

APUEA

Magazine

ENERGY
EFFICIENCY
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APUEA

Asia Pacific Urban Energy Association

Promoting Sustainable Urban Energy in Asia Pacific



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Editorial

Mikael Jakobsson

Executive Director,
Asia Pacific Urban Energy Association (APUEA)

THE first part of the Sixth Assessment Report from IPCC, "Climate Change 2021: The Physical Science Basis," released in August 2021, is no pleasant reading. The report suggests that human activity is the cause of climate change, that the CO2 levels in the atmosphere are the highest in a million years, that the rise of global sea levels has tripled in the past decade, and that even if we do everything right and start reducing emissions now, we will still exceed the 1.5 °C target by 2030.

How severe the consequences will be, both in the short-term and long-term is to some extent debated. However, do we want to take the risk? To panic will not help us much, while there is no excuse not to stop wasting energy and other resources. We must take major actions to take the human impact out of the climate change equation. We must take actions where it matters most – where we get [big] bang-for-the-bucks.

The IPCC report has (again) made me reflect on my own choices. Can I adopt a more sustainable lifestyle? Absolutely! Now, with that said, I have, in turn, been able to contribute significantly to reduce global carbon emissions in collaboration with great business colleagues over the past decades. In a recent district heating project in Datong, P.R. China, we reduce carbon emissions in the range of 1.5 million tons per year while improving energy security and making heating more affordable. This is one (1) out of more than sixty (60) district heating and district cooling projects I personally have been privileged to develop, optimize and implement across the Asia Pacific.

Despite the recent IPCC report, we at APUEA are relatively positive to continuously see governments, investors, and other actors taking small steps towards the clean energy transition. Recently, Xi Jinping announced that China will stop building coal-fired power plants abroad. It is a step in the right direction. As economies across the Asia Pacific continue to develop, resulting in growing energy demand, countless urban energy projects could be developed to gain quick wins in combatting climate change.

District Cooling, District Heating, and Multi-Energy Systems are crucial for RE-integration and systemic efficiency in the energy sector and combat climate change. Through APUEA's activities with members and partners across the region, we have seen a significant increase in awareness on this topic in recent years. In India, Energy Efficiency Services Limited (EESL) has taken the lead to increase the awareness and accelerate the development of District Cooling schemes across the country, in collaboration with ADB, APUEA, BEE, GIZ, ISHRAE, NIUA, OECC, UNEP DES, among others. EESL's leadership is crucial to succeeding with these activities, and following EESL's and APUEA Academy's successful District Cooling capacity building activities in Pune, recently, several cities are lined up to benefit from the capacity building.

The 7th Global District Energy Climate Awards will be hosted by APUEA, Euroheat & Power, and Informa Markets as a virtual event during Asia Urban Energy Assembly on 11th November 2021, followed by a physical event on 15-16th September 2022, in conjunction with the ASEAN Sustainable Energy Week. Qatar Cool will contribute to the execution of the 7th Global District Energy Climate Awards as a Gold sponsor.

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DESPITE THE RECENT IPCC REPORT, WE AT APUEA ARE RELATIVELY POSITIVE TO CONTINUOUSLY SEE GOVERNMENTS, INVESTORS, AND OTHER ACTORS TAKING SMALL STEPS TOWARDS THE CLEAN ENERGY TRANSITION. AS ECONOMIES ACROSS THE ASIA PACIFIC CONTINUE TO DEVELOP, RESULTING IN GROWING ENERGY DEMAND, COUNTLESS URBAN ENERGY PROJECTS COULD BE DEVELOPED TO GAIN QUICK WINS IN COMBATTING CLIMATE CHANGE.



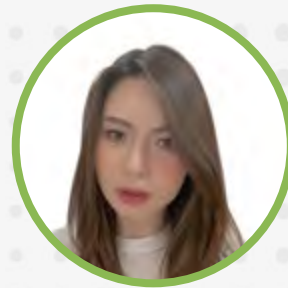
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ASIA PACIFIC URBAN ENERGY ASSOCIATION



APUEA

Asia Pacific Urban Energy Association

For more information about APUEA and how to become a member, contact info@apuea.org

www.apuea.org



The Asia Pacific Urban Energy Association (APUEA) was launched in 2017 to promote the development of sustainable Urban Energy Systems in the Asia Pacific region. The APUEA platform promotes public and private sector collaboration to develop sustainable urban energy systems that support livable cities across the Asia Pacific region. Our membership and activities serve as an information hub to support city policymakers, program managers, and other stakeholders in the design, development, and implementation of sustainable urban energy systems. Through our activities, including APUEA events, conferences, and continuous outreach to our members, we share international and regional best practices for planning and implementing sustainable urban energy systems—including policies and regulations, business models, and technologies for implementing district heating and cooling, smart grids, energy efficiency improvements, and renewable energy systems.

The APUEA membership provides a unique opportunity to liaise with governmental agencies and important stakeholders and get access to valuable information and intelligence on urban energy developments, business opportunities, trends, and financing in one of the fastest growing energy and infrastructure markets in the world. Membership benefits include a marketing platform, newsletters, APUEA Magazine, Annual Publications, Annual General Meeting including Trade Exhibition and Direct Assistance.



ASIA PACIFIC URBAN ENERGY ASSOCIATION MEMBERSHIP



The Asia Pacific Urban Energy Association (APUEA) is a platform to collect and disseminate knowledge, best practices, and tools related to the development of sustainable urban energy systems, and thereby support the development of livable cities in the Asia Pacific region.

APUEA serves a broad range of members including but not limited to utilities, manufacturers, investors, engineering companies, donor agencies and sector associations that are active in the urban energy sector. Members can choose among several membership categories, depending on their sector and level of engagement in APUEA.

PREMIUM MEMBER

Premium membership includes an active role in the governance of the association through the APUEA Executive Committee and during the APUEA Annual General Meeting.

Premium membership also includes special recognition in APUEA publications and marketing channels, and free participation at APUEA events.

CORPORATE MEMBER

Corporate membership includes influence on the association's activities during the APUEA Annual General Meeting, recognition in APUEA publications and marketing channels, and discounted participation at APUEA events.

AFFILIATE MEMBER (Invitation only)

Individual or agency invited by the Association to participate as an individual member; and entities such as regional NGOs, development agencies, and utility organisations. An Affiliate Member benefits from the Association but does not take an active role in the Association in terms of its governance and operation.

THE ANNUAL MEMBERSHIP FEE DEPENDS ON THE MEMBERSHIP CATEGORY AND ORGANIZATION SIZE:

CORPORATE CATEGORY	EMPLOYEES		
	< 1,000	1,000 - 10,000	> 10,000
PREMIUM MEMBER	USD 10,000	USD 10,000	USD 10,000
CORPORATE MEMBER	USD 3,500	USD 5,000	USD 6,500
AFFILIATE MEMBER	N/A		

BENEFITS

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- ✓ Knowledge and Best Practices
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- ✓ Direct Assistance

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including those from Thailand, USA, China, Korea, Taiwan, Japan and many more!

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which aims to build business networks that enhance interaction for business linkage opportunities through live chat and video calls.

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- ASEAN Bioenergy and Bioeconomy Conference
- iEVTech - International Electric Vehicle Technology Conference
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Asia Urban Energy Assembly

7TH GLOBAL DISTRICT ENERGY CLIMATE AWARDS

 **11** VIRTUAL EDITION
NOVEMBER 2022

 **15-16** LIVE EDITION
SEPTEMBER 2022  BANGKOK
THAILAND

- ✓ 30-60 Speakers
- ✓ 10-20 Exhibitors
- ✓ 6 Award Categories
- ✓ 200-500 Participants



GLOBAL DISTRICT ENERGY CLIMATE AWARDS



PLENARY SESSION

- DIPLOMATIC PANEL
- URBAN ENERGY POST-COVID 19
- CITY PANEL



THEMATIC WORKSHOPS



URBAN ENERGY EXHIBITION



SITE VISIT

Urban Energy Disciplines

- ✓ District Cooling
- ✓ District Heating
- ✓ Thermal Energy Storage
- ✓ Multi-Energy Systems
- ✓ Industrial Symbiosis

Participants

- ✓ Government Agencies
- ✓ Intergovernmental organisations
- ✓ Utilities
- ✓ Investors
- ✓ Solution Providers

- ✓ Academia
- ✓ Real estate developers
- ✓ Planning institutions
- ✓ Engineering firms
- ✓ Sector Associations



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A VERY LARGE PROPORTION OF THE BUILDINGS WE HAVE NOW WILL STILL BE WITH US IN 2050. THEREFORE, IT MAKES GOOD SENSE TO EXPLORE HOW WE CAN OPTIMIZE THE ENERGY EFFICIENCY OF OUR EXISTING BUILDING MASS. IN FACT, SOME QUICK WINS ARE AVAILABLE THAT WILL REDUCE A BUILDING'S CARBON FOOTPRINT FROM THE MOMENT THEY ARE IN OPERATION, AND USUALLY PAY FOR THEMSELVES IN LOWER ENERGY BILLS IN LESS THAN TWO YEARS.





