

# Cooling India

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



"The availability of affordable credit and other fiscal incentives will lead to growth,"  
**MD, Tecumseh Products India**

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**Editor: Mahadevan Iyer**



## Publisher's Letter

### Where 'Change' is the only constant...

Representatives from the industry are analysing the impact the COVID-19 pandemic is likely to have on the economy, and on businesses as a whole. Few representatives suggest optimism and stability as their present state of functioning, while others try and innovate with different business models to sustain and get through. In both cases, change is the only constant. For the first time, we have been presented with all-round virtual expos where networking and brand showcase takes on an entirely different definition. And we, at Chary Publications are proud to attend webinars, and other online meet-ups and networking sessions, providing the industry with report-worthy content.

The May – June 2020 issue of the Cooling India Magazine, presents its readers with interesting coverage. To name a few – we have the Power Talk @5PM which is hosted on our Instagram handle, the coverage is also run in print in our news section. Also, we have other articles inclusive of guest writers from the industry who write on a wide range of topics.

In this issue we have an article - 'Understanding supply, the cold chain and logistics sector in the food industry,' by Dr D.B. Jani, Gujarat Technological University – GTU, Ahmedabad, Gujarat, India. We also have the representation of other international writers such as Dr Iyad Al-Attar, an Environmental Enthusiast, Air Quality expert for HVAC and land-based gas turbines, who has given us input on Climate Change and the importance of food security. We also have Kiran M.B, Consultant – Cold Chain, Food Distribution - Supply Chain Transportation Equipment & Refrigeration Systems, who speaks specifically on - The Indian Cold Chain sector as being largely 'Farm to table.'

The next issue of the Cooling India magazine focuses on the Refrigeration in the logistics and the supply chain sector - the use of refrigerants, India is a signatory to the Paris Agreement, the market for refrigerants, the food and beverage industry, the production of the same in a temperature monitored environments in India. Also, the issue will draw special focus to the technologies available for the sake of energy efficiency - HVAC System design and more.

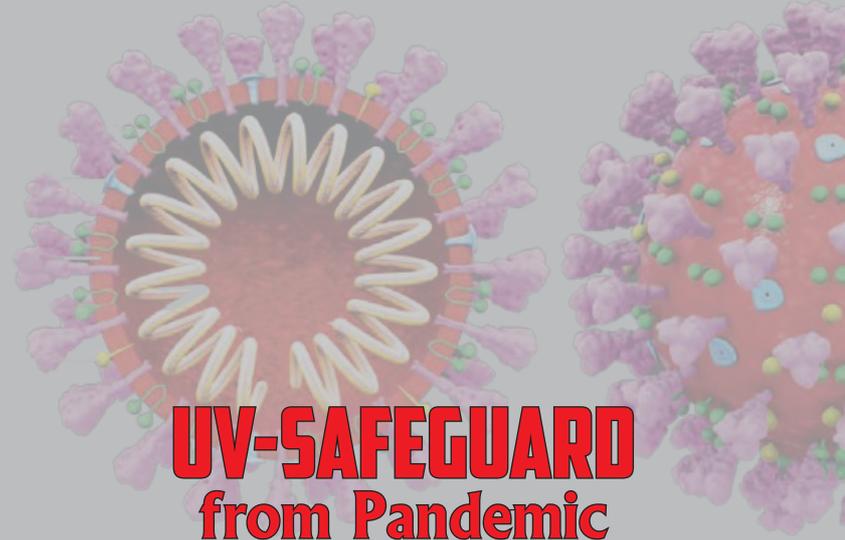
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# EDITOR'S NOTE



## Wading through, pushing forward!

The May-June 2020 issue of the Cooling India Magazine pays special attention to the cold chain logistics sector – inclusive of the food chain sector and highlights the subject of digital retrofits.

In an exclusive interview, Jegapriyan Govindarajan, Managing Director, Tecumseh Products India, tells us that the Indian retail sector is emerging as one of the top-five retail markets in the world by economic value. In the overall retail industry, inclusive of the food and grocery account for the largest share in revenue in India. India is the world's second-largest producer of food. The food retail market where the organized market constitutes only 3 per cent in comparison to the unorganized segment that forms 97 per cent of the food retailing market. The unorganised sector in food retail is predominantly serviced by general stores, *Kirana* stores, convenience stores and street markets. On the other hand, the organized sector includes gourmet stores, department stores, discount stores, supermarkets and hyper-marts, e-trailers and cash-and-carry formats.

On the other hand, the Indian cold chain sector is fragmented with over 3,500 players and most of them are a part of the unorganised sector. Also, consumers prefer scaled and integrated service providers who provide end-to-end solutions. Also, a research conducted by MarketsandMarkets shows that on the global front, the market size for the cold chain monitoring sector is expected to grow from USD 4.6 billion in the year 2020 to USD 8.2 billion by the year 2025 at a CAGR of 12.5% from 2020 to 2025. Also, we see that the increasing demand for temperature-sensitive drugs, the rising demand for better food quality and the need to reduce food wastage, the focus on increasing the supply chain efficiency of the fast-growing pharmaceuticals sector in Europe and North America are some of the major factors driving the growth of the cold chain monitoring market.

Also, we are aware that retrofits play a crucial role in meeting energy efficiency ratings, and on the global front, we see new acquisitions such as Johnson Controls that aims at expanding its HVAC installation and service capabilities in the UK. However, we must try and analyse the possibility of carrying out digital retrofits and the market for it in India. The issue highlights the insights drawn by Prabhu Ramachandran, CEO, Facilio. He talks about how and how as a solution it can offer system-wide transparency, ultra-optimised operations and centralised command and control. As a part of our editorial exercise, we urge industry representatives to write to us and collaborate with news-worthy information and articles.

Do feel free to write to me with input and industry insight as we value our sources.  
Write to me at [ranjana@charypublications.in](mailto:ranjana@charypublications.in)

**Ranjana Konatt**  
*Editor (Brand Positioning)*

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## Power Talk with Thermax Cooling Solutions

*The following is an excerpt from the interview conducted on our show 'Power Talk' via our Cooling India Instagram handle. Now in conversation with Dinesh Badgandi, CEO, Thermax Cooling Solutions Limited (TCSL)...*

**- By Ranjana Konatt – Editor (Brand Positioning)**

**T**CSL offers various wet & dry cooling solutions to remove heat from different process & manufacturing industries. The range of wet & dry cooling solutions use air, water or a combination of both as medium of heat rejection. Dinesh Badgandi, CEO, Thermax Cooling Solutions Limited (TCSL) spoke about how the COVID-19 situation has thrown the market with unique challenges. He said: "For the first time in history not only the demand-side but also the supply-side has also been impacted. A virus has brought the world to a standstill and we are no exception. Since Pune is also one among the most affected cities, we had to stop our operations since mid- march." Speaking on the ACC project business, he said: "Our ACC project business is likely to get more affected by the scenario and expect the industry movement to start in late Q2 of this FY. However, our products cater to industries which are in the consumption domain. We expect positive traction to build in Food processing, Dairy, Meat processing industries. We continue to support our customer in these segments with proposals, schematics which will be useful for their decision making." He added: "We are using digital communications platform extensively

to being in touch with all stakeholder and have a number of webinars and video conferences with our esteemed customer to discuss our solutions and proposal, this in addition to the technical trainings that are arranged for our dealers."

Speaking on the recent CTI Certification, Badgandi said: "CTI is a renowned institute in the field of certification of the cooling towers. Our process to obtain the CTI certification has been very fulfilling. This initiative was led by our internal team and involved co-ordination and execution with CTI – the Certificate is a testimony to our commitment to design and the performance of our product. We expect that the credentials will help us gain new customers in the market." Adding, he said that the cold chain market is one of the fastest growing domains in industrial refrigeration in India with a CAGR close to double digits. Also, presently over 7,000 cold storage facilities are operational in India, and over 70% are catering to the storage of potatoes. "30-40% of horticulture produced gets wasted today as we don't have cold storage infrastructure which shall provide huge opportunities. Govt has started aiding this industry which will further accelerate the growth rate," he added. ■

## Increase productivity with the new Parker Valve Station (PVS) from Parker's Refrigerating Specialties Division

*The Refrigeration Business Unit of Parker Hannifin Corporation, the global leader in motion and control technologies, has launched its new PVS for the industrial refrigeration market.*

**- Presented to you by the Cooling India Content Team**

**T**he Parker Valve Station is designed to make evaporator valve groups easy to install and maintain. Featuring 6 functions in a single housing the PVS will drastically cut down on installation time. What used to take up to 12 welds can now be accomplished with only two welds. The PVS is also designed to offer superior serviceability and features top mounted hand shut off valves and control valves. The product is serviceable using standard tools to ensure that maintenance is as simple as installation.

The PVS features a maximum working pressure of 52 bar (754 psi) that allows the product to be used with Ammonia (R-717), CO2 (R-744) and other standard refrigerants. What separates the PVS from the competition is the wide range of applications that can be covered using this new valve platform. From simple solenoid operation to pressure regulation to



electronically controlled expansion the PVS can do it all. While the most common applications are evaporator control groups the PVS can also work as a liquid injection valve, a feed valve for liquid level control, and even as an electronic expansion valve for superheat control in DX applications. Whether you are a refrigeration contractor, OEM, or end user the PVS will decrease your installation and maintenance time.

