FAIRCONDITIONING: BEMAP WORKSHOP REPORT

Pune, June 2015

Abstract

The Fairconditioning Programme conducted Workshops on Cooling interiors Efficiently and Sustainably at BRICK College of Architecture, Pune This report summarizes this event.

Content

Executive Summary

The Indo-Swiss *Fairconditioning* programme organised its first two practitioner trainings "Modelling Sustainability – Training Practitioners in Building Energy Modelling for Efficient Design and Sustainable Cooling Technologies". These trainings took place from June 12 to 14, 2015 at the Pune BRICK College of Architecture (BRICK) and from August 21 to 24 at the Kamla Raheja Vidyanidhi Institute for Architecture (KRVIA).

The Fairconditioning workshop at BRICK, Pune Workshop was attended by 11 practitioners in the field of architecture from 5 different firms in Pune, Maharashtra.

3 trainers gave lectures, and conducted hand-on software training. Software licences were provided to all participating architecture firms at no cost at this event. Attendees at this event were granted certificates by the Fairconditioning Programme.

The trainings are part of the Fairconditioning programme designed to significantly improve awareness, knowledge and know-how in today's architectural practices in the field of building energy efficiency.

Such trainings are currently in preparation in three other major Indian cities: Delhi, Bangalore and Chennai. In each city Training workshops will be organized in a partner architectural college or university.

The end goal is to see energy efficiency being seamlessly integrated in the core design processes of architectural practice and to equip the realm of Indian architecture with Principal and Senior architects that are ready to shoulder responsibility in India's quest for an energy efficient, sustainable building growth.

Providing additional funding, trainings will be extended to Hyderabad, Ahmedabad and Jaipur.

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The Building Energy Modelling and Advisory Project (BEMAP) - Introduction

Fairconditioning was devised by Noe21 (Geneva) and cBalance Solutions Hub (Pune) to help countries in the tropical regions of the world address their cooling demand with the highest level of energy efficiency and lowest carbon emissions. The Pilot phase completed in June 2013 which concentrated on phasing out air conditioners using synthetic (fluorinated) refrigerants with very high global warming potential and phasing in energy efficient ACs charged with low global warming potential natural refrigerants (propane).

In its present mature phase Fairconditioning concentrates on incubating a culture of energy efficiency in the cooling of interiors in India, implying academia, large corporations and practitioners in the building services area.

Fairconditioning deploys four Projects to promote these objectives, each targeted at intervention groups who influence the perception of energy efficient technology and consumption patterns of a wide range of Indian industries and consumers:

1. Academic Curricula Integration Project - ACIP
2. Technology Adoption Project - TAP
3. Building Energy Modelling and Advisory Project - BEMAP
4. Corporate Thermal Policies Project - CTPP

Building Energy Modelling and Advisory project has been designed to enhance action-oriented understanding of efficient building design processes, sustainable cooling technologies and building energy modelling (BEM) software application (for architects) and sustainable cooling technology (for HVAC engineers) primarily focussing on centralised artificial cooling for buildings in urban areas. These professionals equipped with in-depth knowledge about building sciences, awareness about sustainable cooling technologies and capability to use cutting edge energy modelling software will become ambassadors of the Fairconditioning programme capable of implementing the passive cooling strategies, recommending sustainable cooling technologies and assess their design proposals for energy efficiency to evolve highly efficient building designs incorporating low energy cooling technology.
Architects will be shown how exactly environmental factors affect a building's performance, using quantified data to design sustainable buildings, incorporating energy efficiency at every level of the design process. HVAC engineers will predict the thermal behaviour of buildings prior to their construction and propose better suited system designs. They will also learn to simulate the energy implications in constructed buildings in their existing conditions to enable assessment and proposals for retrofitting measures.

BEMAP aims at an ambitious but realist objective: In 3 years from now, leading architecture and HVAC engineering firms from 5 of the biggest urban areas of India will have deeply integrated energy efficiency in their firm’s design processes, reducing carbon emissions of their building’s lifetime.

After events such as the ones described below will have been carried out, the BEMAP team will carry out a follow-up process with participant firms to install BEM software in their firm's offices and help identify points in each firm's early design processes as well as their detailed design processes, where measures to increase energy efficiency can be introduced. Events are the visible part of this project designed to be followed with less visible but highly critical working relationships with architects and architecture firms motivated to bring and mesh energy efficiency with architectural design processes.

Approached by the BEMAP team, principal and senior architects in Pune showed largely negative responses to the programme's goal with respect to implementation of the learning into design practice. While most architects showed resistance or dis-interest in sustainability and incorporating additional software and related skills, only a small fraction of them were willing to engage in a discussion about the possible value in being exposed to sustainability concepts. Among these architects, a small number of architects agreed to participate after convincing them through a range of different approaches. The main concern for architects was that the construction industry that their clients came from does not include energy efficiency as an enforced requirement. Financial implications on the architecture firm for implementing such processes of along-with design analysis in the conventional design process, were also seen to be unviable as the architect would need to absorb these costs. The absence of general awareness in their field and among clients was cited as the main reason for their scepticism toward such a programme.