UPGRADING IS THE SMARTER WAY AHEAD FOR ENERGY EFFICIENT BUILDINGS

Frank Taaning Grundholm, Vice President, Global HVACR Sales, ABB Motion, Explains why upgrading existing buildings with the latest variable speed drives and high efficiency motors could offer a smarter route to a low-carbon future than constructing new buildings.

Megacities comprising state-of-the-art high-rise buildings offer an enticing vision of a global low-carbon future. Indeed, these new structures offer multiple opportunities to embrace high-performance insulation materials, implement passive natural ventilation and deploy smart technology. Their potential to create comfortable living and working environments with minimum energy consumption is truly impressive.

However, in placing the focus on new buildings, I believe the industry is missing two very important points. First, any new building has a very large carbon footprint, especially from the concrete, steel and other materials used in its construction. That means however energy efficient it is, it will still take some 25 to 30 years for its daily low emissions to offset the CO₂ emissions created when it was built.

Second, a very large proportion of the buildings we have now – perhaps 80% or even more depending on the region – will still be with us in 2050. Therefore, it makes good sense to explore how we can optimize the energy efficiency of our existing building mass.

In fact, some quick wins are available that will reduce a building's carbon footprint from the moment they are in operation, and usually pay for themselves in lower energy bills in less than two years.



VARIABLE SPEED DRIVES OFFER A QUICK WIN

The first quick win is to install variable speed drives (VSDs). In a typical building around 40% of electrical energy is consumed by the heating, ventilation and air conditioning (HVAC) systems.

But most of the time these systems operate at 80% of the maximum load or even less. Using a VSD to adjust the motor speed of fans, pumps and compressors to meet the building's current needs will cut energy consumption by up to 60% compared to traditional damper or valve control methods – see Figure 1.

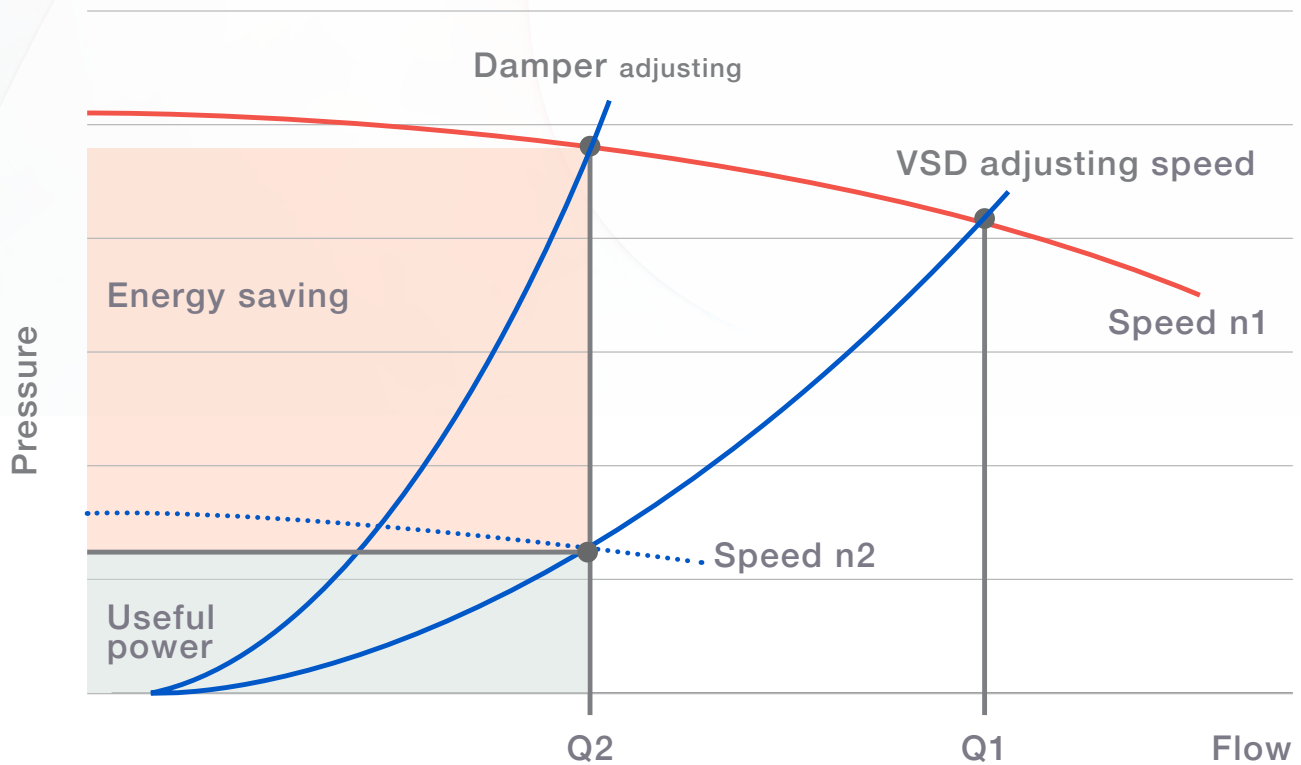


Figure 1 - Comparison of the change in power consumption when decreasing the flow rate from Q1 to Q2 with a damper or a VSD. The damper doesn't decrease the speed, instead it creates the resistance to decrease the flow, wasting energy (as shown in the red square). The VSD also decreases speed (from n1 to n2) so less energy is consumed.

The beauty of using VSDs is that they are relatively simple and straightforward to install with no modification to the building structure required. All you need to do is to rewire the motor. Furthermore, the controls built into the drive offer advanced software tools for easy configuration, startup and maintenance as well as functions such as fireman's override that keeps systems running as long as possible during a fire.

TAKE ENERGY EFFICIENCY TO THE NEXT LEVEL WITH IE5 MOTORS

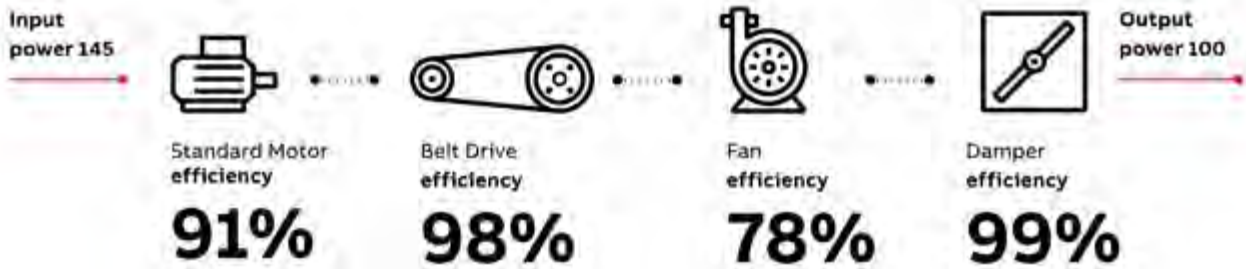
Even if a building has VSDs already installed then significant gains in energy efficiency are still possible by upgrading its electric motors.

It is common for buildings today to have legacy motors with the IE2 or even IE1 efficiency class as defined by the International Electrotechnical Commission (IEC). IE3 is now established as a minimum requirement for new motors. However, you can go well beyond this. For example, ABB's synchronous reluctance motors (SynRM) deliver IE5 ultra-premium energy efficiency, with reduced losses of 40% compared with previous generations.

Upgrading is easy because the latest motors are still in IEC frames. That means the old motor can be removed and a new one installed in exactly the same footprint. Combined with VSDs, the new motors will offer exceptional energy efficiency. If, at the same time, high efficiency fans are installed and belt drives are removed the savings are even greater, see Figure 2.