As of this announcement the PVS is available in a DN20 (3/4"), DN25 (1"), DN32 (1-1/4"), DN40 (1-1/2"), DN50 (2"), DN65 (2-1/2") and DN80 (3") port size and is configurable for a variety of applications including liquid feed, hot gas feed, defrost relief, suction regulation and expansion applications. Also, the PVS product offering Parker also offers a DN15 (1/2") manifold named the S8VS that is based on the tried and true S8, RSF, and R/S hand valve components. This small manifold is ideal for liquid feed lines and purge point solenoids. ■

## “Cet-enviro offers a wide-product range for water-saving sustainable solutions,” highlights company representative

*In a free-wheeling interview with Amit Kumar Singh, International Business - Field of providing Energy & Water Saving Sustainable Solutions, Cet-enviro highlights that as per the NITI Aayog report, India stands at 120th position out of 122 countries where almost 70% of water is being contaminated due to chemical utilization leading to excessive water wastage...*

- Presented to you by the Cooling India Content Team

Cet-enviro is a four-year-old Indian company that provides energy and water-saving solutions. Amit Kumar Singh, International Business - Field of providing Energy & Water Saving Sustainable Solutions, Cet-enviro, said that the company has a wide service team stationed across metro cities that make installation effortless and also a strong research and development team that helps manufacture technologies in-house. Cet-enviro highlights that as per the NITI Aayog report, INDIA stands at 120th position out of 122 countries where almost 70% of water is being contaminated due to chemical utilization leading to excessive water wastage.



Amit Kumar Singh,  
Head-International Business, Field  
of providing Energy & Water  
Saving Sustainable Solutions

Elaborating on the ACCS – Automation Condenser Cleaning System, Singh said: “The heat exchangers/condenser cleaning involves chemicals circulation along with brushing, causing wear and tear of the tubes which requires shutdown. ACCS is an online and completely automated system that keeps heat exchangers free from fouling. It does not only help save a lot of energy but also eliminates the downtime required for cleaning.” He said that pharmaceuticals companies, hotel chains and hospitals require need air-conditioners 24x7 which is the biggest energy guzzler. Hence any inefficiency in these sectors leads to an increase in specific energy consumption considerably. ACCS supports to maintain their design efficiencies making the environment friendly and beneficial for pharmaceutical companies, hotel chains and hospitals.

Also, elaborating on the non-chemical treatment for cooling towers, he said: “Chemical dosing is done to restrict scaling, corrosion and biofouling in Cooling Towers but has a lot of limitations along with EHS issues and excessive water blowdown. Scale & Bio-Remover (SBR) is a solution to all water treatment

problems of a Cooling Towers, as it has the features of eliminating chemical dosing, saves water, automation in water treatment, and filtration.” Adding, he said that the response received from the market towards SBR is overwhelming as they had not expected such a tremendous demand. “Industries that have cooling towers, and who are aware of SBR are asking for a site inspection.” Singh also drew attention to the looming target place on saving energy. He said: “Chillers specific energy consumption can be only monitored if COP or IKW/TR is measured. Almost all Chillers have energy meters if not separate metering is installed but it only measures electric consumption of Chillers.

Flowmeters are required for measuring the TRH generated by Chillers which is generally not available at most sites.” Adding, he said that EMOS is an online monitoring tool which shows IKW/TR of the individual chillers on a real-time basis. It is a plug and play solution providing several benefits such as trend analysis, dashboard, alarm, etc. An important part of having EMOS is its ability to gauge the inefficiencies and issues much before, which helps save energy increasing the life span of Chillers.

Also, while giving us an overview of the market value for the products, Singh said: “The value of any product is defined by its overall impact and how sustainable it is. The industry values our solutions and that is visible from the respect we enjoy from our customers. Quality and service are two strongest pillars on which we strive and that is why customers rate us much above any of competitor of ours.” He added and said: “A growing company often deals with cash flow issues, however, it’s more important on how we manage without many debts. We are proud to say that we have been sustaining without a single debt/loan since the inspection.” ■

## AI in Homes & Buildings Estimated to Garner Revenues of Nearly \$9 Billion by 2030

- Presented to you by the Cooling India Content Team

Frost & Sullivan’s recent analysis, Artificial Intelligence in the Global Homes & Buildings Industry, forecast to 2030, finds that the deployment of artificial intelligence (AI) in the homes and buildings space is gaining rapid momentum across the globe

as the industry is estimated to witness an approximately 15-fold increase by 2030. Increasing at a compound annual growth rate of 27.7%, the industry is likely to garner revenues of \$8.98 billion by 2030, compared to \$610.2 million in 2019. ■

# The GEM Sustainability Certification

## A Report

On the April 30th 2020, the ASSOCHAM GEM Council organised a Webinar on GEM Sustainability Certified Professional - (GEM CP) Online Exam in support with the ISHRAE Jaipur Chapter. More than 500 participants attended the webinar which included professionals, architects, engineers, energy auditors and managers, and MEP equipment manufacturers.

The webinar covered topics based on the latest versions of BEE ECBC 2017 and NBC 2016 which comprised of sustainability, energy and water efficiency, fire and life safety, more green area, indoor air quality, daylight, fresh air and human comfort. Projects under the GEM sustainability certification will achieve points from level one to five on a scale of 0-135 depending on the fulfilment of requirements in each level. This rating depends upon the project design including building architectural and elevation design, materials used during construction, HVAC, lighting and plumbing system designs, water and energy consumption of the building. GEM Sustainability Certification Rating is organized into Thirty Principles that are fundamental to enhance sustainable development. There are certain essentials and suggested requirements of each principle and points are rewarded on the accomplishment of each requirement. ASSOCHAM has come up with a reference guide for people attending the exam.

**Some of the crucial principles discussed during the webinar were as follows:**

**Post-occupancy waste management:** The purpose is to collect, segregate and dispose of the waste. Two points are provided for implementing separate bins to segregate biodegradable and non-biodegradable waste at the residential unit, tenant level or floor level as applicable. Providing central waste collection yards biodegradable and non-biodegradable waste from the entire project will be given two points.

**On-site conversion of organic waste:** This principle aims at the conversion of organic waste into a nutrient-rich, usable material encouraging zero waste. Projects are given four points on fulfilling this requirement.

**Sustainable development of construction engineering:** The utilization of alternative material in the construction industry to conserve natural resources preventing valuable recyclable materials going to landfill as waste.

- Sites using facade glass with recycled content more than 15% is given two points.

*Projects under the GEM sustainability certification will achieve points from level one to five on a scale of 0-135 depending on the fulfilment of requirements in each level. This rating depends upon the project design including building architectural and elevation design, materials used during construction, HVAC, lighting and plumbing system designs, water and energy consumption of the building, excerpts...*

- A report by the Cooling India Content Team

- Use of Portland Pozzolana Cement (PPC) from masonry and plasterwork with 50% is provided one point and with 75% use is awarded two points.
- Usage of fly ash bricks or AAC blocks or similar products with 40% implementation are given one point and 80% are provided two points.
- Using fly ash in concrete mix or ready-mix concrete are given two points.
- Installing TMT steel bars with recycled content of more than 25% will get two points
- Similarly using 50% of tiles with recycled content of more than 25% is given two points.

**Local sourcing of construction materials:** Using local available building construction materials manufacturers or suppliers for buying materials to reduce environmental pollution and transportation cost. Maintaining source distance from the project site within 250 km, 550 km and 850km are given two points each. These distances are not the radial distance it can be pedestrian, rail or road distance.

**Energy management best practices:** Implementing energy management best practice in the project to achieve energy savings consist of 12 points depending on each requirement being full filled.

**Use of imperishable energy resources:** Utilizing resources of imperishable energy to reduce dependency on exhaustible fossil fuels. Acquiring each per cent contract demand of the onsite project are given points accordingly from 1-5 with contract percentages being multiples of five. Offsite projects are provided points from 1-3 with contract percentages being multiples of ten.

**Optimal use of natural light:** Optimistic utilization of natural light to reduce dependency on artificial lights and save lighting energy.

- Stimulating approach- Ensure through computer simulation that occupies an area of daylight space with 40%, 60% and 80%, wherein 40% is mandatory, 60% is given two points and 80% is provided 4 points.
- Manual approach – Ensuring coverage area of daylight space to be 40%, 60% and 80%, wherein 40% is mandatory, 60% is given two points and 80% is provided 4 points.
- Daylight/occupancy sensors/ timer on exterior lighting- Residential and industrial units and Commercial and industrial units are given two points each.

## CAREL & World Refrigeration Day 2020

- By the Cooling India Content Team

The 26th of June was World Refrigeration Day, the day when the importance of refrigeration, air conditioning and heat pumps is celebrated all over the world. "HVAC/R is a significant part of our daily lives, yet most of the time it is hidden from view", commented Biagio Lamanna, CAREL HVAC/R Knowledge Center Manager. "As if to say it's there, but you don't see it. For this reason, CAREL has decided to make an active contribution to World Refrigeration Day 2020 and work to promote the awareness and importance of the subject." CAREL's campaign in support of World Refrigeration Day revolves around natural refrigerants, a topic that is very dear to us and is linked closely to environmental sustainability. Every week, we will reveal a few facts to help you learn more about the world of natural refrigerants and CO2. On 26 June a summary infographic will put together the pieces of the puzzle, and an educational video will explore the world of natural refrigerants. "We opted for an infographic and a more captivating way of presenting information to extend the target audience", Lamanna continued. "Simple concepts alternating with more complex notions to entice even younger people to learn more about air conditioning and refrigeration". ■

## Best practices to follow while reconnecting refrigeration equipment post quarantine

- Presented to you by the Cooling India Content Team

During these times of the COVID-19 pandemic, quarantine and lockdown procedures, many food service businesses have had to shut down for a while or had their demand strongly reduced. As a result, some may have chosen to disconnect their refrigeration equipment to save energy. In this case, there are some easy measures that can be taken to protect the equipment in order to work properly when reconnecting it.