Structure of the Project

The BEMAP, designed workshops of two types, Certificate Programmes for Practicing Architects, and Certificate Programmes for Practicing Engineers . These workshops, held in Pune were solely for architects and were a first in a series to be carried out also in Delhi, Bangalore and Chennai.

The programme unfolds in two fields of practice: Architecture and Engineering, both civil and mechanical engineering. Currently the workforce available to professionals in the building industry is not sufficiently trained or knowledgeable to design and implement the construction of energy efficient buildings India so direly needs to mainstream.

Overview & Highlights

The second Fairconditioning architects certificate workshop was held at, 2015 BRICK College of Architecture, Pune from 12th – 14th June, 2015, where 11 practicing architects from firms of all sizes and specialisations attending to re-learn the fundamental principles of building sciences and analyse the different tools and techniques that inform design choices. The importance of the knowledge disseminated during the workshop was highlighted, as these architects will be torch bearers who will make informed decisions to prioritize energy efficiency in their building designs, once equipped with this knowledge.

The workshop comprised two formats for training, first an interactive lecture on Building Sciences and Sustainable Cooling Technologies followed by a hands-on BEM software- Integrated Environmental Solutions :Virtual Environment (IES:VE)-GAIA's capabilities, use and application in a computer laboratory setting.

Building Science
Topics covered in the first half of the day included, heat transfer in buildings, weather and climate data, solar geometry and building orientation, shading, psychrometry, and passive building design strategies. These were taught using a range of media like lecture presentations, quizzes, handouts with problems to be solved. Participants asked questions and interacted with the trainer, raising questions about content and its applicability in practice.

Modelling & Inputs
The latter part of the day began with an introduction to capabilities of the BEM software- Integrated Environment Solutions: Virtual Environment, IES:VE. The initial introduction was followed by a hands-on teaching of translation methods for models built in architecture software like Google SketchUp and Revit, to import them into IES:VE interface.
Participants then learnt how to create such models using the software's inbuilt modelling tool. Building components like walls, doors, windows, roofs and shading devices among many others were created, and then assigned attributes as inputs to allocate functions to spaces in the building structure. Each of the features like Sun Cast, Radiance, Apache HVAC, required seperate inputs for the different parameters of the building they address and the relevance of each of these was learnt.

Simulations
The participants ran simulations of the virtual models they constructed and were familiarized with the implications of results generated. Two kinds of data were generated, numerical and visual, and using these, recommendations to improve efficiency of the design were evolved. Participants then used an iterative process to go

back and modify their models and see improvement in the simulation results. Results were then compared to see the cost and energy savings made through these changes.

Demonstrations
In order to familiarise architects with the kind of detailed designs possible in HVAC systems, a demo was given for the detailed HVAC design feature of the IES software- Apache SIM. A similar demo was shown for computational fluid dynamics, CFD, to show the participants that there are more complex simulations that can be run to assess the building's performance in much greater detail.

Assessment and Feedback
The participants were assessed through a written evaluation and feedback. The written test was designed to help participants assimilate the information they learned over the three days and urge them to articulate their thoughts. Participant responses gave a clear picture about the context in which the BEMA project looks to intervene, and brought to the fore a range of new problems that occur to practicing architects that need to be looked into and addressed in future practitioner workshops.

Key Outcomes

Capacity building of project team: By conducting the Pune workshop for architects, the Fairconditioning programme, has completed 'pilots' and absorbed key learnings from these two events. In addition, the capacity of the project team has been built substantially, due to exposure to the training content and its review, engagement with the trainers and aiding the training process during excercises, and hands-on software use. This capacity building helped institutionalise this knowledge, homogenise training content, improve the quality of content and develop strategies to streamline content delivery for the future workshops.

Pioneering partners: Each of the architects trained in the workshops accepted their role as early adopters of the sustainable approach to building design and recognised its need as imperative. While some degree of scepticism in their ability to implement remained, they were resolved to increase awareness and attempt implementation in their individual capacities within the firms they represented.

Identification/knowledge of latest softwares: During the training presentations several exercises, rules of thumb and latest softwares were explored, demonstrated and used. The architects felt more aware and confident in using BEM, applying passive design strategies and proposing the use of sustainable cooling technologies. The extensive exposure to modern, state of the art software IES:VE was a unique experience to most trainees.

Follow up plan with participant architects: Post the events, participant architects were provided with all trainer presentations, exercises, tip-sheets, step-wise instructions for download, installation activation and tutorials in-order to use the BEM software on computer systems at the firm. Participants were also provided references, internet links and reading material to strengthen their new learning and improve their awareness on the subject of energy efficiency in building design.

Environmental Friendly and Carbon-friendly event:

- *Natural Ventilation & Airconditioning* – In the case of the Pune workshop at BRICK College of Architecture, a naturally ventilated room with passive design strategies and customised window fixtures for cooling was used and served as an experiential learning for the architects. In the case of the workshop at MIT, non-AC classrooms and seminar rooms were used to avoid AC usage.
- *Carbon oath* – A basic undertaking was read out to all participants to try and maintain a carbon-friendly lifestyle atleast during the course of these events.
- *Minimal air travel* – A lot of effort went into identification of local trainers in order to avoid air travel and minimise the events' carbon foot print

Minimal waste generation – No effort was spared to minimise the use of plastic bottles and cups during the lunch and refreshments break during these events.