Conventional ventilation system

System efficiency = 69%



Energy-efficient ventilation system

System efficiency = 83%

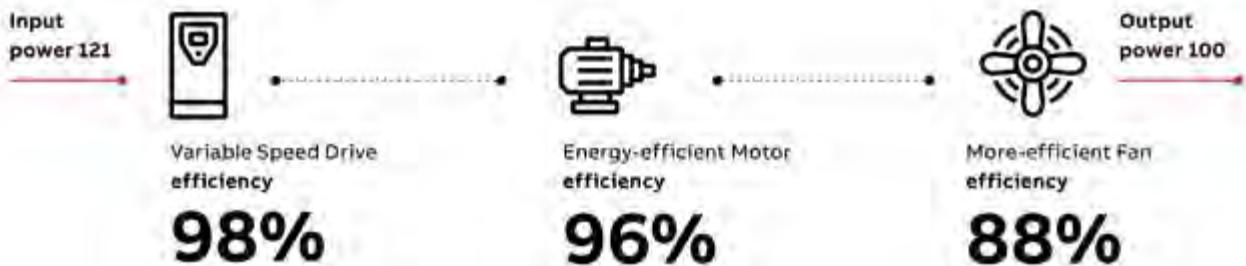


Figure 2 – Changing to high efficiency components and direct drive significantly increases system efficiency.

AVOID THE CONTINUOUS CYCLE OF CHASING YOUR CARBON FOOTPRINT

I estimate that some 70% of the world's building stock was built before current codes came into existence. That means there is tremendous scope to upgrade buildings with new glazing, better insulation and more energy-efficient mechanical components such as air handling units (AHUs), ducting and auxiliary equipment.

The challenge is that these upgrades start to involve significant structural work and associated costs.

Even with a massive effort, it is virtually impossible to make an existing building carbon neutral. If it really is vital to achieve that goal, then the only way to achieve it is to tear it down and construct a new building.

But remember that both those actions impose a considerable carbon debt that will last for some 30 years. In essence, the desire for a carbon neutral building right now could actually make things worse by locking you into an almost never-ending cycle of chasing your carbon footprint.

A SMART INVESTMENT

The really smart way to reduce the carbon footprint of buildings is to make a thorough assessment of your existing stock with an expert in energy efficiency. They will almost certainly be able to identify some upgrades that can be implemented with minimum disruption and maximum benefit.

A good example is the renovation of the HVAC and hot water supply systems of the InterContinental hotel in Madrid. Installing ABB VSDs and IE3 motors has resulted in energy savings of around 40%, helping the hotel to meet its sustainability goals.

Over a year these savings totaled 445,000 kWh, cutting the hotel's annual energy bill by \$37 000, which delivered on the projected return on investment in exactly two years.



Figure 3 – ABB VSDs and motors have helped the InterContinental hotel in Madrid cut its energy bills by 40%.

The majority of current buildings will probably still be there in 30 years' time. If the investment in energy efficiency is paid back in two years, then you have 28 years of saving costs while minimizing your carbon footprint. At the same time, you are helping create a more sustainable urban environment for everyone.

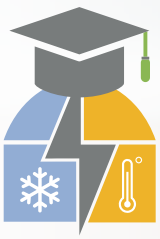


For further information:
www.energyefficiencymovement.com

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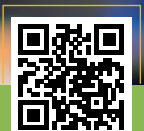
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DISTRICT COOLING SYSTEM: A BOQUET OF OPPORTUNITIES

BY TARUN GARG, AKHIL SINGHAL
ALLIANCE FOR AN ENERGY EFFICIENT ECONOMY

Cooling is critical for human health, nutrition, comfort and the creation of products used in daily life. Rising temperatures have added to the enormity of India's developmental challenges. Rising temperatures present a grave danger to thermal comfort, impacting overall economic productivity, making access to cooling an essential utility for the Indian population. However, due to a large share of densely populated cities, rising temperatures disproportionately impact urban areas. Cities are on the front lines of the growing climate change risk across the world. India is no different; the world's second-most populous country (Bureau 2021), is now rapidly urbanizing.

At present, 34% of India's population lives in urban areas, with an annual growth rate of 2.4% in the 2010-18 period (G. MoHUA 2021). Cities are the dominant source of greenhouse gas emissions and need to create a path to net-zero carbon that considers city-specific features like climate, resources, and culture. Cities, which will contribute over 80% to GDP by 2050, need to be Receptive, Innovative and Productive to foster sustainable growth and ensure a better quality of living.





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IT WAS ESTIMATED THAT BY 2038, INDIA'S SPACE COOLING DEMAND IN NEW COMMERCIAL BUILDINGS THAT COULD BE MET BY DCS, WOULD BE AROUND 50 - 60 MILLION TONS OF REFRIGERATION (TR). IF THIS TOTAL DEMAND COULD BE MET VIA DCS, IT COULD LEAD TO REDUCING 25 GW OF PEAK POWER DEMAND, REDUCTION IN 27 MILLION TONNES OF CO₂, 4,361 TONNES OF AVOIDED REFRIGERANT RECHARGE AND LEAD TO ANNUAL ENERGY SAVINGS OF 32 TERAWATT-HOURS (TWH) IN INDIA (EESL, 2021).

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Environmental Case of District cooling:

Improvements in the efficiency of refrigeration and air-conditioning equipment through district cooling during the transition to low-global-warming potential refrigerants would bring additional GHG reductions resulting in benefits for climate change mitigation and to a lesser extent for air quality due to reduced air pollutant emissions from power plants.

DCS could also play a significant role in achieving the commitments made in Paris agreement as well as in decarbonization at city level in India.

It was estimated that by 2038, India's space cooling demand in new commercial buildings that could be met by DCS, would be around 50 – 60 million tons of refrigeration (TR). If this total demand could be met via DCS, it could lead to reducing 25 GW of peak power demand, reduction in 27 million tonnes of CO₂, 4,361 tonnes of avoided refrigerant recharge and lead to annual energy savings of 32 terawatt-hours (TWh) in India (EESL, 2021).

Furthermore, DCS could also be a step forward to a achieving net zero cooling solution if coupled with non-conventional sources of energy such as wind, solar or green electricity and integrating it with innovative heat sinks solutions such as water bodies, ground cooling or industrial free cooling.

Business Case of District cooling:

DCS investment potential in India has been identified to be around USD 35.9 billion by 2038. Furthermore, it has also been estimated that DCS will avoid investment of around USD 10.5 billion required for development of additional infrastructure such as power plants, transformers, and water supply systems by the government (EESL, 2021). DCS have proven to provide consistent revenues and returns worldwide and would thus enable the municipalities to develop alternative revenue stream as well led to cost savings in several aspects.

DCS could also lead to development of an all new cooling as a service industry in India if enacted by the municipalities or service providers thus would lead to job creation and employment and in turn lead to skill development. Moreover, DCS could provide benefits beyond quantification such as improved aesthetic value of cities without the grid of standalone air conditioners, that could lead to enhanced tourism and social aspect of the cities.

Social Case of District cooling:

DCS can also lead to provision of several social benefits most important being Thermal Comfort for All. Cooling has been proven to be a necessity rather than luxury, it not only leads to better comfort and improved quality of life but overall enhanced productivity of the people.

DCS could provide sustainable cooling to buildings and households at costs that are affordable and a solution that could be adopted by the masses. The implementation of DCS will also help in reduction of emissions from energy generation which inturn could help in improvement of air quality and improved environmental conditions.

Further, DC involves coordination at different levels and provides benefits at the local level such as empowering local business and skill development of local communities, enhanced collaboration between local businesses, communities and the government.



Figure 1: District Cooling System: A Boquet of Opportunities

The DCS technology even after having proven above mentioned benefits in environmental, economic and social domain, these have not yet been implemented in India at large scale.

Some of the pertinent reasons for its slow pace of implementation are lack of market stimulating policies supporting energy-efficient centralized cooling systems, absence of bankable project ideas and hence lack of investment interest, lack of awareness and skill-set to design and commission large scale centralized cooling system, lack of interest shown by technology partners to work as it is perceived as "high risk" investment project in India.

