

# Cooling India

India's foremost Monthly dedicated to the growth of HVACR Industry

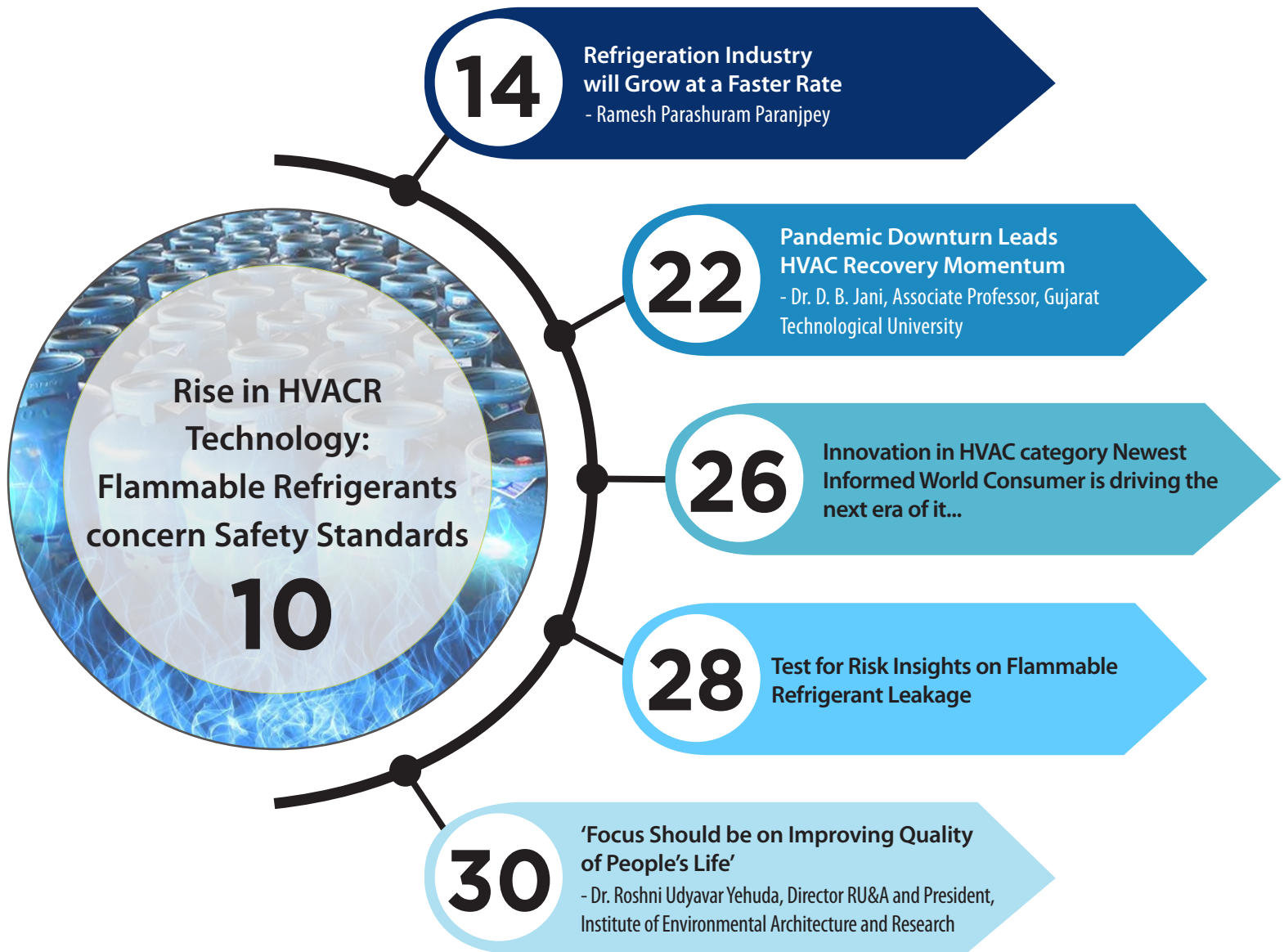


**RISE IN HVACR TECHNOLOGY**  
**FLAMMABLE**  
**REFRIGERANTS**  
**CONCERN SAFETY STANDARDS**



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Researching on alternative materials which have low or zero impact on indoor air quality, Dr. Roshni Udyavar Yehuda, Director RU&A and President, Institute of Environmental Architecture and Research, interacts with Gopal Anand, Editor from Cooling India, through mailed responses about RU&A activities, touching the aspects about Ecospaces, green and energy audits.