It's important to make sure that the condensers and evaporators are clean before restarting the equipment, as this will ensure proper operation.

- When restarting, be sure to check for any unusual noises like liquid slugging the compressor or fans out of balance before allowing the cabinet to be restocked. Once the equipment is started back up, make sure the cabinet has achieved the design temperature in the refrigerated space before allowing it to be stocked with product.
- Once the product is loaded, check cabinet temperature again and note the time it took to pull down. Take amp draws on all motors if possible once the cabinet has reached temperature. It's also a good time to inspect and tighten all electrical connections.
- If it is necessary to restart the equipment with a big stock of product, then avoid turning it off again for at least 24 hours. It is also recommendable to allow the equipment to reach a stable condition of temperature before putting more products inside it again.
- The most important thing to consider when restocking equipment that has been off is that the product going into the cabinet is at temperature and not too warm or it will take very long to reach the appropriate temperature.

To conclude, David Ramirez explains that disconnecting equipment to save energy is not always the best choice if it is only for short periods of time. "Normally, you imagine that will improve the energy consumption of the equipment by shutting it off in moments of lower demand, such as during the night. But in this case, we have to take in consideration that when we disconnect an equipment, the internal temperature tends to get higher and when turning it on again, it will require a lot more energy to pull down the temperature", he explains. ■

## Arcadia Finalizes major investment in Ultraviolet Technology to protect its students

*Arcadia schools awarded a major contract of ultraviolet technology to Sanuvox, the global leader in ultraviolet air purification*

- Presented to you by the Cooling India Content Team

Arcadia schools awarded a major contract of ultraviolet technology to Sanuvox, the global leader in ultraviolet air purification, the school said via a press release. Under the contract, Sanuvox, through its local distributor Oasis Coils and Coatings, will install ultraviolet technology to continuously clean its cooling coils and the air molecules coming through the air conditioning systems in both its primary and secondary school campuses.

Ultraviolet technology is recommended by the ASHRAE, the global organization that sets benchmarks in the field of air conditioning, to help eliminate the transmission of airborne infectious diseases. In light of COVID-19, sales of UV technology have risen exponentially across sectors. "This move is the first in a series of investments we will be making to protect our students when they return back to our campuses. This is by far one of the most effective methods in eliminating bacteria and mold in our airconditioning units as well as cleaning the air molecules that comes through our ducts by breaking down their DNA." said Navin Valrani, CEO of Arcadia School, as he promised to leave no stone unturned to protect the Arcadia community when schools open in Dubai. "This shows the true commitment of Arcadia's school towards teachers and student health. As everyone knows a healthy body in a healthy environment is all we want for our kids to learn, succeed and further contribute to society", says Jocelyn Dame, President of Sanuvox. ■

# Heat Exchanger Market Worth \$33.01 Billion by 2026 - CAGR: 6.9%

- Presented to you by the Cooling India Content Team

The global Heat Exchanger Market is anticipated to reach USD 33.01 billion by 2026 according to a new study published by Polaris Market Research. Heat exchanger is a very dynamic industry concerning raw materials, equipment manufacturing and end-use industries. A heat exchanger primarily works on the principle of convection and conduction for making transfer of thermal energy in the required processes. New technological developments and increased demand for energy-efficiency in almost every industrial and commercial sector around the globe has been a force majeure for the global heat exchangers market.

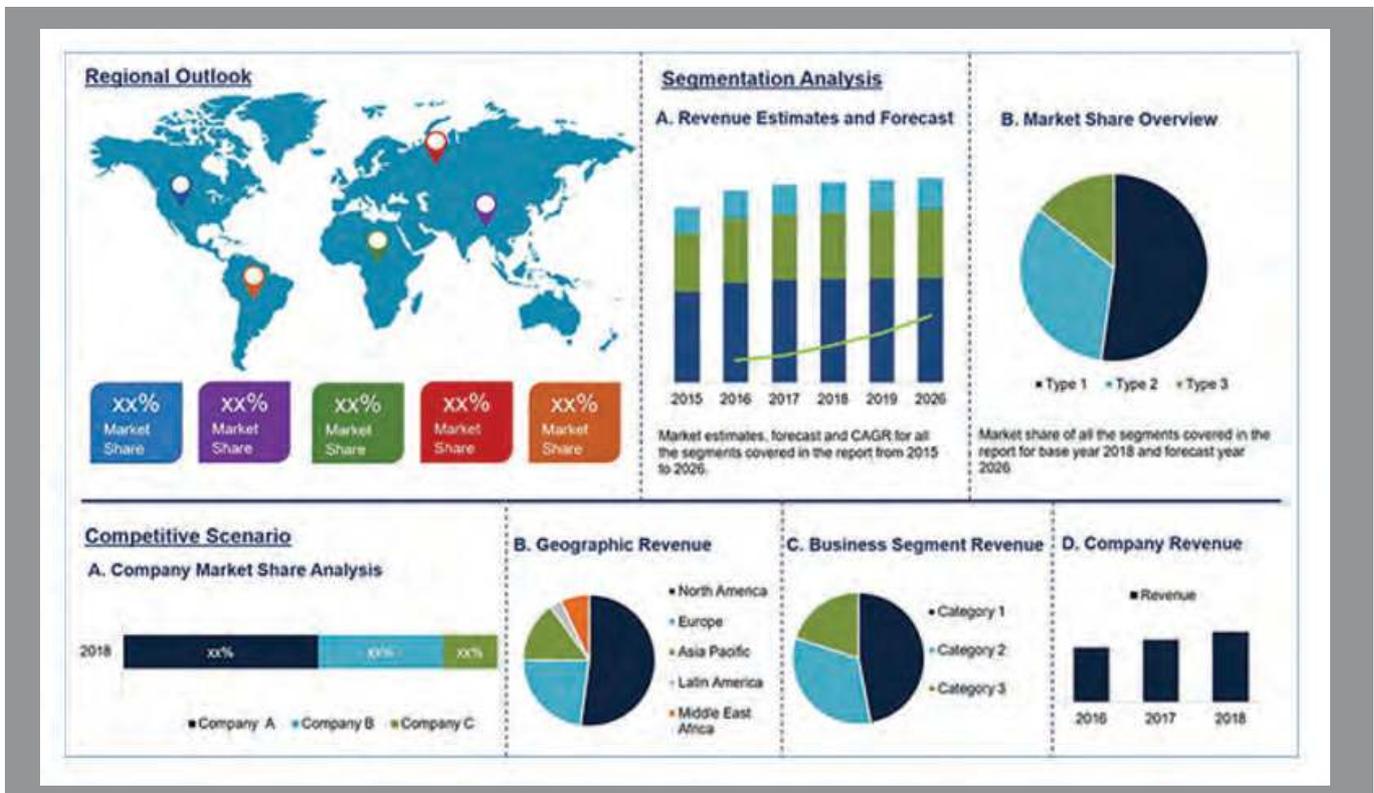
This industrial equipment is available of different types such as shell & tube, plate & frame, graphite and other heat exchangers types. Each type of heat exchanger includes its own set of pros and cons and is generally compared on the basis of purchase cost, installation cost, operating cost, and maintenance cost. Some of the primary criteria for choosing a particular type of heat exchanger includes operating pressure & temperature, application, available utilities, characteristics of the fluids, plot plan & layout constraints, considerations for future expansions, and mechanical considerations. The global market has significantly evolved around the technological efficiency of the products, their raw materials and government initiatives for energy efficiency across the world. The change in consumer preference towards utilization of energy-efficient products, buildings and construction has also played a significant part in this gain.

Manufacturing practices in chemicals & petrochemical plants and up gradations of plants and facilities has also resulted in reduced carbon emissions contributing to the global climate mandates. Reduction of volatile organic compounds in environment and specific regulations adopted specifically in European, American and Asian countries such as China has greatly affected the sustainability factor.

The heat exchanger market has also evolved in terms of advanced & innovative products for better & sustainable thermal efficiency in many operating utilities such as power generation by making use of renewable sources.

Asia Pacific industry is projected to be the largest market for the equipment sale in terms of revenue and volume both. The shift from western industrialization to the Asia Pacific has been the primary factor for driving this regional industry. The business operators or primarily the manufacturers have become increasingly and exceptionally globalized to make out higher value for cost and, simultaneously, compete to fulfill the rapidly emerging expertise in the Asian market. North America is yet another potential market with an established manufacturing base. The industry is highly fragmented in nature with many significant market players worldwide. Some of the global key manufacturers include Alfa Laval AB, Hughes Anderson, Kelvion Holdings GmbH, Koch Heat Transfer Co., SPX Corporation, HRS Heat Exchangers Ltd., Xylem Inc., AOI Heat Transfer Inc., and Hindustan Dorr-Oliver Ltd. ■

Source: Polaris Market Research



**“The availability of affordable credit and other fiscal incentives will lead to growth,” Managing Director, Tecumseh Products India**

Jegapriyan Govindarajan, Managing Director, Tecumseh Products India, highlights that the food and grocery retail in India exceed US \$294 billion representing 16 per cent of India’s GDP – likely to influence the cold chain sector.  
- By the Cooling India content team

Photo by Jason Leung on Unsplash

Photo by Gabriel Gurreola on Unsplash

**T**he cold chain has potential in India, and we see change concerning consumer preference. Also, when compared to other countries, we see low demand for cold chain technologies and related equipment.