Triple sector leadership for creating and sustaining market for District cooling

For its uptake, bold action is required by policymakers, civil society organizations (CSOs) and business leaders to speed the transition. Examples have already been set in various sectors such as air pollution, e-mobility, and renewable energy. Now is the time for the cooling community to advance the agenda of district cooling and limit the damage to the environment from the rapidly growing air conditioning demands.

The policymakers can be the torch bearers by setting policies in place to create an enabling mechanism to develop a thriving DC industry in India. Continued commitment by policymakers to update building-related and energy-related codes and regulations, the most severe

consequences of climate change may be limited, especially as the demand for refrigeration increase in the coming decades as populations grow." Coupled with commitment from businesses including industries, building practitioners, technology providers, and associations to ensure the development and deployment of energy-efficient technologies that could support the transition towards energy efficient DCS and low global warming potential refrigerants.

The CSOs can work cohesively with industry to develop research and evidence and put together a directory of good practices and innovative business models that can accelerate the markets to innovate and absorb

the transitions. On the other hand, the advisories and advocacies by CSOs in the dimensions of awareness, training, and capacity buildings can foster to bring acceptance of DC as a solution and mediate between the policy makers and business communities to ensure the environmental and social aspects of DCS are provided keeping in mind the interest of the business communities in order to generate and maximize the desired impacts across Indian building sector.

This is indeed another opportunity for India to take on a leadership role that will strengthen India's global position on actions to promote district cooling.

Alliance for an Energy Efficient Economy (AEEE), is one of the leading organizations in India that works on creating awareness about energy efficiency as a resource. It is a policy advocacy and energy efficiency market enabler with a not-for-profit motive. We advocate for data-driven and evidence-based energy efficiency policies and research.

We foster a culture of energy efficiency in India, working with industry, government and civil society organizations. AEEE advocates for Thermal Comfort for All, and a Lean-Mean-Green philosophy to design and construct net-zero energy-water-waste built environments, Sustainable Transportation and robust Energy Data Framework for better policy-making and implementation, to build a culture of energy efficiency in India.

We are committed to achieve India's energy transition for a climate-resilient and energy secure future and meet India's commitments to the 2030 nationally determined goals (NDC) and UN sustainable development goals (SDG).



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CONTROLLING YOUR INDUSTRIAL RISKS

BY BRUNO LHOPITEAU
MANAGING DIRECTOR, SIVECO CHINA

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EXPERIENCE PROVES THAT THE WEAKEST LINK IN TERMS OF RISK MANAGEMENT IS NOT MACHINES, PROCESSES, TECHNOLOGIES BUT PEOPLE. PEOPLE MAKE MISTAKES AND THE MORE ADVANCED, THE MORE COMPUTERIZED, THE MORE 4.0 THE PLANT, THE MORE QUALIFIED PEOPLE ARE NEEDED TO MAINTAIN IT, TO MAKE COMPLEX DECISIONS, IN AN EVER MORE COMPLEX ENVIRONMENT.

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Industrial disasters in Thailand and Singapore have made headlines recently, in a time when infrastructure projects and industrial plants, their workers and managers, are facing unprecedented pressure from the prolonged Covid-19 crisis and economic difficulties.

Official investigations have shown that technical errors are either the cause or a contributing factor of most accidents: lack of maintenance, non-compliance with regulations or internal best practices, wrong diagnosis leading to wrong technical actions, bad management decisions, often due to lack of knowledge and lack of accurate information.

Health, Safety, Environment (HSE) is of course intertwined with maintenance, yet these disciplines are often seen as separate.

In most companies, HSE is a noble profession, while maintenance is seen as an ugly duckling...



Converging standards

International standards offer great insight in the subject. According to the well-known ISO 31000 Risk Management standard, "Risk is the effect of uncertainty on objectives": there is no risk without objective. As per the European standard EN 13306 Maintenance terminology, the role of maintenance is "to retain in, or restore to, a state in which the items [under maintenance department responsibility] can perform the required function".

We note that the "maintenance department" can be any department in charge of maintaining an item (not strictly the one called "maintenance"). Typical objectives include availability, cost reduction, product quality, environment preservation. Maintenance is meant to reduce the effect of uncertainty on these objectives, mostly by reducing the probability of failure through preventive maintenance.

If you have a Preventive Maintenance plan in place, you already have a Risk Management plan.

More interestingly, the ISO 31000 Risk Management standard explicitly points to methodologies, tools and practices that are all well-known to maintenance partitioners: FMEA (Failure Modes and Effects Analysis), RCA (Root Cause Analysis), RCM (Reliability Centered Maintenance).

It emphasizes the need for a feedback loop between field activities and decision makers. The ISO 55000 Asset Management standard offers a risk-based approach to Asset Management (defined as "The coordinated activity of an organisation to realize value from assets.") fully aligned with ISO 31000 and a practical tool for implementation, with clear steps and control points. As a result of this convergence between Maintenance and Risk Management standards, a large variety of tools become available to the organization and maintenance professionals must take center stage in the Risk management effort.

The weakest link

Yet, experience proves that the weakest link in terms of Risk Management is not machines, processes, technologies but people. And not just "them", but "you and me" too! People make mistakes and the more advanced, the more computerized, the more 4.0 the plant, the more qualified people are needed to maintain it, to make complex decisions, in an ever more complex environment. There is no easy solution: no Digital Twin or Maintenance Drone that can magically solve all problems. Furthermore, in the ongoing crisis, companies face a more challenging human resources environment than before.

The experience of China comes to mind, a nation that has faced very similar HSE challenges in the booming two decades during which it became the factory of the world and the global infrastructure leader. The analysis outlined earlier in this article reflects the experience Siveco China, an Asset Management consultancy and digital solution provider originating from France, which has developed alongside its Chinese clients during this period, before expanding its business to Southeast Asia and elsewhere.

According to Siveco China, the challenge or rather the opportunity of Risk Management can only to be tackled by placing people at the center. The ongoing crisis, increasingly strict regulations, give plenty of incentives for such a project. The best practices embodied in the ISO 31000 and ISO 55000 standards offer a credible framework, first to convince your boss, and then to run the project with a structured manner. ISO 55000 advocates prioritization and favors continuous improvement, which means you can start small and fast. The feedback loop between workers and managers, with proof of compliance, is best implemented though a digital tool designed based on the standards. This is where 4.0 finally appears, not as a magic wand, but as a tool in a worker-centric risk-based approach.

In times of crisis, companies and managers may be tempted to wait for the crisis to end. Experience shows that one crisis will soon replace the other. Good times will come too, during which pressure to improve may disappear, until the next crisis. While you wait, problems won't go away, new regulations may appear, competition will strengthen. This has been the case in China in the past decade. Some companies transformed themselves and their industry, while complacent players, among them leading multinationals, lost their competitive edge. The best time to act is now.



Chonburi Clean Energy (Thailand) benefits from this risk-based Smart O&M approach



Case study – Chinese storage terminal takes risk management to world-class level with bluebee®

In 2016, facing increasing regulatory oversight and toughening market conditions, LBC Shanghai Shipping Terminal (a 74,200 m³ bulk liquid chemicals and petroleum products storage terminal) decided to strengthen its risk prevention management system with Siveco China in line with ISO 31000 and 55000.

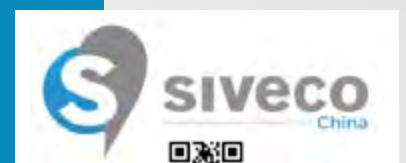
Critical assets and inspections points were documented and labelled with QR-coded tags. Technical staffs were trained to use a mobile application named bluebee®, running on explosion-proof ATEX-certified Android phones. The app helps capture information from the field, such as incidents reported in a structured manner for systematic analysis, and enforce best practices, such as inspections or troubleshooting procedures. It connects to a cloud-based risk management platform, which contains all inspection routines, standard operating procedures and technical data. The platform produces regular analysis reports, as well as real-time graphical indicators showing the project's progress, identifying risk areas, tracking the corrective and preventive actions taken.

With the app, scanning of QR codes, automatic time stamps and onsite photos prove that inspections are actually performed, in ways that a paper-based system with regular audits could never achieve ('how do we know for sure the job was done'). Indeed, inspection forms (either preprinted or printed from a CMMS program), common in the industry, seldom accurately reflect the reality in the field: all checkboxes are invariably ticked off. Another key aspect of the system is that it enabled training on-the-job, in addition to classroom training on related concepts and methodologies during the implementation phase.