## 'Focus Should Be On Improving Quality Of People's Life'



What initiated your journey into the field of Ecospaces? Please detail us about Roshni Udyavar and associates objective, activities and achievements so far?

**Ecospaces** was born of a desire to create a new paradigm of environmentally-sensitive and humane built spaces. The journey of Ecospaces is more than 20 years old, but the concepts are fluid and futuristic, grounded in the past and constantly envisioning a new future.

Ecospaces is a design approach aimed at enhancing the quality of life of the users of a space through optimization of the surrounding environment. It comprises of a climate-responsive and resource efficient approach that reduces the ecological and carbon footprint of inhabitants while ensuring thermal and visual

comfort, optimum indoor environment, reduction in outdoor pollution and noise, as well as resilient and sustainable spaces – indoors and outdoors. It is applicable at all scales – from a single dwelling unit to a neighborhood to a city or bio-region and involves deep-engagement with the users and their immediate ecosystem.

The mission of Roshni Udyavar & Associates is to create resource-efficient & humane spaces catering to human comfort in an inclusive design process with the client, our team and the unique environment of the place.

Currently, Ecospaces provides services in six broad areas: architecture, interiors, energy, environment, capacity building and nature experience. The first four areas focus on design implementation based on the design approach of:

- Resource optimization – water, energy and waste,
- Improved environment quality for users - visual and thermal comfort, reduction of pollution in the indoor environment,
- Circular economy – building materials, urban farming and waste recycling,
- Ecosystem restoration and biodiversity.

The last two services are related to capacity building, knowledge sharing and behavioral change.

### Would you detail about Roshni's Organic Farm in Zhirad, Alibaug?

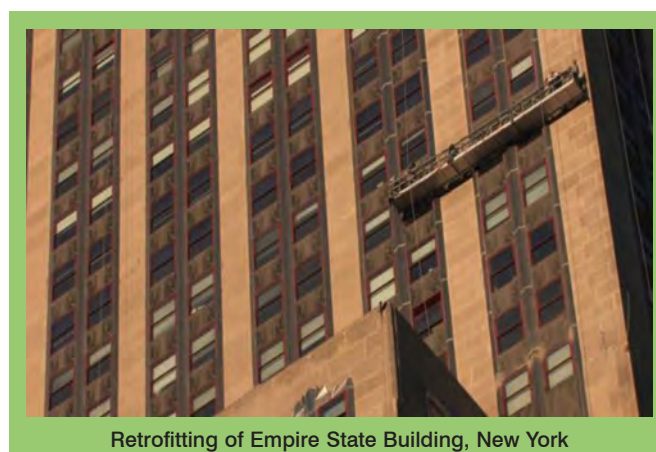
The organic farm at Zhirad is an experiment in organic farming. Currently, paddy, mangoes and seasonal vegetables are harvested from the farm. The vision is to create a successful business model of a sustainable farm, making the most of traditional practices and modern know-how without the use of artificial pesticides and fertilizers.

### Which is the most preferred area where RU&A has spread its reach extending overall benefits?

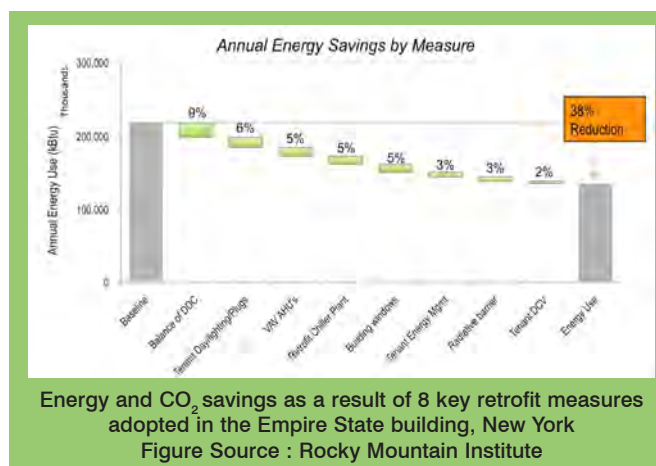
RU&A's current foray is in the area of green and energy audits, capacity building, and low energy human-centric interiors. It has also ventured into green building design, ecological planning of landscape (designing for biodiversity) and various types of building related audits. RU&A believes in undertaking a diverse range of projects with the central theme of low impact, low energy, environment-friendly and humane approach to design.