Jegapriyan Govindarajan, Managing Director, Tecumseh Products India, while speaking on the COVID-19 scenario, the cold chain and its relevance in various sectors, he said: “In the post COVID – 19 scenario, the biomedical and pharmaceutical segments are expected to step-up their investments in the cold chain.” Government policies, he added, are steered towards encouraging the development of the cold chain sector, but we see that the level of development may vary.

### Food retails sector: A boost to the Indian cold chain market

Govindarajan also highlighted that the Indian retail sector is emerging as one of the top-five retail markets in the world by economic value. Estimating the value, he said: “Food and grocery retail in India exceed US \$294 billion representing 16 per cent of India’s GDP. The food retail organised market constitutes of 3 per cent in comparison to the unorganised segment that forms 97 per cent of the food retailing market.” The unorganised sector in food retail is predominantly serviced by general

stores, *kirana* stores, convenience stores and street markets.

India is presently the world’s largest producer of milk, the second-largest producer of fruits and vegetables and also has a good amount of production of seafood, meat, poultry products and is also the largest provider of generic drugs globally.

Govindarajan tells us that food processing is considered as one among the fastest-growing industries in India. The growth of the industry is supported by the availability of a large raw material production base like milk, banana etc. “Food processing is a priority sector for the Indian Government, as well as the focus sectors in the ‘Make in India’ initiative. Further, the availability of affordable credit and other fiscal incentives has also and will lead to growth,” he said.

### Exploring innovation

Govindarajan asserts how Tecumseh has recently set-up the Global Tech Center in India, while it intends to develop many advanced products for the global market. “Once the products are launched in India, they will provide value to our customers. We have also invested in innovation, for instance, we have alternate refrigerants used within the cold chain, this is to minimize the impact on the climate,” he said. Tecumseh is one of the largest producers of Condensing Units to support the cold chain, he added, and from the refrigeration point of view, further, we are also focusing on variable speed technologies with an off-grid solution to support last-mile logistic to cold chain equipment. ■



# Digital Retrofits:

An empowering pathway  
to reducing operating costs

*Proactive Facilities Management (FM) strategies and predictive models of real estate operations are going to be essential, highlights Prabhu Ramachandran, CEO, Facilio*

*- Presented to you by Ranjana Konatt, Editor - (Brand Positioning)*

Slowly but surely, the initial response to the global spread of the Covid-19 contagion is giving way to calls for managing the crisis and emerging into a new normal. The most recent figure for unemployment claims in the US was a staggering 36.5 million. One can only imagine the impact worldwide, given such disheartening figures currently characterize the world's largest economy. Fortunately, although we are months, perhaps even years away from being out of the woods completely, the initially projected fatalities have not materialized, in most parts of the world. Somewhere between these two extremes, a consensus is forming around trying to get the economy at least somewhat back on track, while still securing our populations against the on-going threat and a possible second wave of infections.

### The central role of real estate and facilities management in minimizing the risk

Given they are a venue for all our activities, and our safe havens in this time of crisis, operating and managing buildings will be crucial to any new paradigm that we roll out. Proactive facilities management (FM) strategies and predictive models of real estate operations are going to be essential if we are to achieve a balance between security, health, and productivity. For effective alternatives to emerge, we need to first consider the functionality that will need to be enabled. The emerging medical consensus is that the Covid-19 virus will now be part of our environment on a virtually permanent basis.

In the meantime, essential properties have re-started operation and building management will need to function with skeletal onsite staff so that these professionals can maintain social distancing norms. At the same time, the stringent sanitation requirements that buildings need to adhere to represent a



workload that is more than legacy models. The 'wait and watch,' approach that investors have inevitably taken, as well as the financial constraints being experienced by a vast number of tenants, presents yet another set of practical constraints, which the real estate industry will need to address.

So, the inevitable question is how exactly building owners must and FM service providers respond to this challenge? Is it even possible to simultaneously deploy a leaner onsite workforce, while optimizing business operations, financial models and unprecedented standards in outcomes? Digital retrofits are the solution real estate needs to evolve in keeping with a post-pandemic world. The short answer to the dilemma that the real estate industry faces can be summed up in two words – digital retrofits. As a technological upgrade, they were already a compelling solution, which offered granular system-wide transparency, ultra-optimized operations and centralized command and control. Now, given the peculiar circumstances we find ourselves in, the proven efficacy of this solution, in delivering on seemingly impossibly contradictory requirements, has become even more compelling.

Digital retrofits, which gather real-time building systems and workforce data across an entire portfolio using IoT, and derive actionable insights with the help of AI and machine learning, can give real estate businesses the unified management platforms that they need, to retain control over their assets and reduce operating

costs. In conjunction with Cloud-based apps for automated maintenance, tenant engagement, and predictive analytics of building performance, this is a model that can help cost-effectively rationalize real estate operations, without much-disrupting business outcomes, while securing the confidence of tenants to return to the workplace environment.

One of the operational capabilities commercial real estate will need, to reconcile quality in outcomes with smaller workforces, is gaining remote access and control to critical building automation. In this context, Cloud-based remote operations, which has already proven to be the most effective way to manage critical automation such as HVAC systems remotely, will prove to be a powerful solution to reduce cost without compromising efficiency. Also, being able to optimize returns on opex, through optimal energy and benchmarked equipment performance, will depend on a real estate business being able to deploy a data-driven platform approach with predictive models. Digital retrofits are the most rational and cost-efficient route to enable all of these outcomes concurrently.

### The right tool for the job

Many more factors that correspond to optimally productive, but leaner and more agile operations, can also be better realized using digital retrofits. Data-driven decision making, connected and better-informed stakeholders, as well as being able to allocate resources efficiently – based on usage patterns, mission-critical priorities and securing the premises – are all better achieved through the unified software platforms that digital retrofits enable. Perhaps the most decisive advantage that the solution offers, in preparing for the seismic shift that the industry is preparing to undergo is that it is relatively low-cost, with ROI achievable in the shortest possible timeframe. ■

# THE INDIAN COLD CHAIN SECTOR LARGELY 'FARM TO TABLE'



**Kiran M.B, Consultant**  
– Cold Chain, Food Distribution - Supply Chain Transportation Equipment & Refrigeration Systems speaks with **Ranjana Konatt Editor (Brand Positioning)** while giving a worthy assessment of the Indian Cold Chain and Food Chain sector

**K**iran M.B is a Member of ISOBL – USA, Technical Consultant – Project Management, On Cold Chain Transportation, Related Equipment & Maintenance.

A Professional, Experienced in Project Consultancy & Management, with a demonstrated history of working in the Automotive, Trailer & Truck Body Building Industry for Cold Chain Food Transportation & Food Hygiene Control. After Sales Service & Maintenance Facilities Setups, Environment, Skilled in International Business Negotiations, Sales Management, Strategic Technical Knowhow Partnerships, International Sales, Product Sourcing & Development. Has worked with Ministry of Transportation – Kingdom of Bahrain, in 1978, as Head of the Department, in the Automobile Division and went on to work with Al Dhaen Group of Companies in Kingdom of Bahrain, later Joined GORICA Group of Companies, Dubai-UAE in 1998, where he has held various positions over the years within the Group Companies and went on to serve for over 21-years. He has approximately 40-years of working experience to his credit.



**From your perspective and the industry stand-point – assess the cold chain sector in India. (Could be concerning reefer transportation, how the industry approaches the cold chain, trends which have shaped the market, international trade and relations, impact of export etc.)**

The Food Chain & the Cold Chain supply industry in the country and as a whole is yet to gain momentum – the sectors are not organised and need to be improved. The industry in India needs to streamline and formulate rules, regulations and the country also needs specific protocols for the transport of perishables and this must be executed by the Ministry of Transportation. For instance – we have the ‘ATP Certification (Accord for Transport of Perishables)’ – which is widely used and practised in Europe. Also, the enforcement of rules and regulations, the implementation and monitoring would require a separate department, a working committee, a task force for inspection from within the Ministry of Transportation. The practice is that permits for operating the refrigerated trucks and trailers are given based on what is used for transportation, and depending on the temperatures - frozen or chilled. This is also issued by the ‘Ministry of Health’s ‘Public Health & the Food Safety and Hygiene Department,’ or by the Public Health Department of the respective country.

**Explain the concept - ‘Farm to Table’. Describe to us in the general sense the cold chain and how it progresses**

**across the collection phase – the storage and the distribution phase. What are the challenges stressing the Indian market?**

Under certain specified temperatures and hygiene conditions of storage, transportation & distribution, the involve the following:

- Fresh Vegetable Produce from the Farms
- Chilled & Frozen Vegetable Products
- Fresh Milk & related Dairy Products
- All Fresh, Chilled Fruit Pulps & Fruit Juices
- All Fresh, Chilled & Frozen Meat Products

The first challenge begins with the collection of food materials from the source, and these are too many, and at times it gets complex as well.