The project took three months and resulted in a robust Risk Prevention process, demonstrable to all stakeholders. It won a Chinese industry award for Asset Management digitalization and was shortlisted for the Outstanding Terminal Safety Technology Award at 2018 Global Tank Storage Awards in Rotterdam, no small feat for a Chinese terminal.

Siveco China (www.sivecochina.com/en) is a pioneer in the development of Smart Technologies for Operation & Maintenance, with a focus on mobile solutions "for the worker of tomorrow." The company helps facilities owners to optimize assets lifecycle and ensure regulatory compliance.

Siveco China has its Asian headquarter and R&D center in Shanghai, serving clients all over Asia and on the New Silk Roads. It is the only company in Asia to be ISO 9001-certified for this scope of business.



DE-CARBONIZED COOLING AND HEATING WITH ABSORPTION TECHNOLOGY

BY ALBIN FAN, PRODUCT MANAGER ASIA PACIFIC, JOHNSON CONTROLS

“

ABSORPTION CHILLERS / HEAT PUMPS USE WATER AS THE REFRIGERANT, YIELDING ZERO OZONE DEPLETION AND GLOBAL WARMING POTENTIAL; ABSORPTION UNIT OPERATES UNDER VACUUM WITH A FEW MOVING PARTS, QUIET AND LOW NOISE. ABSORPTION TECHNOLOGY IS TRULY GREEN, ENVIRONMENT-FRIENDLY AND SUSTAINABLE.

”

We all have a part to play to fight climate change and we can do this together by moving towards a more carbon-neutral footprint. China has announced that it would strive to bring carbon dioxide emissions to a peak before 2030 and become carbon neutral before 2060 to tackle climate change.

Singapore launched the Singapore Green Plan 2030 on 10th February 2021. This plan strengthens Singapore's commitments under the UN's 2030 Sustainable Development Agenda and Paris Agreement, and positioning us to achieve the long-term net zero emissions aspiration as soon as viable.

The heat (cooling and heating) sector represents a major part of the total energy consumption in Asia Pacific region. Decarbonizing the heat sector is imperative to meet the goal of becoming carbon neutral.





Absorption chillers / heat pumps use water as the refrigerant, yielding zero ozone depletion and global warming potential; Absorption unit operates under vacuum with a few moving parts, quiet and low noise. Absorption technology is truly green, environment-friendly and sustainable.

Why absorption chillers?

Truly green, environment-friendly and sustainable technology



Driven by waste heat (thermal source)



Water as the refrigerant (zero ODP, GWP)



Reduced electric energy costs



Reduced emissions



Quiet and vibration free (low sound level)



Environmental Regulations



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Absorption chillers / heat pumps transfer energy from waste heat source to deliver de-carbonized cooling and heating for commercial, industrial, district energy and even marine applications. Absorption chillers / heat pumps have been around since 1960s with hundreds and thousands of installations in operation successfully all over the world.

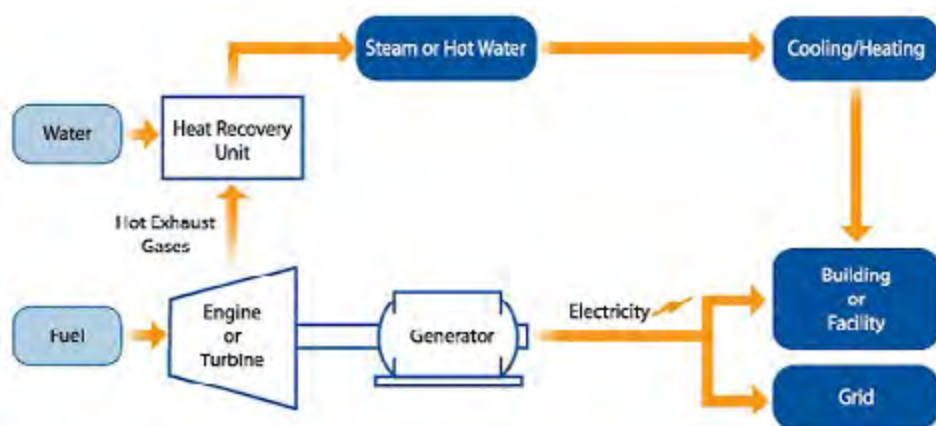
Two major applications of absorption in urban energy sector:

1 CHP Project:

Refer to www.epa.gov/chp/discover-chp

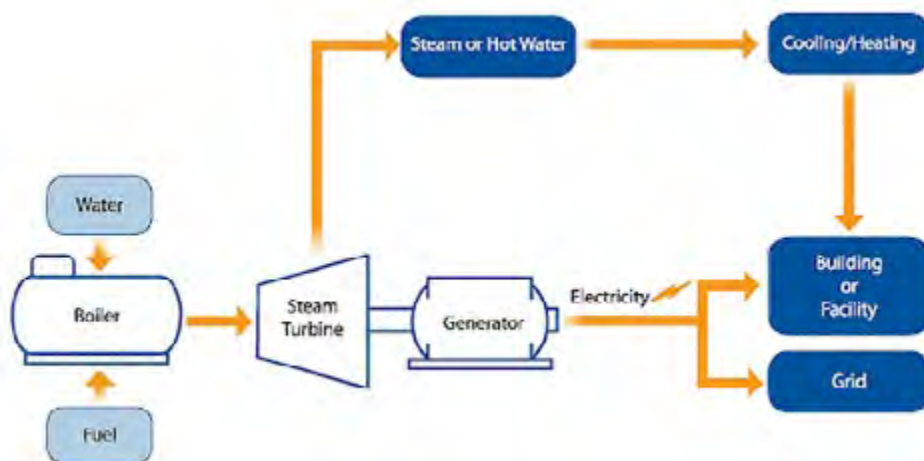
CHP (Combined Heat and Power Supply) is an energy efficient technology that generates electricity and captures the heat that would otherwise be wasted to provide useful thermal energy—such as steam or hot water—that can be used for space heating, cooling, domestic hot water and industrial processes. Two major types of CHP systems:

- Combustion Turbine, or Reciprocating Engine, with Heat Recovery Absorption Unit (Small-medium size)



Combustion turbine or reciprocating engine CHP systems burn fuel (natural gas, oil, or biogas) to turn generators to produce electricity and use heat recovery devices to capture the heat from the turbine or engine. This heat is converted into useful thermal energy, usually in the form of exhaust gas, steam or hot water to drive chillers / heat pumps.

- Steam Boiler with Steam Turbine, with Heat Recovery Absorption Unit (Large Scale)



With steam turbines, the process begins by producing steam in a boiler. The steam is then used to turn a turbine to run a generator to produce electricity. The steam leaving the turbine can be used to produce useful thermal energy. These systems can use a variety of fuels, such as natural gas, oil, biomass, and coal.

Along with the wide applications of CHP, more and more airports, railway stations, hospitals, city center commercial complexes, universities, industrial parks etc. are using absorption chillers / heat pumps for fully utilizing the low-grade heat after power generation. You would probably be surprised to know that the following airports in Asia are mainly or partly utilizing absorption chiller technology for cooling: Both Narita and Haneda Airport Tokyo, Kansai Airport Osaka, Kuala Lumpur Airport, Suvarnabhumi Airport Bangkok, Capital Airport Beijing, and Pudong Airport Shanghai.

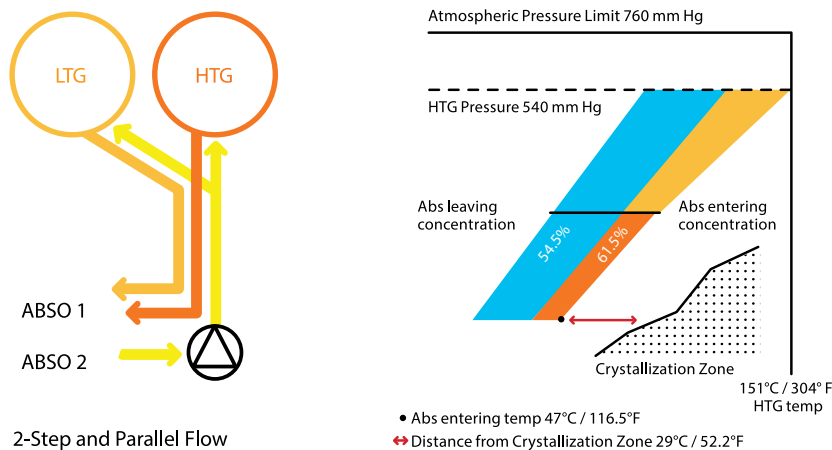
2 Renewable Energy Projects Such as Solar / Bio-mass / Bio-gas / Geothermal / Fuel Cell etc.

