototyping liquid-cooled computers as well.

***Cold and Hot Aisle Layout***

***People are Key***

Facilities and IT staff bring different perspectives to create better solutions when it comes to Data Center energy efficiency. Try inviting your counterpart to an informal meeting so you can begin to learn about their challenges and explain your own.




***How To Start***

-Commit to Improved Design and Operations

-Benchmark existing facilities

-Document design intent

-Introduce energy optimization early in the design process

-Use life-cycle total cost of ownership analysis

-Continuously monitor energy and environmental conditions

- Re-commission as a regular part of maintenance

-Empower IT and facilities staff to work together By ECO3 team. www.eco3.org

# BIMBA

# Water and Carbon foot prints of commonly used products.

***Water footprint***

Traditionally statistics on water use focus on measuring 'water withdrawals' and 'direct water use'. The water footprint accounting method takes a much broader perspective. First of all, the water footprint measures both direct and indirect water use, where the latter refers to the water use in the supply chain of a product. The water footprint thus links final consumers and intermediate businesses and traders to the water use along the whole production chain of a product. This is relevant, because generally the direct water use of a consumer is small if compared to its indirect water use and the operational water use of a business is generally small if compared to the supply-chain water use. So the picture of the actual water dependency of a consumer and business can change radically.

| Products | liters |
|---|---|
| Milk (1litre) | 1000 |
| Cup Of Coffee(125 Ml) | 140 |
| Cup Of Tea(200 Ml) | 35 |
| Apple Juice(200 Ml) | 190 |
| Orange Juice(200 Ml) | 170 |
| Beer(250 Ml) | 75 |
| Rice(1 Kg) | 3000 |
| Wheat(1kg) | 1350 |
| Maize(1kg) | 900 |
| Beef(1kg) | 16000 |
| Burger | 2000 |
| Bread(1 Slice) | 40 |
| Cheese(1 Kg) | 9000 |
| Egg(45g) | 135 |
| Potato | 198 |
| Apple | 70 |
| Tomato | 190 |
| Orange | 50 |
| T Shirt(200gm) | 2000 |
| Shoes | 8000 |
| Jeans | 2250 |
| A4 Paper Sheet | 10 |

***Why bothering about your water footprint?***

Freshwater is a scarce resource; its annual availability is limited and demand is growing. The water footprint of humanity has exceeded sustainable levels at several places and is unequally distributed among people. There are many spots in the world where serious water depletion or pollution takes place: rivers running dry, dropping of lake and groundwater levels and decrease in the count of endangered species because of contaminated water. The water footprint refers to the volumes of water consumption and pollution that are 'behind' your daily consumption.

***Save water in the supermarket***

Our 'indirect water footprint' – the water consumption and pollution behind all the goods you buy is much larger than your direct water footprint at home. We have basically two options to reduce your indirect water footprint.

- One option is to substitute a consumer product that has a large water footprint by a different type of product that has a smaller footprint. Examples: eat less meat or become vegetarian, drink tea instead of coffee, or even better drink plain water. And replacing cotton clothes by clothes from artificial fiber saves a lot of water.
- Second option is to reduce daily water consumption. .www.waterfootprint.com

***Carbon footprint***

Carbon footprint is a measure of the impact of our activities on the environment, and in particular on climate change. It relates to the amount of greenhouse gases we are producing in our day-to-day lives through burning fossil fuels for electricity, heating, transportation.

**O**ur 'carbon footprint' is the measurement of all greenhouse gases we individually produce. It is measured in units of tonnes (or kg) of carbon dioxide equivalent.

The carbon dioxide emissions (carbon footprint) caused by our personal behavior is driven to a large extent by the type and quality of our food. The amount of greenhouse gases caused by the production of food differs very much from one food type to the other. An environmental friendly and "climate change friendly" nourishment is characterized as follows:

· Very little (or no) meat
· Eat primarily organic food
· Seasonal food is preferred
· Regionally produced food is preferred

**C**arbon footprint is made up of the sum of two parts,

- The primary footprint is the measure of our direct emissions of $CO_2$ from the burning of fossil fuels including domestic energy consumption and transportation (e.g. car and plane). We have direct control on these.
- The secondary footprint is the measure of the indirect $CO_2$ emissions from the whole lifecycle of products we use those associated with their manufacture and eventual breakdown. To put it very simply – the more we buy the more emissions will be caused on our behalf. www.carbonfootprint.com

| PRODUCTS | KG OF $CO_2$/KG |
|---|---|
| Beef | 13 |
| Poultry | 3.5 |
| Pork | 3.25 |
| Butter | 23.8 |
| Cheese | 8.5 |
| Cream | 7.6 |
| Eggs | 1.95 |
| Farmer Cheese | 1.95 |
| Yogurt | 1.25 |
| Milk | 0.95 Kg Of $CO_2$/Liter |
| Apples | 0.5 |
| Strawberries | 0.33 |
| Bread | 0.75 |
| White Bread | 0.65 |
| Vegetables | 1.6 |
| Mode Of Travel | In Kg Of $CO_2$ /Km |
| Walking | 0.003 |
| Cycling | 0.003 |
| Small Car (1 Litre) | 0.15 |
| Medium Car(2 Litre) | 0.19 |
| Large Car | 0.35 |
| Minibus | 0.3 |
| Urban Bus | 1.2 |
| Heating Oil | 2.6 Kg Of $CO_2$ /Ltr |
| LPG | 1.5 Kg Of $CO_2$ /Ltr |
| Burning Wood | 0.132 Kg Of $CO_2$/Kg |
| Microwave Oven | 1.35 Kg Of $CO_2$/Hr |
| Geyser | 3.3 Kg Of $CO_2$/Hr |
| Air Conditioner (2.5 TR) | 3 Kg Of $CO_2$/Hr |
| T-Shirt | 6 Kg Of $CO_2$Piece |
| Mobile | 23.5 Kg Of $CO_2$/Piece |
| Computer | 275 Kg Of $CO_2$/Piece |
| Jeans | 33 Kg Of $CO_2$/Piece |
| Shoes | 66 Kg Of $CO_2$/Piece |