### RU&A provides options for creating or retrofitting of buildings into energy-efficient ecospaces with optimum thermal comfort. Could you elaborate on the specifics?

Yes, this is our main area of interest. While it is possible to make new buildings green, they will add further to the ecological impact of the built environment. On the other hand, retrofitting existing buildings to reduce their environmental impact and improve human comfort, makes



Retrofitting of Empire State Building, New York



Energy and CO<sub>2</sub> savings as a result of 8 key retrofit measures adopted in the Empire State building, New York  
Figure Source : Rocky Mountain Institute

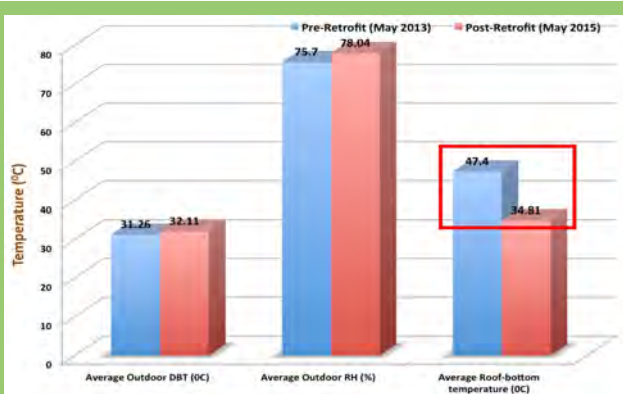
more ecological and economical sense. There is a huge stock of existing buildings built without any consideration for environment. And there lies a great opportunity to transform them into ecologically and environmentally sensitive buildings.

Retrofit involves a wide range of services. An existing building can be made up to 50% or more energy efficient. This includes changing existing light fixtures and HVAC to more efficient ones incorporating changes in the building envelope – improvements in the roof, glazing and wall – to higher thermal performance envelope assemblies. A good example of retrofit is the energy retrofit of the Empire State Building. Through a series of measures including changing the 6500 windows from single glazed to triple glazed, changing the chillers to more efficient ones, etc., reduced the overall energy consumption of the building by 38%.

Thermal retrofit of a college building in Mumbai, by RU&A, reduced the below deck roof temperature by 10 deg C, reducing the overall Mean Radiant Temperature (MRT) and thus the thermal comfort of inhabitants. This was achieved by a combination of spatial and structural retrofit measures, including introducing turbo ventilators for roof and radiant barrier under-deck material below roof with air gap, removing false ceiling, applying high albedo paint,



Rendered view of retrofit classroom



Pre and Post-Retrofit Average Roof-bottom Temperature shows a difference of about 12.6°C

Image Source: Dr. Roshni Udyavar Yehuda

single banking of rooms across central corridor and enhancing cross ventilation through proper placement of the openings. Post occupancy studies showed a positive impact on the occupants and improved thermal comfort levels.

Other measures in buildings include rainwater harvesting, which includes collecting the water from all the catchment areas within a site including rooftop, and either storing it (if there is space) or recharging it (if geology permits). We have successfully completed several rainwater-harvesting projects for buildings in Mumbai, reducing tanker and municipal water dependency.

Solid waste management is another area. Depending on the type of waste, plans for recycling the waste can be made. Organic waste can be composted, vermi-composted or used in urban farming. Terrace farming for growing vegetables can also be introduced.

Renewable energy i.e., introducing solar photovoltaic or solar thermal to reduce the overall load of energy from fossil fuels, is another retrofit measure which can be undertaken depending on cost and space available.

Retrofit also provides opportunities for enhancing visual comfort through enhancing daylight access to the building or by the introduction of light pipes.

**With regard to air pollution, how much importance do you attach to Indoor- outdoor air quality for human existence? What has been RU&A contribution to improve upon that with changing times?**

Indoor-outdoor air quality is a fundamental aspect for good quality of life. However, there are limitations to control of outdoor air particularly in cities. Plants are one way of providing barriers to dust and noise around buildings and habitats. Noise can also be redirected or absorbed by introducing noise absorbing elements on the building façade. Indoor air can also be enhanced by the use of specific indoor plants such as golden pothos and dieffenbachia amoena.