Solar hot water chiller; bio-mass boiler combined with steam / hot water absorption chiller; bio-gas direct fired chiller, or bio-gas CHP projects; geothermal hot water chillers / heat pumps; and the latest innovative application of hydrogen fuel cell CHP systems...

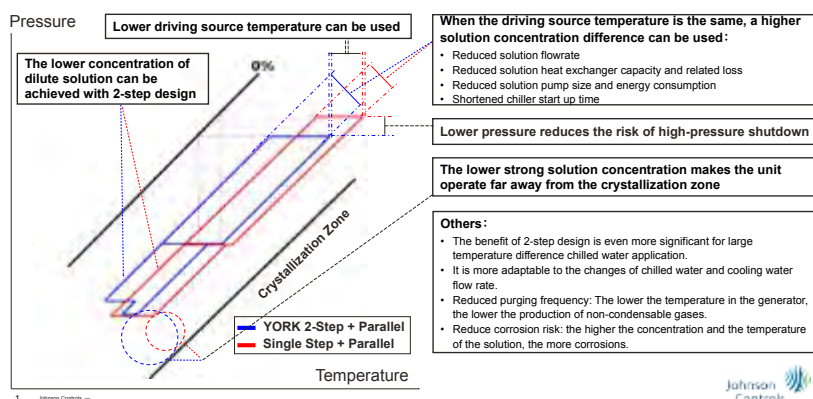
Johnson Controls and the YORK® brand have been at the forefront of progress and development in absorption technology serving global markets since 1960.

With more than 80 patents recognizing the innovative engineering, YORK® Absorption chillers/heat pumps have a much deeper history when combining decades of proven reliability with the design flexibility of multiple driving heat sources. These sources deliver a truly reliable, highly efficient and resilient solution for more flexible applications with unique features such as patented two step evaporator / absorber and parallel solution cycle for double effect design.

This two-step evaporator / absorber design has an effective vapor-pressure difference in both the upper and lower sections; when compared to the conventional cycle, enhances single-effect absorption chiller performance by improving crystallization protection, along with enabling the use of lower-grade hot water or low-pressure steam as a driving heat source. These benefits cross over to a double-effect absorption chiller that takes advantage of parallel flow cycle combined with the two step E/A structure, with unprecedented lows in lithium bromide solution concentration during operation, which minimizes crystallization risks and provides performance benefits. (See Figure 1 and 2)



YORK 2-Step E/A & Parallel Flow Design: Customer Values for Double Effect Chillers



The combination of two step E/A technology with double effect parallel flow cycle is accomplished with simple construction and the end result is greater application flexibility, plus an optimum balance between reliability and efficiency, which make these advanced absorption chillers / heat pumps designs more attractive for more applications than ever before.

Furthermore, flexibility has increased dramatically in recent years by Johnson Controls. Below are some examples:

1 Low Leaving Chilled Water Temperature

The innovative YORK® YHAU-C-LL absorption chiller enables -5°C refrigeration without ammonia using an advanced two-step evaporator and absorption cycle. As a result, YHAU-C-LL absorption chillers provide an environmentally friendly and energy-efficient solution where refrigeration is needed below the freezing point – such as food processing and storage applications.

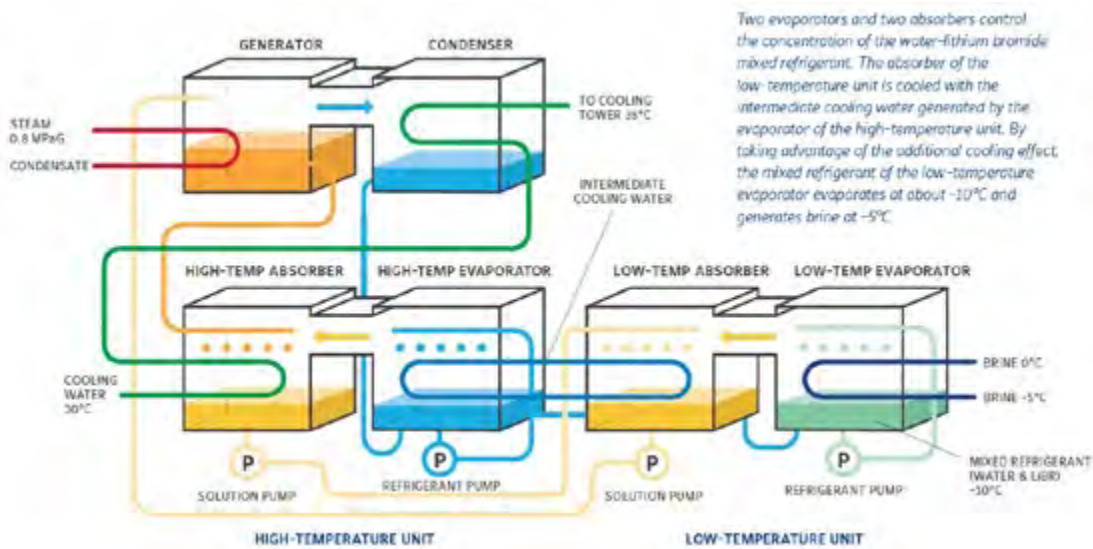


Figure 3: YHAU-C-LL two-step evaporator and absorption cycle design

2 Marine Absorption Applications

The use of absorption chillers on a passenger vessels further illustrates the evolution of YORK® technology. Absorption chillers have successfully overcome the vessel's rolling, pitching and tilting, demonstrating true operating flexibility.



Figure 4 YORK YHAU-CLM Marine Type Single Effect Hot Water Absorption Chiller

For more information on YORK absorption technology.

Please visit:
www.YORK.com/absorption-chillers



Johnson Controls is a global diversified technology and multi-industrial leader serving a wide range of customers in more than 150 countries. It has more than 105,000 employees creating intelligent buildings, efficient energy solutions, integrated infrastructure and next generation transportation systems that work seamlessly together to deliver on the promise of smart cities and communities. Johnson Controls' commitment to sustainability dates back to its roots in 1885, with the invention of the first electric room thermostat. The company is committed to helping its customers win and to creating greater value for all of its stakeholders through a strategic focus on buildings and energy growth platforms.





FINAL REPORT LOW-TEMPERATURE DISTRICT HEATING IMPLEMENTATION GUIDEBOOK

Edited by Kristina Lygnerud and Sven Werner

The energy transition is global, one important way forward is efficient climate goals with enlarged shares of renewables in the energy mix, active disinvestment plans for fossil-powered units, and increased energy efficiency.

One example of a renewable source is waste heat from different processes. There is an ongoing urbanization world-wide, and it is predicted that 68% of the world population will live in an urban area by 2050.

By living and working in cities, people generate heat in their

daily lives, referred to as urban heat sources. These sources alone could meet 10% of the demand for heat in Europe², but merely a fraction of them are sourced today.

Low-temperature district heating allows increased cost efficiency in using renewable sources for heat recovery³, and they are locally available in any city. A group of researchers under the International Energy Agency – District Heating and Cooling branch have identified that low temperature heat implementations is a significant trend. Over 160 implementations have been

identified world-wide. The team now released a book summarizing the information available on the topic to which experiences from early cases was added.

The book provides information on how to adjust building and the distribution network, what the economic gains are for low temperature, its competitiveness and possible transition strategies in cities with high temperature implementations.

IVL was jointly founded in 1966 by the Swedish state and national business interests to carry out research on industrial air and water issues. Today we are an environmental agency concentrating on much more. Common to all of our assignments is the interaction between ecological, economic and social perspectives.

We employ more than 300 engineers, behavioural scientists, chemists, marine biologists, biologists, political scientists, journalists, business developers and economists – to name only a few. We also possess exceptional specialist skills – a fourth of our employees have doctorates.