**The basic parameters to be followed & practised are as follows:**

- The level of the hygiene conditions at the source or the point of collection
- Suitable packaging, depending on the nature of the Food Materials
- Suitable refrigerated transport truck/trailer with temperature control for the payload area during transportation/transit
- Monitoring Mechanism - for monitoring of Storage Temperatures in the warehouse & while Loading at the Point of Origin
- Monitoring Mechanism for Specified / Required or Set Temperatures during Transit

- Monitoring of Temperature at the Point of Distribution at Destination

In brief, temperatures need to be monitored throughout – that is from the point of origin, during transit and even at the destination. The most important factor in the cold chain is to maintain hygiene levels within the payload areas of the transport equipment – trucks and trailers by way of regular cleaning and disinfecting of payload areas, pallets, plastic crates which use food grade and compatible disinfection materials.

**What are the common issues concerning the collection and transportation phase? Give us instances where food has often gone rotten on its way while being transported, what is the kind of damage we have been seen in terms of food wastage?**

As a standard practice, care must be taken to store food materials in a clean area and a hygienic environment depending on the requirement and the type of food material. The hygiene conditions of storage areas, cartons, pallets, crates must be maintained at all times without compromise. The explanations in detail are that the above requirements are not practised and maintained as required by which the basic requisites and parameters stated earlier are compromised, thereby owing to the decomposition of leftovers and wastes of food materials in the respective storage areas. The fungus can form, mildew, microbes and bacteria develop and infect storage areas, pallets, cartons, plastic crates. Hence, the food stored in unclean unhygienic conditions as stated above will get infected, begins to rot & decompose, which leads to wastage and the renders the food materials unusable.

However, with experience, I can say that most of the times the above are ignored and compromised to a great extent and that can pose a health risk.

**Give us an overview of how the industry has progressed? What are the steps which have been taken to improve the situation? Has government policy and regulation, the presence of certain leaders which you'd like to mention made a difference? Please elaborate?**

Our country has a long way to go, we need to gain experience and must attain progress especially in the Cold Chain Transportation and the food chain distribution & supply industry. If we compare this especially to Europe whose standards are very high in terms of storage, cleanliness, hygiene levels in storage and the cold chain transportation industry by adhering to the set rules, regulations and temperature parameters as per the Accord for Transportation of Perishables (ATP) – the Geneva Convention. Whereas, when we talk of our

country as to date, because there are no legislations, set rules governing the cold chain – to regulate and streamline the industry – we refer to it as 'Farm to Table.' For instance: Are you aware of practices in India of an individual, supermarket chain, hotels, restaurants or for that matter also asking for temperature proof for goods at the point of origin which is delivered at the point of destination during the time of delivery. It is crucial to check the temperature of supplied/ the delivery of frozen, deep-frozen or chilled goods, and most likely the answer is no, I don't think so. I am not aware of whether such a system exists and I don't know the practise and if it exists. Please note – it is a must because a person needs to know what was the temperature at which a particular thing was stored at the point of origin, the temperature at the time of loading and the temperatures maintained during transit.

**How is India placed on the global front?**

India is still far behind and we need to accelerate reforms to reach and to keep up with the developed world. For instance – countries such as Europe & the USA are highly advanced in this sphere and these issues must be taken seriously while we act on augmenting and upgrading systems to keep up the pace with technology and more importantly to be up to date because food safety is the subject being questioned. Our country needs changes in laws governing food safety and there is a need for legislation and the need for protocols and reforms.

**How can we as an industry thrive and move towards change? How can we improve the way we function and thrive towards change?**

We as an industry can move forward with the support and the co-operation of the Central Government and all related ministries in the state governments such as the Ministry of Agriculture, the Ministry of Fisheries and the Food Corporation of India (FCI) are related to the food processing industry. Also, dairy farms, poultry farms, fisheries, farmers associations across the country, supermarket chains and related cold storage and temperature-controlled warehouses. FCI has been active since the year 1964. And since inception, it has played a crucial role in the Food Industry especially when it comes to regulating and streamlining various Food Supply Channels, while also helping agriculturists, farmers and their associations while also rendering assistance during drought or a food crisis. However, having said that, in the context of the Food Chain & Cold Chain Industry, the Central Govt. has to create a separate department, under the responsible ministry which the Central Govt. deems fit. The FCI could also be empowered by the Central Govt. to control & regulate the Food Chain / Cold Chain, once the required Legislations are in place by the Central Govt. ■

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**D**uring my recent visit to Germany, I truly admired the green scenery that surrounded me and wondered; in a world rife with inequalities, do we have a plan in place to manage the rapid urbanization and population growth? While the advent of smart technologies has made our economies increasingly interconnected and globalized, billions of people still live in poverty and go to bed hungry every night.

The world is changing; our accelerating urbanization and population growth have strained our finite resources. While we are still working towards solutions for climate change and pandemics like COVID-19,

## RISING TIDES: CLIMATE CHANGE AND FOOD SECURITY

The following article is authored by Dr. Iyad Al-Attar, an Environmental Enthusiast and Air Quality expert for HVAC and land-based gas turbines

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data suggests that our urban environment is going to double through the building of megacities such that the population growth is expected to be approximately 3 billion people by the year 2050. Ultimately, we all require smarter management and stewardship of the political, social, environmental challenges and impact of our own population growth. This global growth, if not strategically managed, would further drive the complex issues of climate change and food security in the wrong direction particularly in terms of production, distribution, and consumption.

Humans depend on resources such as water, air, food, and energy, and with the growing effects of climate change rapidly, the resources are threatened since they are all inextricably linked. Our planet can only sustain a certain number of people, we cannot continue to deplete our resources and indefinitely abuse our planet.

Therefore, food security emerges as a pressing issue facing humankind in the twenty-first century. Climate change affects all four dimensions of food security, including food availability, accessibility, utilization, and food systems stability [1].

The complexity of food security is associated with a wide spectrum of issues such as environmental policies, water scarcity, soil erosion, human health, and nutrition. Ultimately, the exacerbation of food security has captured the attention of the international communities due to an increase in the number of people that still lack adequate access to food. The Global Report on Food Crisis produced by “Food Security Information Network” 2018, has highlighted that 53 nations worldwide experience acute food insecurity, requiring an urgent humanitarian action [2]. Furthermore, the exploitation of natural resources and the effects of climate change are other undeniable challenges affecting long-term food provision.

### **Air pollution and food security**

While the impact of air pollution on our climate is well pronounced, its impact on food security is understated. The recent report by UNICEF, “The State of Food Security and Nutrition in the World 2019” has stated clearly that “Climate change and increasing climate variability and extremes are affecting agricultural productivity, food production and natural resources, with impacts on food systems and rural livelihoods, including a decline in the number of farmers” [3].

Pollutants damage the field of crops and degrade their nutritional safety and quality. The evolution of the Earth’s climate over the twenty-first century depends on the rate at which anthropogenic carbon dioxide emissions are removed from the atmosphere by the ocean and land carbon cycles. Emissions associated with fossil fuel and biomass combustion have contributed to nearly double the global mean tropospheric ozone concentration, and further increases are expected over the twenty-first century [4-7].

### **Food insecurity is more than just hunger**

The image of an empty shelf in a local market resonates in my mind and makes me wonder whether the pandemic has disrupted the food supply chain, particularly in those countries deemed developing and challenged prior to the pandemic. While the recent pandemic is believed to have impacted the buying behavior of the consumers, the challenges ahead are great, ranging from eradication of hunger to dealing with the prevalence of malnutrition.

### **Food Loss and Waste**

It is counterintuitive to realize that while food production is on the rise, the



Natural fruit and vegetable productions.

United Nations reports 820 million people worldwide still do not have enough to eat [3]. In fact, according to the “What a Waste 2.0” report issued by the World Bank [8], “global Food, Loss and Waste (FLW) is a widespread issue, posing a challenge to food security, food safety, the economy, and environmental sustainability. Although no accurate estimates of the extent of FLW are available, studies indicate that FLW represents around 30% of all food globally” [9]. This amounts to 1.3 billion tons per year. Ironically, this means that land and water resources are wasted, pollution created and greenhouse gases (GHGs) emitted at no added benefit [10].

FLW lead to depleting resources such as land, water, labor, and energy used for food production. It strongly contributes to climate change because greenhouse gases are emitted during food production and distribution activities, and methane is released during the decay of wasted food. FLW is believed to:

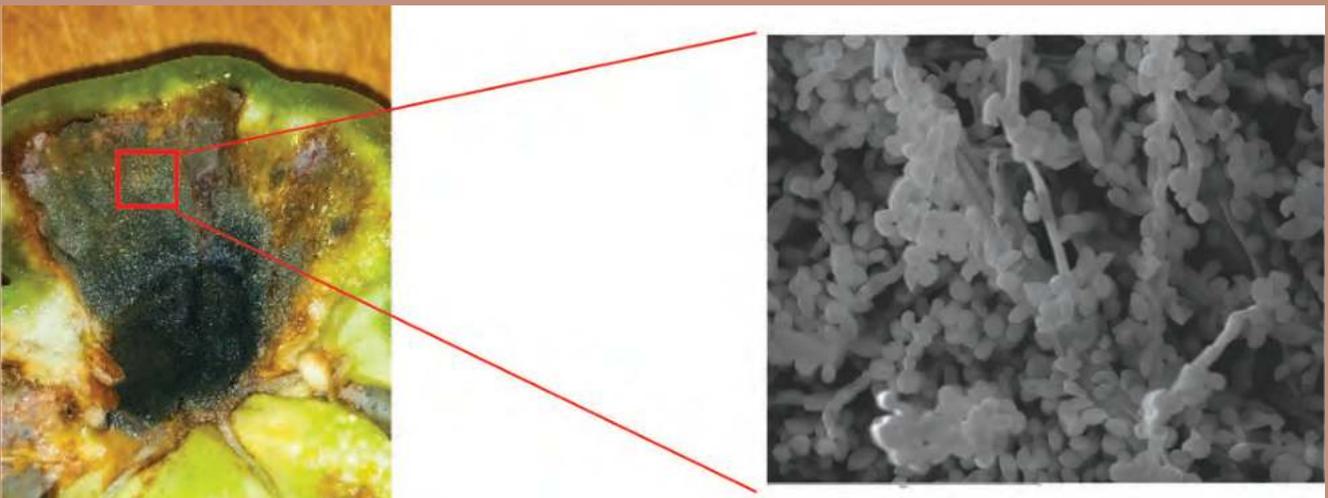
- Decrease the income for food producers.

