WORLD REFRIGERATION DAY • 26th JUNE
#NEXTGENCOOLING

NEXT GENERATION COOLING

World Refrigeration Day (WRD) celebrates the people and technologies responsible for creating and maintaining the world we live in, a world dependent upon temperature-controlled environments. Centered around June 26, the event is supported globally by industry, professional groups, scientific and engineering associations, as well as by governments and individuals.

The WRD 23 campaign "Next Generation Cooling" focuses on the future of cooling's technology and workforce.

Next Generation Cooling refers to the innovative and advanced cooling technologies and practices that are revolutionizing our ability to meet cooling demands while minimizing the environmental impact. By enhancing indoor comfort for occupants and reducing energy consumption, these innovative cooling technologies pave the way for a more sustainable future.

Next Generation Cooling begins by implementing technology advancements emanating from both within the cooling industry and from other disciplines impacting modern life, such as artificial intelligence and renewable and stored energy development.

And of course, Next Generation Cooling requires an expanded and skilled workforce – men and women working in various capacities wherever cooling is used – meaning everywhere. The cooling industry needs to recruit, train and retain people equipped with the knowledge and experience that a modern, forward-thinking industry requires.

Just as no one should expect the cooling solutions of the future to be the same as those from the past, no one should expect the workforce to be the same either. The future is in our hands.

Next Generation Cooling tells the story of how our wellbeing depends upon sustainable cooling, and how cooling technology choices and an evolving industry can safeguard the well-being of future generations.

WORLD REFRIGERATION DAY FACTS:

- Cost-effective, energy-efficiency improvements of over 50% are possible for refrigerators and air conditioners.
- Air Conditioning units are forecast to rise to 1.5 billion in 2030 from 900 million in 2019.
- Household refrigerator stocks are forecast to rise to 2 billion in 2030 from 1 billion in 2019.
- 20% of electricity used in buildings is for space conditioning and cooling energy demand is anticipated to triple by 2050.
- 1.3 billion tonnes of food – a third of total food produced for human consumption – is lost or wasted annually, including 475 million tonnes due to insufficient cooling.
- 30% of the world's population is exposed to deadly heatwaves more than 20 days a year.

Source: UNEP Cooling and Climate Change Fact Sheet

Join the global community conversation using the hashtags #NextGenCooling and WREFD23."
To learn more about UNEP OzonAction and its support of the Next Generation Cooling campaign visit www.unep.org/ozonaction or contact unep-ozonaction@un.org

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...ESSENTIAL ...GREEN ...INNOVATIVE

...SMART ...SUSTAINABLE

WHAT ARE NEW DEVELOPMENTS IN REFRIGERANT APPLICATIONS?

The market will focus on new refrigerants development as it becomes increasingly oriented to reducing the environmental impacts of ozone depletion and global warming. Considering the trends and policies implemented through the Montreal Protocol and the Kigali Amendment, a progressive migration to the innovative use of natural refrigerants and new alternative refrigerants will occur.

Low GWP flammable refrigerants, both ASHRAE Class 2L (HFOs and their blends) and Class 3 (hydrocarbons) that best balance the needs of Safety, Efficiency and Environment will be wide spread. ASHRAE Class 1 Flammability (non-flammable) low GWP fluids will be available as well for certain applications as refrigerant technology allows. In addition to new flammable refrigerants, other natural refrigerant like ammonia (R-717) will incrementally expand their use and CO2 (R-744) will see rapid expanded use for commercial refrigeration applications where efficiency can be maintained.

HOW ARE TODAY'S SYSTEMS EVOLVING?

Compression technology used in today's cooling systems will continue to advance in efficiency. This drive to create more efficient vapor compression systems is leading to hybrid systems that combine different technology solutions.

Among the advanced technologies entrering the market are Magnetic Cooling which uses a magnetic field to manipulate temperature, Thermally Driven Cooling which uses absorption or adsorption processes to transfer heat, Evaporative Cooling systems that take advantage of water absorbing heat when it evaporates, Thermal Storage, use of Advanced Sensors, Artificial Intelligence, and Machine Learning that can adjust cooling based on occupancy patterns and energy availability, and Solid-State Cooling that uses solid-state materials, such as thermoelectric materials, to achieve cooling.

WHAT IS IN THE NEAR TERM FOR COOLING TECHNOLOGY?

For most applications, the technologies employed today will be the same used in the near future but adapted to handle new lower GWP refrigerants, such as those that are flammable.

Expect Rankine and reverse Rankine vapor compression cycles to continue for cooling/refrigeration and expand to heating application. Small fractional refrigeration ton capacity applications may see alternate not-in-kind technologies development, such as various caloric technologies that generate cooling effects when cyclically acted upon by magnetic, electric or mechanical forces.