On the topic of low temperature waste heat recovery we coordinate frontrunner project ReUseHeat where heat is recovered from sewage water, metro tunnels, data center and hospital. We also collaborate in Rewardheat, the sister project of ReUseHeat where demonstrators of low temperature are implemented across Europe. IVL has also supported Halmstad University to contribute and build the handbook for IEA-DHC, TS2.

RECENT APUEA ACTIVITIES

One of APUEA's main activities is to provide meeting platforms where our members and the energy community can discuss, share ideas and knowledge, and hopefully initiate new projects to speed up the development of Sustainable Urban Energy in the Asia Pacific region. Since July 2021, APUEA has continued to host sessions focusing on District Cooling, this time for the markets in Malaysia and Vietnam. APUEA also hosted a webinar on the topic "Future Urban Energy in ASEAN" and supported two-member webinars, Trends and Technology of Car Charging in Asia by ABB and Controlling your Industrial Risks: Case Studies During COVID-19 Times by Siveco China. More details of our latest activities can be found in the text below.



EXPLORING THE POTENTIAL OF DISTRICT COOLING SYSTEMS IN MALAYSIA

On 2 September, APUEA co-hosted the workshop on "Exploring the Potential of District Cooling Systems in Malaysia" together with Informa Markets Malaysia. Malaysia has a population of 33 million and the second highest GDP per capita among the ASEAN countries. Malaysia has a high utilization rate of air condition systems, 80% percent, and the country has a developed District Cooling market. There are 23 District Cooling Systems in operation, and 2 are under development. With its tropical climate and economic development, the country has a large potential for District Cooling systems. The objective of the webinar is to introduce the status and development potential for District Cooling in Malaysia.

Exploring the Potential of District Cooling in Malaysia (Webinar): 2 September 2021

TIME	ACTIVITY
14:00 - 14:05	<p>Moderator: Peter Lundberg, Head of Operations at Asia Pacific Urban Energy Association (APUEA)</p> <p>Opening remarks and session introduction Gerard Leeuwenburgh, Country General Manager, Informa Markets Malaysia</p> <p>Mikael Jakobsson, Executive Director at Asia Pacific Urban Energy Association (APUEA) (APUEA)</p>
14:05 - 14:20	<p>The Potential of District Cooling in Malaysia Dr. Mohd Hafiz Ibrahim, General Manager, Pendinginan Megajana Sdn Bhd</p>
14:20 - 14:35	<p>Developing District Cooling in Malaysia Anh-Hà de FOUCAULD, Head of Mixed-Use Retail and Real-Estate Solutions ENGIE South East Asia</p>
14:35 - 14:50	<p>District Cooling System (DSC) as a Service in Malaysia Adrian Lim Hock Heng, General Manager, KJ Technical Services Sdn Bhd</p>
14:50 - 15:05	<p>District Cooling Developments in Iskandar Puan Kamisah Mohd Ghazali, Senior Vice President of Key Result Area Resilient Environment (KRA RE).</p>
15:05 - 15:20	<p>International Experiences for the District Cooling Market in Malaysia Mohannad Khader, Commercial and Development Director, Qatar Cool</p>
15:20 - 15:30	<p>Q&A Audience</p>
15:30	<p>Workshop conclusion APUEA & Informa Markets</p>

RE-WATCHED WEBINAR HERE:
EXPLORING THE POTENTIAL OF DISTRICT COOLING SYSTEMS IN MALAYSIA



THE POTENTIAL OF DISTRICT COOLING IN VIETNAM

On 9 July, APUEA co-hosted a webinar on “The Potential of District Cooling in Vietnam. Vietnam has a population of 98 million and has strong economic growth, with an economy that grew 7% in 2019.

At the same time, despite its tropical climate, only 7% of households use ACs. With a large urbanization rate, tropical climate, and economic growth, the country has a large potential for District Cooling systems. This webinar was a part of the HVACR Vietnam 2021: The 15th International Exhibition on Heating, Ventilation, Air-Conditioning, Air Filtration & Purification, Refrigeration Systems in Vietnam.

District Cooling in Vietnam (Webinar): 9 July 2021

TIME	ACTIVITY
	Chair: Peter Lundberg, APUEA
16:00 - 16:05	Opening remarks & Session introduction Mr. BT Tee, Country Manager, Informa Markets Peter Lundberg, Head of Operations, Asia Pacific Urban Energy Association (APUEA)
16:05 - 16:20	The Rising Cooling Demand in Vietnam Nguyen Dang Thu Cuc, De National Ozone Coordinator, Department of Climate Change, Ministry of Natural Resources and Environment
16:20 - 16:35	Sustainable Urban Cooling in Vietnam Cities Huong Ta, Senior Program Officer, Global Green Growth Institute (GGGI)
16:35 - 16:50	Developing District Cooling in Vietnam Steve Seah, Head of Business Development, District Cooling, SP Group
16:50 - 17:05	District Cooling System Case Study Delivering Carbon Neutrality Garry Chui, Senior Manager, Product Portfolio Management, Greater Asia at Johnson Controls, Johnson Controls
17:05 - 17:20	Energy Saving and Benefits of Variable Speed Drive in District Cooling TeongWah Yeoh, Head of Motion Business ABB Vietnam
17:20 - 17:30	Q&A Audience
17:30	Workshop conclusion APUEA & Informa Markets



ASEAN ENERGY & UTILITIES DIGITAL WEEK - FUTURE URBAN ENERGY IN ASEAN

On 7 July, as a part of the ASEAN Energy & Utilities Digital Week, APUEA hosted a webinar on the topic “Future Urban Energy” in collaboration with Informa Markets. The session discussed future urban energy concepts and solutions, focusing on energy efficiency and digitalization, to help ASEAN cities become more sustainable.

Topics discussed in the session:

- The vital role of high-efficiency motors and drives in reducing energy consumption
- The Future of Operations and Maintenance
- Applying Artificial Intelligence for District Energy Operation Optimization

Future Urban Energy in ASEAN: 14:45 – 15:45, Indochina Time, 7 July 2021

TIME	ACTIVITY
	Chair: Peter Lundberg, APUEA
14:45 - 14:50	Session introduction Peter Lundberg, Head of Operations Asia Pacific Urban Energy Association (APUEA)
14:50 - 15:05	The vital role of high-efficiency motors and drives in reducing energy consumption Maria Fedorovicheva, Global HVAC Product Marketing Manager at ABB Motion
15:05 - 15:20	The Future of Operations and Maintenance (O&M) Guillaume Gimonet, COO - Operations Director of SIVECO CHINA
15:20 - 15:35	Applying Artificial Intelligence for District Energy Operation Optimization John Jakobsson, Managing Director, NXITY ICT Solutions
15:35 - 15:45	Q&A Audience
15:45	Workshop conclusion APUEA & Informa Markets



APUEA MEMBER EVENTS

LIVE 8 SEPTEMBER | 10:00 (GMT +8)
CHANNEL: EV & CHARGING

MOVE ASIA
MOBILITY • TECHNOLOGY • SUSTAINABILITY

LIVE PANEL: TRENDS AND TECHNOLOGY OF CAR CHARGING IN ASIA

Kumail Rashid
E-mobility Division Lead, Asia Pacific
ABB

Xiang Yeow
Senior Specialist, E-Performance
Porsche Asia Pacific

Min Yih Tan
Senior Vice President, Global Mobility Network
Shell

Peter Lundberg
Head of Operations, Asia Pacific Urban Energy Association
(Moderator)

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RE-WATCHED WEBINAR HERE:
MOVE ASIA - LIVE PANEL: TRENDS AND TECHNOLOGY OF CAR CHARGING IN ASIA



MOVE ASIA - LIVE PANEL: TRENDS AND TECHNOLOGY OF CAR CHARGING IN ASIA

On 8 September, as a part of the Move Asia 2021, APUEA's Peter Lundberg moderated a live discussion on "Trends and Technology of Car Charging in Asia. The session was sponsored and organised by ABB and Terrapin.

The session included three expert panelists representing three different sides of the EV industry, including Porsche, ABB, and Shell. The session discussed the development of EV charging infrastructure, how e-mobility can help mitigate climate change, and how ABB, Porsche, and Shell are working in the fast-growing e-mobility sector.