- Increase the cost of food for customers.
- Limit access to food.

Therefore, minimizing FLW would lead to substantial food security and environmental gains. The report stated that bad weather, processing problems, overproduction and unstable markets, overbuying, poor planning are behind the food waste [11]. All of the above-mentioned reasons lead to food loss prior to its arrival to the shelves of grocery stores. Furthermore, food waste entails other environmental issues such as excessive water and fossil fuels consumption as well as farmland erosion [8-13].

### Elevated O<sub>3</sub> and CO<sub>2</sub> Concentrations

Tropospheric or ground-level ozone is one of the most widespread air pollutants. It is formed when nitrogen oxides produced by combustion processes primarily from power stations, react with other air pollutants in the presence of sunlight.



[Left] Mold formation close-up on green pepper - [Right] Scanning electron microscopic image of mold



Pest protection combating infestation of locust

Tropospheric ozone is known to damage plants, reducing plant primary productivity and crop yields. On the other hand, increased carbon dioxide and ozone levels can both lead to the closing of stomata, which are the pores on the leaf surface that regulate gas exchange with the atmosphere [14].

Atmospheric carbon dioxide is considered to be a major contributor to climate change. Between 1750 and 2011, it is estimated that 50% of the cumulative anthropogenic carbon dioxide was emitted between 1970 and 2010. During the same period, emissions of carbon dioxide from fossil fuel combustion and industrial processes contributed to about 78% of the total increase in greenhouse gas (GHG) emissions [15]. It is evident we are not only combusting fossil fuels irresponsibly but also using energy excessively. Therefore, smart methods must be sought to allow societies to be more accountable in terms of power generation and use. A parallel approach to reducing emissions is essential in terms of controlling the sources and treating the inevitable emissions.

While the impact of air pollution on food cultivation is well pronounced, other challenges such as plagues of swarming locusts annihilate crop fields. These threats further amplify the challenges of food production of our farmlands and put our global cultivation at grave risk.

### Betting on our common humanity

We live in an interconnected world and capitalizing on our common humanity is more important than highlighting our profound differences. Therefore, we cannot live in isolation and need to confront the twenty-first-century challenges with benevolence for the global village we have become. Food security is a growing challenge and our global efforts to mitigate this is an increasingly critical challenge and opportunity. Food needs to be provided, preserved, and secured to around 7.8 billion people

today and approaching some 10 billion people by 2050. The intersection of climate change and food production is clear. Our responsibility to end hunger and secure food in a sustainable manner require new thoughtful strategies related to climate change that is global in perspective and action. We ought to integrate our ambitions and skills to harness our resources. Our mundane strategies to produce more food without extending its shelf-life, preserving its quality, and addressing food waste alone will not allow us to tackle the problem we face. If we are genuinely keen to live in a world that is more just and conflict-free, our food security plans ought to be driven by actions, enticed by our intelligence, and guided by common humanity. If we believe in equality and value human life, then shouldn't everyone in the world have access to the basic needs in life such as clean air, water, food, and shelter? ■

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The HVAC industry in India is expected to become a \$ 7.7 billion industry by the year 2022, growing at a CAGR of seven percent<sup>1</sup>, resulting in continued development in terms of energy-efficient and data-driven technologies, highlights **Gaurav Mathur, Business Development (Building Services), Grundfos India**

- By the Cooling India  
Content Team



## SUSTAINABILITY— THE CORE OF ITS BUSINESS, SAYS GRUNDFOS INDIA

### **What's latest with the company, elaborate on the business and how the company pioneers to meet customer demand?**

With an annual production of 17 million pumps, Grundfos is a global leader in advanced pump solutions and a trendsetter in water technology. The company is a signatory to the UN's SDG 6 and 13 goals, by pioneering innovative water solutions that improve quality of life for people and care for the planet. Our smart water technology solutions help customers move water to where it is supposed to go, in an energy efficient manner. Our applications can be broadly classified into buildings, water utility and industrial processes. Grundfos India is a 100% subsidiary of the Denmark based global company. The company has leveraged its global competencies to successfully meet the requirements of its Indian customers with an

extensive network across the country with more than 200 distributors, Point of Sale outlets and authorized service centres. Grundfos has always been working towards introducing a new era of intelligent pumps with unprecedented performance.

Grundfos pumps are intelligent pumps equipped with an integrated variable frequency that allows adjustment of the speed and flow, remotely, based on demand. Most of our pumps can be augmented with Grundfos' digital frontrunner, iSOLUTIONS, with maximum efficiency at a minimum consumption of energy. These solutions use sensors to understand the flow and pressure of water, providing better energy savings than mechanical means and can potentially reduce overall system costs and improve overall life. Data collected from the pump via sensors can be used to provide actionable insights that can be used relevantly.

**With sustainability at the core of its business, how has Grundfos been working towards pioneering intelligent, reliable, highly efficient, sustainable and quality pumps for HVAC applications?**

Grundfos supplies a broad range of pumps across applications that can be classified into buildings, the water utility and industrial processes. A diverse range of buildings from family homes to commercial properties, Grundfos pumps cater to the vastly different requirements and challenges when it comes to water accessibility and availability. While at the same time ensures optimal comfort and safety without compromising energy consumption. TPE3 pumps with its intelligent control modes and unparalleled energy efficiency play an integral role in bringing hot water to your faucets and cool air to your ventilators. They are used primarily in commercial and domestic buildings such as hotels, airports, office buildings and hospitals, and have a host of heating and cooling applications.

Offering a broad range of pump systems for industrial processes, utilities, system builders and OEMs that can be used to optimize wastewater processes and improve productivity to meet the specific needs of the industries. The Grundfos iSOLUTIONS ensures efficiency of wastewater management through real-time monitoring of the wastewater process and providing insights that help reduce downtime. This solution also provides warnings for overflow or any mismanagement of flow/pressure. As we prepare to be

future ready, digital solutions and e-pumps are going to be important growth drivers across every industry with effective utilization, with intelligent pumps providing unparalleled utilities and services. Also, our solutions are future ready to meet the demands of Digitalization, Connectivity and System Optimization trends. Our next generation intelligent pumps with an integrated variable frequency provide optimal efficiency with actionable insights at the lowest lifecycle cost. Also, we are best equipped to customise solutions for any application across our broad product portfolio.

**How has Artificial Intelligence helped enhance global sustainability? Elaborate on your supply chain. Also, help us with some of the current projects your company is into.**

Digitalization is the first step towards leveraging the benefits of artificial intelligence. We have built the foundation of digitalization of pump solutions with our world-class iSOLUTIONS, sensors and wireless technology. Grundfos' controls, monitoring and maintenance solutions utilize machine learning algorithms to achieve system energy optimization, predictive maintenance and alarms set. According to a report published by Frost Sullivan in September 2017, Global Condition Monitoring Equipment Market expected to surpass \$2 Billion revenue in 2021, driven by technology convergence and increasing awareness. Automation for pumping technologies is expected to be a significant part of this Condition Monitoring Equipment market.

**What role does policy and regulation play in the wider scope of things?**

Grundfos creates value through close relations with customers, suppliers and other stakeholders. We also realize the key role that policy and regulation plays in ensuring that key aspects such as sustainability, standards and efficiencies are not only set but also adhered to. Through our associations with industry associations like AEEE, CII, MCCI and IPA we aim to take the industry's inputs and recommendations to the Government and concerned authorities and we also leverage these platforms to promote awareness on energy and water conservation in India. ■

# UNDERSTANDING SUPPLY

## THE COLD CHAIN AND LOGISTICS SECTOR IN THE FOOD INDUSTRY

A cold chain is a temperature controlled supply chain cold storage and distribution in which agricultural products are preserved afresh and where shelf-life is extended for a long period of time. With the increasing food demand and changing lifestyle, the cold chain has become the focal point for the government and investors. This industry facilitates long distance transport of various perishable products and seasonal fruits available for the entire year. It's a kind of linkage between the farmers and consumers. This integrated system helps in maintaining quality in terms of nutritive value, crispness, freshness, taste and appearance. India is one of the largest producers and a leader of various agricultural products. But due to fledgling cold supply chain



there is a heavy loss of food and other resources. These losses have been stated to be as high as US\$ 8 to 15 billion per annum from the agriculture sector alone. There is a need to develop cold chain sector to avoid these problems. The cold chain industry has been growing at a CAGR of 20% for the last three years i.e. from 2014 to 2016. The cold chain market in India is anticipated to reach Rs 624 billion (US\$13 billion) by end of 2017. Cold stores are the major revenue contributors of the Indian cold chain industry. But still lacks proper infrastructure as India have capacity below 1,000 MT of products. However, lack of proper and adequate food storage, processing and cold chain logistics remains a serious challenge. Though, the Indian government is one of the driving forces in developing the cold chain industry and supports private participation through various subsidy schemes and grants. Investment in the cold chain in India was also opened under the automatic route for 100% FDI participation.