However, awareness of indoor air quality is important. A design that allows ample sunlight and provision of flow of fresh air can go a long way in detoxification of polluted indoors, since we spend majority of our time indoors now-a-days. Indoor pollutants such as molds, bacteria and microorganisms, dust particulates and even volatile organic compounds tend to build up in interior spaces depending on the materials used and their susceptibility to creating or supporting the growth of pollutants. Regular flushing is required to empty or reduce these pollutants. In case this is not possible, then use of a high-end air filter is recommended.

At RU&A, we are making an effort to create awareness among various sections of society through training and capacity building programs. We are also researching on alternative materials which have low or zero impact on indoor air quality to be able to implement in our designs. A webinar on Healthy Buildings is organized in collaboration with Institute of Environmental Architecture and Research (IEAR) and ISHRAE on 13 January 2021.

**Globally, what impression has been created by pandemic? What emerging trends do you anticipate in the upcoming new normal times?**

The Pandemic has been like a warning. It is like Nature telling us to slow down, review and proceed with caution. Human beings are among the few living species that can examine its past and envision its future. Historical events such as the extinction of the Dinosaurs, for example, have shown us that Nature is supreme. And, we have been only a very tiny tick in the clock of evolution of the planet. The Pandemic has shown us that a tiny invisible creature can control the planet, can force entire nations into lockdown.

It is a sign for us to truly rethink our life and work. Living in harmony and balance with creation, and reducing our ecological footprint, will be the mantra for the future.



Research project on Energy Efficient and ECBC compliant Opaque Wall Assembly.  
Image Source: DST-IPHEE Research project Team

### According to you what could be the suggestions to counter-effect COVID-19 damage while transitioning into new normal times?

The maximum damage due to COVID-19 has been to human beings, especially those who are older and isolated. In the lockdowns that countries announced following the COVID-19 Pandemic, we saw nature prosper in all places, pollution decreased and at least for the first few months, interaction amongst the members of a family increased. I see these are the positive aspects of the Pandemic. What suffered is the economy which we will need to rethink.

If there is one thing we all agree, it is that we need to strengthen our immunity to combat COVID or any such virus in the future. So, the focus should be on improving the quality of life of people. How can people have access to good quality food and nutrition, exercise on a regular basis, live less stressful lives, get more sleep and peace, and have more meaningful relationships. I think that cities and buildings must be planned holistically taking these into consideration.

### A research project undertaken by you as Lead/ Principal Investigator involves 'Developing energy efficient and ECBC compliant opaque wall assembly unit for warm-humid and hot-dry climate' under Ministry of Science & Technology, DST. Could you detail aim of the project and its significance?

Building envelope plays a major role in reducing the operational energy consumption and Energy Performance Index (EPI). Opaque Wall Assembly (OWA) comprises, on an average, between 15 to 60% of building envelope area in India depending on typology of building and climate zone. In high-rise buildings, the area of OWAs is proportionately higher and thereby contributes significantly to cooling loads. OWAs with higher thermal performance will positively contribute to lower energy consumption in buildings.

The aim of this project is to develop an OWA which is energy efficient, ECBC compliant and aligned with

sustainability and life cycle analysis approach, meets the needs and demands of industry with respect to supply chain demands (when using unconventional and agro-waste materials such as rick husk, rice straw, etc.), infrastructure required for input of materials in the right form into the design mix, and developing materials that are easy to handle, light weight, easy to transport and acceptable to the functional and aesthetic demands of the consumers. The project is being undertaken under the aegis of the Science and Technology Park, Pune and is conducted under the Department of Science and Technology (DST), Government of India's Initiative to Promote Habitat Energy Efficiency (IPHEE).

The research project is now its final phase of shortlisting of prototypes based on thermal behaviour, final testing of full scale prototypes and techno-commercial analysis.

### In general, what future plans do you have for the welfare of human existence; net zero building design, green sustainability and so on?

I envision a future society in which natural resources are recycled, managed and used with caution, there is sensitivity towards all humans and all life forms, consumption and pollution is reduced and there is a good quality of life for all. Buildings will be human centrically designed, energy, water and waste efficient, using renewable energy and climate responsive.

### What strategy do you plan to devise meeting your objectives in the next three years?

Our focus in the coming years will be on three areas: i. Research & development, ii. Network & data collection and iii. Awareness and capacity building. Research and development will be focussed on sustainable and resource efficiency, socio-economic tools and mechanisms and on technology. Network and data collection will be built through audits and market survey. The awareness and capacity building will be done through training programs and online teaching-learning mechanisms. ■