Controlling your Industrial Risks: case studies during COVID-19 times

Practical use of Smart O&M solutions and ISO 31000 / ISO 55000

Date/Time: August 13th, 2021/5pm-6pm (GMT+8)

WEBINAR

About the Agenda & the Speaker

- How to set up a risk prevention management system in line with ISO 31000 and ISO 55000
- How to design and deploy a Smart O&M solution to enforce and demonstrate compliance
- Case studies of achieving Risk Prevention in Asian infrastructures and plants

Bruno Chopiteau
Managing Director

Organized by: **S siveco** Supported by: **APUEA**

CONTROLLING YOUR INDUSTRIAL RISKS: CASE STUDIES DURING COVID-19 TIMES

On 13 September, APUEA supported the webinar "Controlling your Industrial Risks: Case Studies During COVID-19 Times" organized by Siveco China. Industrial disasters in Thailand and Singapore have recently made headlines.

Common root causes include poor maintenance, non-compliance with regulations or internal "best practices", wrong technical decisions. At the same time, infrastructures, plants, and staff face unprecedented pressure from the Covid-19 crisis.

Session Agenda:

- How to set up risk prevention management systems in line with ISO 31000 and ISO 55000?
- How to design and deploy a smart O&M solution to enforce and demonstrate compliance
- Case studies of achieving Risk Prevention in Asia infrastructures and plants



RE-WATCHED WEBINAR HERE:
CONTROLLING YOUR INDUSTRIAL RISKS: CASE STUDIES DURING COVID-19 TIMES





The 14th international exhibition on Heating, Ventilation, Air-conditioning, Air filtration & Purification, Refrigeration Systems in Vietnam



Virtual Exhibition

7 – 10 July 2021

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Physical Exhibition

» New Date

10 – 12 November 2021

Saigon Exhibition & Convention Center (SECC),
799 Nguyen Van Linh, District 7, HCMC, Vietnam



Organiser



SES Vietnam Exhibition Services Company Limited

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E: ryan.nguyen@informa.com



DISTRICT COOLING | DISTRICT HEATING | INDUSTRIAL ENERGY EFFICIENCY | MULTI-ENERGY SYSTEMS

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SERVICES



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Client representative and multisector project management services to support your business objectives while delivering projects that meets quality, cost, and timeline.



BUSINESS CONSULTING

Multidisciplinary business consulting services to empower your organization and projects while adding value and filling management and engineering gaps.



ENERGY ICT SOLUTIONS

ICT solutions for District Energy and Thermal Power systems to support decision making along the entire project value chain and optimize O&M across entire system value chain.



GREENFIELD

Developing optimal energy schemes by localizing international best practises



BROWNFIELD

Developing efficient energy schemes suitable to meet old and new requirements



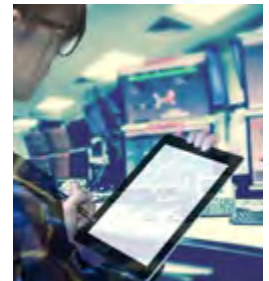
EXPANSION

Expanding energy systems cost-effective by introducing innovative solutions and timely implementation



OPTIMIZATION

Systemic technical and financial optimization while building capacity and improving efficiency, reliability and safety



MODERNIZATION

Improving technical and financial performance while introducing new technologies, building capacity and adding new features

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Welcome to Smart O&M !

Asset Management consulting, BIM for O&M, Maintenance 4.0 and mobile solutions

Siveco China is a pioneer in the development of Smart Operation & Maintenance solutions for energy and environmental infrastructures and industrial plants, with a focus on mobility "for the worker of tomorrow". Headquartered in Hong Kong, Siveco China has since 2004 helped over 1000 customers optimize the lifecycle of their assets and ensure regulatory compliance.



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For further information
please contact:
info@sivecochina.com
www.sivecochina.com/en



EVENT CALENDAR



FOCUS EVENT

7TH GLOBAL DISTRICT ENERGY CLIMATE AWARDS & ASIA URBAN ENERGY ASSEMBLY

 **11** VIRTUAL EDITION
NOV 2022

15-16 LIVE EDITION
SEP 2022
📍 Bangkok, Thailand

APUEA EVENTS

Q4

XIAN CLEAN DISTRICT ENERGY SUMMIT, Xian, China
(Co-hosting organization)

 Q4 2021

14 - 16
OCTOBER

ASEAN SUSTAINABLE ENERGY WEEK, Bangkok, Thailand
(Co-hosting organization)

 14-16 OCTOBER 2021

FUTURE ENERGY SYSTEMS

 14 OCTOBER 2021

EFFICIENT URBAN ENERGY

 15 OCTOBER 2021

TBC
NOVEMBER

DISTRICT COOLING IN THE PHILIPPINES, WEBINAR
(Co-hosting organization)

 NOVEMBER 2021

TBC
DECEMBER

DISTRICT COOLING IN INDONESIA WEBINAR
(Co-hosting organization)

 DECEMBER 2021

APUEA SUPPORTED EVENTS

28 - 30
SEPTEMBER

ENLIT ASIA 2021
Jakarta, Indonesia
(Supporting organization)

 28-30 SEPTEMBER 2021

09 - 11
NOVEMBER

ASEAN SUPER 8
Kuala Lumpur, Malaysia
(Supporting organization)

 09-11 SEPTEMBER 2021

17 - 20
NOVEMBER

ELECTRIC & POWER INDONESIA
Jakarta, Indonesia
(Supporting organization)

 17-20 SEPTEMBER 2021

08 - 10
DECEMBER

PHILENERGY
Manila, Philippines
(Supporting organization)

 08-10 DECEMBER 2021

7TH GLOBAL DISTRICT ENERGY CLIMATE AWARDS & ASIA URBAN ENERGY ASSEMBLY

 **11** VIRTUAL EDITION
NOVEMBER 2022

 **15-16** LIVE EDITION
SEPTEMBER 2022
📍 BANGKOK — THAILAND



MEMBER DIRECTORY

PREMIUM MEMBERS



ABB



Engie



Johnson Controls

MEMBERS



International District Energy Association (IDEA)



NXITY



Alliance to Save Energy



Qatar Cool



District Energy in Cities Initiative



Danish Board of District Heating (DBDH)



Northeast Clean Energy Council (NECEC)



IVL Swedish Environmental Research Institute



China District Heating Association (CDHA)



DEVCCO



Thai ESCO Association



Overseas Environmental Cooperation Center (OECC)



Institute for Sustainable Energy Policies



tabreed



Chongqing Renewable Energy Society



Tera



Kamstrup



SIVECO China



Fengxi New Energy



Euroheat & Power (EHP)



Alliance for an Energy Efficient Economy (AEEE)



Asia LEDES Partnership



Black and Veatch

PARTNERS AND SUPPORTING ORGANIZATIONS

- Asian Development Bank (ADB)
- International Energy Agency (IEA)
- United Nations Environment
- Asian Infrastructure Investment Bank (AIIB)
- REN21
- C40 Cities

APUEA REGISTRATION FORM - MEMBERSHIP

WE, THE UNDER-MENTIONED ORGANISATION / COMPANY,
HEREBY APPLY TO BECOME A MEMBER

You can print out your registration and entry form below.



1 ORGANIZATION / COMPANY DETAILS:

Organization name.....

Marketing name and/or Abbreviation.....

Street

Postal code..... City..... Country.....

General Phone..... General Fax.....

General E-mail..... Web.....

Primary Contact: First name..... Surname.....

Position..... Direct Phone..... E-mail.....

2 ORGANISATION CATEGORY (please check as appropriate below):

Association / Federation

Manufacturer / Equipment Supply

NGO

Utility / Operator

Academic

Media company - Press / Journalist / Advertisement

Advisor - Financial / Legal / Banking

Building Sector

Consultancy - Engineering / Design / Technical

Other

Specify:.....

3 BILLING INFORMATION (if different from above):

Billing Address:.....

.....

.....

4 MEMBERSHIP CATEGORY (please check as appropriate below):

Member Category	Employees		
	≤ 1,000	1,000 - 10,000	≥ 10,000
Premium Member	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Corporate Member	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Affiliate Member	<input type="radio"/>		

5 PAYMENT METHOD:

Bank Transfer

Credit Card

Paypal

Please indicate preferred payment method. Payment instructions will be provided following confirmation of membership.

Please complete the form, and send a scanned version
to info@apuea.org



APUEA

Asia Pacific Urban Energy Association

APUEA Magazine

No.11 / September 2021