### Introduction

Efficient Supply Chain Management (SCM) is an essential feature that is responsible for the rapid growth of any county's economy. As the competition has increased globally, developing countries like India have now shifted their focus to producing non-traditional agriculture goods. This change has improved not only their export capacity but also the enough availability of food within the country. Despite having such an increased agricultural capacity, a huge part of Indian population is still struggling to fulfill their basic needs. The actual concern that has to be addressed is not the food producing capacity but the capability of storage and distribution. This has led the governments of many countries to think about the various means of food safety. This would also enable the government to give away the benefits of revenues through agricultural products to the farmers. The farmers in many developing countries including India usually come across many challenges in



Fig. 1 The Cold chain supply network



Fig. 2 Cold chain supply cluster with all stake holders

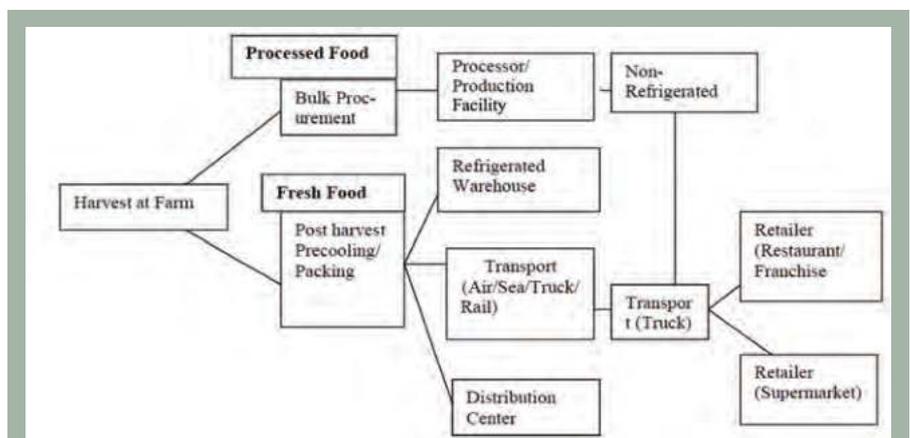


Fig. 3 Process in cold chain supply of food.

identifying and accessing the economical ways of diminishing the risks to their produces and stand in the match with the big food producers who can produce in moderate quantity. Such a jeopardize condition leads to the increased requirement for efficient supply chain management. Cold Chain Supply is the

best possible option to fulfill this requirement.

India is a fast growing economy with a large agricultural base. But lack of transport infrastructure, cold chain facilities and non-application of supply chain management principles is making the agri-business in general and the food processing

sector in particular very inefficient. Recognizing this, the Government of India has initiated several steps including creation of a separate ministry for food processing industries, opening up the agriculture sector for foreign direct investment through the agri export zones and special economic zones, and in several other ways. India aims to be the food factory of the world and increase its share in global food trade from 1% to 3%.

## Cold chain supply

The Cold Chain Supply (CCS) is relatively a recently adopted concept in the supply chain management. It is significant to understand the concept appropriately to execute the operations of Cold Chain Supply (CCS). The literature defines the CCS or also known as Cold Chain Management (CCM) as: "A network of refrigerators, cold stores, refrigerated trucks, freezers and cold boxes organized and maintained so that the perishable items are kept at the right temperature to remain fresh and intoxicated during their transportation, storage, and distribution from factory to the point of use." An environment controlled logistics chain, ensuring an uninterrupted care from source-to-user, consisting only of the activities related to storage, and distribution in which the inventory is preserved within predetermined environmental parameters. The Cold Chain does not alter the essential characteristics of the produce or product handled.

The cold chain supply has proved to be a suitable and uninterrupted storage as well as distribution model for food safety concern of the country. Every year, a huge quantity of perishable goods like as food, vegetables, flowers, meat, fruits, and medical drug/vaccines, etc. gets wasted only because of unavailability of on-time storage and distribution capability in India. Cold Chain Management/Supply (CCM/CCS) has a significant impact on farmers, and the companies working in food Industry. Modernized cold-chain development with controlled temperature generally focuses on one supply chain and not on the network of channels (Fig. 1 and 2). As shown in fig. 1 and 2, CCS is a



Fig. 4 Growth in Cold chain supply sector

separate series of storing and supplying activities leading to scheduled delivery of the product to end consumers, and consequently satisfy them as shown in Fig. 3.

## The Cold Chain industry in India

The cold chain industry in India is still at a nascent stage. Although, there is a large production of perishables but still the cold chain potential remain untapped due to certain reasons like high share of single commodity cold storage, high initial investment (for refrigerator units and land), lack of enabling infrastructure like power & roads, lack of awareness for handling perishable produce and lapse of service either by the storage provider or the transporter leading to poor quality produce. However, increasing urbanization and growth of organized retail, food servicing and food processing sector are boosting the growth of cold chain industry in India. The trend is shifting towards establishing multipurpose cold storages and providing end to end services to control parameters throughout the value chain.

As FAO (Food and Agricultural Organization) estimates that a 45% increase in food production and availability will need to be achieved by 2030 as shown

in Fig. 4. It is to ensure adequate food supply to over 9 billion inhabitants by 2030 which would be a huge challenge for the world. Thus, it is vital to explore every possible means of achieving progress, particularly the reduction of post-harvest losses. Losses of perishable foods are

The crucial factor in most important in developing countries where over 80% of the global population lives, and where about one quarter of production is lost due to a lack of an incomplete cold chain. These losses represent more than 400 million tons per year. Large post-harvest losses affect food security to the rural economies by markedly widening the gap between consumer prices and the amounts the producers are being paid at the end. They make products less affordable for consumers, and reduce farmers' income, thus discouraging them from producing and supplying markets. Following table 1 shows the range of temperature of the food product storage. Also it has competencies in the cold chain management particularly in the storage and transport of food items and in managing their supply and demand networks.

## Benefits of the cold chain supply

Having compared the system requirement

Food product Storage	At optimum cold temperature	Optimum temperature + 10°C	Optimum temperature + 20°C	Optimum temperature + 30°C
Fresh Fish	10 days at 0°C	4-5 days at 10°C	1-2 days at 20°C	A few hours at 30°C
Milk	2 Weeks at 0°C	7 days at 10°C	2-3 days at 20°C	A few hours at 30°C
Fresh Green Vegetables	1 Month at 0°C	2 Weeks at 10°C	1 week at 20°C	Less than 2 days at 30°C
Potatoes	5-10 months at 4-12 0°C	Less than 2 months at 22°C	Less than 1 month at 32°C	Less than 2 weeks at 42°C
Mangoes	2-3 Weeks at 13°C	1 Weeks at 23°C	4 days at 33°C	2 days at 43°C
Apples	3-6 Months at -1°C	2 Months at 10°C	1 month at 20°C	A few weeks at 30°C

of cold chain supply, the advantages are summarized as follows:

- Better Product Quality in terms of nutritional value, color, texture.
- No Bacterial formation takes place due to proper cold storage conditions.
- The Maintenance of hygiene.
- Maintained Humidity.
- Longer Storage of product/extension of Shelf life.
- Value for Money.
- Development of packaging industry.
- Address the issue of traceability.
- Better handling and Hygiene practices.
- Inventory management and automation.
- Palletized handling and racking.
- The growth of refrigerated transport industry.

### Challenges to cold chain supply

The key challenges to the growth of this sector are:

**High Energy Consumption cost:** Operating costs for the cold storage business in India are approximately Rs 80-90 per cubic ft. per year as compared to Rs 40 per cubic ft. per year in the West. Energy expenses alone make up about 30 per cent of the total expenses for the cold storage industry in India compared to 10 per cent in the West. These factors make the business of setting up of cold storages a high entry barrier.

**Rising real estate costs:** A fully integrated cold storage facility with one million cubic ft. of storage space will require an area of an acre to build, which could cost between Rs 1 crore and 1.5 crore, constituting 10-12 per cent of the project cost. Cooling units are not mobile units, and so location becomes a key factor, and with India's

small land holdings, getting a sufficiently large tract of land to build a cold storage unit becomes a major additional constraint.

**Lack of Logistical Support:** Cold chain industry in India is fragmented and it will require heavy investment in building technology enabled cold storage facilities to cover entire value chain from procurement to transportation in refrigerated trucks to retail outlets in cities.

**Uneven distribution of capacity:** A majority of investment in setting up cold storages in India has been in states like Uttar Pradesh, Uttaranchal, Maharashtra, Gujarat, Punjab and West Bengal. Secondly, cold storages that have been set up can cater to single commodities only which are a big bottleneck.

### Strategies to overcome the challenges faced by cold chain supply

- One strategy could be to ease import rules for cold-chain equipment including refrigerated vans.
- Developing FPOs and FIGs and enabling them to develop direct market links. Developing improved business models by promoting producer owned supply chains.
- Amendments to APMC aimed at enabling direct market driven supply chains and opening options through alternate market channels.
- Continue extant grants and subsidy schemes for cold-chain infrastructure development and extend the schemes to include the logistics and transport sector.