Innovative solutions are being developed to replace components or develop complementary devices that are easy to install to improve the efficiency of current equipment or to replace them.

HOW WILL COOLING DEMAND CHANGE?

More demand for cooling will be required as the Earth warms, the middle class worldwide expands, and more people move to urban environments. In mature cooling markets, indoor air quality (temperature and humidity) and reduced energy use through minimum efficiency standards will stabilize or reduce the overall cooling refrigeration tons need even as markets grow.

In general, demand for cooling applications will continue to grow since the air conditioning and refrigeration sector provides not only comfort, but also is essential for modern life, protecting the quality of food, medicines and vaccines, ensuring air quality in hospitals and research facilities, enabling data centres to function, and maintaining environments needed for manufactured goods.

Change will be reflected in more environmentally friendly and efficient equipment, but change will only come about if the cooling sector makes its contributions to humanity known.

HOW WILL ENERGY EFFICIENCY DRIVE COOLING APPLICATIONS?

NextGen cooling will be driven by energy efficiency. Improved operation of cooling equipment will be combined with use of non-mechanical methods of cooling buildings such as solar reflective coatings, natural ventilation, and insulation. Smart technology like timers and occupancy sensors can conserve electricity, while shifting demand can reduce the burden on electric grids, lowering costs, limiting pollution and enhancing resiliency.

Renewable energy sources can be used to power cooling systems, including geothermal systems that move heat from above ground to the cooler environment underground. Heat pumps can be used to remove heat from within a building during the warmer months and exchange it for cooled, conditioned air.

In the years to come, the world will need to expand cooling access while switching from outdated, electricity-driven approaches. Implementing and enforcing energy-efficiency standards, switching to less environmentally harmful refrigerants, and using low-carbon energy will be critical.

...DIVERSE

...QUALIFIED

...INNOVATIVE

...MULTI-DISCIPLINED

...DRIVEN

WHAT SKILLS ARE REQUIRED FOR THE NEXTGEN COOLING WORKFORCE?

Technological change taking place in the cooling sector requires that there be qualified personnel. Manufacturers, distributors, service providers, design firms, facility operating staffs and others in the sector will require personnel with skill sets that include varied disciplines, creative thinking, and environmental awareness. This is as HVACR systems continue to be more complex and require ever increasing diagnostic and problem-solving skill sets. New systems and tools to remotely control and monitor will be the norm and not the exception.

To address current deficiencies in understanding current technologies, the sector is stepping up classroom, hands-on, virtual and hybrid training and is also implementing worker qualification programs such as the Refrigerant Driving License that can be adopted nationally in developing economies.

WHAT WILL BE ARTIFICIAL INTELLIGENCE'S SERVICING, DESIGN, MANUFACTURING INFLUENCE?

Artificial Intelligence will allow for greater efficiencies in the HVACR sector.

Although manufacturing processes are becoming more automated and human intervention is less, AI could be a complement to make processes more accurate and efficient. For maintenance,

AI can help workers identify possible causes of failure. In addition, it can provide instant information such as spare parts inventories, manufacturer's manuals, standards, and procedures to guide the maintenance staff in ensuring processes and equipment function correctly.

Also, AI can be used for energy optimization by analyzing real-time data on temperature, occupancy, weather conditions, and energy prices. AI–powered cooling systems can dynamically adjust cooling settings, such as airflow, temperature, and fan speeds to provide customized/desired comfort levels while minimizing energy consumption.

WHERE WILL THE SECTOR FIND TALENT?

Human talent must be trained to meet demands of more complex systems, making it important to develop and implement strategies to motivate young people to study for cooling careers.

Some of the training can be done in schools, with educational talks that describe the importance of cooling. Most people don't realize that cooling equipment is an important dimension in their day to day existence. It also would be good to develop curricular programs focused specifically on cooling technology and to support Science, Technology, Engineering Math (STEM) education in general.

And the importance of HVACR technician training cannot be overestimated. Educational opportunities and events need to expand to reach larger audiences of candidates. Careers in the sector are numerous, challenging and rewarding.

ARE THERE OPPORTUNITIES FOR WOMEN?

To satisfy the workforce needs of NextGen Cooling, more women are needed in the ranks of cooling technicians, operators, engineers and in other HVACR positions. Currently, less than 3% of HVACR engineers and technicians are women.

Surveys show that one of the important factors in women joining the industry is their having family members, friends and peers who are already involved. Sector firms and associations need to build on this by showcasing women who have launched successful careers in the sector.

Engaging more women will require setting specific targets and goals followed by focused action to turn commitment into reality. Women need to be empowered to succeed through networking opportunities, mentoring and education. Increasing inclusion of women specifically in these areas can bring different approaches to sustainable design and service.