- Develop multi-model cold-chain links through rail and highways; aimed at a fast track green corridor for perishables.

Innovations in packaging, fruit and vegetable coatings, bio-engineering (controlled ripening), and other techniques reducing the deterioration of food products have helped shippers extend the reach of perishable products. For food products such as fruits and vegetables, time has a direct impact on their shelf life and therefore on the potential revenue a consignment may generate. Concomitantly, new transport technologies have permitted the shipment of perishable products over longer distances. Various parameters have been recognized by the Indian government and 100% FDI in the cold chain has already been permitted country needs to ensure that their production does not go waste and returns fair value to producers and consumers There must be a better linkages and way of transportation between growers, storage and customers. There is absence of a single dedicated perishables gateway or fast track corridor for perishable cargoes. Consumer food retail sector is the fastest growing in the country, worth around 15 billion USD 40% of fresh produce is wasted due to lack of satisfactory handling in the supply chain Indian cold chain business is fragmented in a big way. ■





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## **CASE STUDY: TARGETING ENERGY - EFFICIENT SOLUTIONS**



The following case studies are presented to you by Shyamsundar Rao, DGM-Sales, Symphony Limited

**A**s the world fights Covid-19, public places, offices, schools and colleges are under lockdown for an indefinite period or at least till we find a definite solution. Children spend a considerable amount of time at educational institutes. There has been much debate and awareness around the role played by air conditioners in maintaining good IAQ, and also theories on how it could also impact the overall COVID-19 situation.

Evaporative cooling has emerged as one of the most desirable options and we know that evaporative air coolers ensure that fresh filtered cool air is constantly pumped into premises by creating positive pressure and pushing out the air that is stale. The principle of air changes can play a vital role and can eliminate any infection / viruses in the air.

So, what is evaporative cooling – Evaporative cooling requires water for cooling the air and water has large enthalpy of vaporization which helps in cooling the dry air. Evaporative air cooler works on the principal of conversion of sensible heat into latent heat. The energy needed for evaporating the water is taken from air in the form of sensible heat, which reduces the temperature of air and gets converted in latent heat and during this complete transformation the enthalpy remains constant which is called as adiabatic process, dry bulb temperature of air decreases and humidity of air increases. Water is an excellent coolant which is available in plenty, non-toxic and it evaporates easily. A simple example of natural evaporative cooling is the separation of sweat from the body, which is evaporation process. The advantages of evaporative air cooler over the air conditioner are less expensive to install and operate, good ventilation of air, no harmful effect on environment and brings constant fresh filtered cool air inside the premises.

With the above advantages it makes one of the most preferred solution for schools, colleges and coaching centers.

Symphony the world leader in air cooling has recently executed two very prestigious projects, one for a typical secondary school in New Delhi and another one for a well-known university from Ahmedabad. Both the institutes adopted Symphony air cooling technology successfully and got the desired results while ensuring that they saved over 80% on electric consumption as well and also reduced their carbon foot print.

## CASE STUDY 1

### Project requirements

St Mary school located in New Delhi has 8 classrooms and each classroom is over 300-400 sq.ft where over 1,700 students spend nearly 6 to 7 hours. When summer sets in it becomes difficult for students to concentrate on their studies, and hence the management at the school called the Symphony team to help reduce temperatures, hence enabling a more comfortable environment.

The management evaluated the option of putting air conditioners, but they wanted a environmentally friendly solution. They did not want to compromise on their policy of open-door classrooms and with air conditioners they would have to shut all doors and windows which would make the atmosphere inside the building very stuffy with lack of any ventilation and fresh air.

### Solution

Symphony suggested its PAC 18 - model which are ductable packaged air coolers. 16 PAC evaporative air-cooling units were installed as shown in the pictures and diagram. Each Symphony PAC18 unit had a 1.1 KW motor with 18,000 CMH air delivery and had a capacity to cool almost 1500-2000 sq.ft of area. Without any ducting the machines were installed in the corridors from the center of the building in way that each machine covered 3 classrooms and cooled them effectively.



### Benefits

Post installation, the temperature measured was 28 degrees Celsius while outside temperature was close to 42 in the month of April. Constant fresh filtered cool air was being injected inside the class rooms which made the environment inside the class rooms very pleasant.

Both students and teachers were feeling extremely comfortable after installation of evaporative air-cooling units.

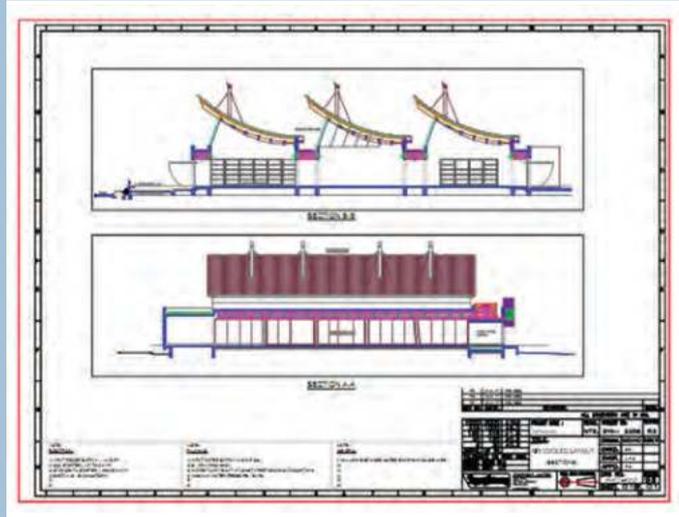
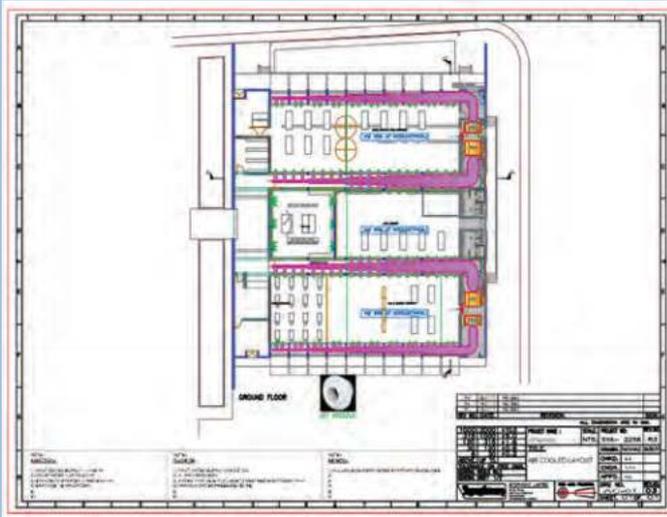
Doors and windows can be kept open all the time.

Absolutely no noise since there was no ducting involved.

Savings in electricity over 90% against conventional air conditioners. They were originally planning to put 2 units of 1.5 ton in each classroom which meant total of 96 air conditioners with power consumption of over 180 units per hour against which the evaporative air coolers installed consumed just 16 kw to cool the entire building. Attained thermal comfort with eco-friendly solution and improved indoor air quality drastically.



Inside of the workshop of CEPT



## CASE STUDY 2

### Project requirements

CEPT – The Center for Environmental Planning and Technology University, Ahmedabad is a well-known institute in Gujarat. CEPT had a newly constructed workshop, approximately 7000 sq.ft with a height of over 17 feet. The institute wanted to adopt an environment-friendly cooling solution considering the space was large and putting air conditioners would be an expensive solution. The second challenge they had was the dust and fumes, and they had to constantly push the dust and fumes outside else it would make the atmosphere inside the workshop very suffocating and it would be difficult for students to breathe fresh air.

### Solution

Symphony suggested to install central evaporative air-cooling

units with ducting. 4 large units of evaporative air cooling were installed, 2 units of SPS30 model which deliver 30,000 CFM each and another 2 units of SPS28 model which deliver 18000 CFM each for the entire workshop. With this 4 units entire workshop was very effectively and economically air cooled. As compared to air conditioners we saved over 70% on power. The power consumption in case of air conditioners would have been over 80 units/ hr against which an air-cooling system which consumed only 30units per hour was installed. Apart from power saving there is continuous fresh and filtered air which makes the workshop atmosphere very pleasant for the students. Entire cooling system was designed and installed with 25 air changes per hour which kept the dust and fumes away from the atmosphere of the workshop. There was enough positive pressure created inside so that outside dust particles and insects would not get inside. This resulted in better environment inside the workshop while maintaining the ambient temperatures during peak summers. The units installed have 300 mm cooling media which deliver 90% efficiency. The measured grill temperature on 2nd May 2019 was 26.5 degree Celsius whereas the outside temperature was measured at 43 degrees Celsius.

### Benefits

- Constant fresh filtered cool air was being injected inside the workshop which made the environment very pleasant.
- Doors and windows can be kept open all the time.
- Jet nozzles were installed for air delivery which made entire room cool evenly and air was felt evenly across the workshop.
- Savings in electricity of over 60% against conventional air conditioners. They were evaluating to put air conditioners but due to very high CAPEX and OPEX they preferred to go with air cooling and are very satisfied with the installation.
- Reduced carbon footprint for CEPT. ■



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4	Approach to WBT	4°C	1°C
5	<b>ΔT for Chiller</b>	<b>28°C</b>	<b>25°C</b>
6	Chilled Water Compressor Motor Kw for 1200 TR	720	643
7	Energy Saved in %	-	10.7%
8	<b>Energy Saved in Kw</b>	-	<b>77 Kw/Hr</b>
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