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Trends Shaping The Future of Long-term Care Facility Management

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Executive Summary

Long-term care facilities provide a wide range of inpatient health services to people who are unable to manage independently. These services include chronic care management or short-term rehabilitation services for adults whose ability to care for themselves is limited due to age; illness; injury; physical, cognitive, or mental disability; or other health-related conditions. According to the U.S. Department of Health and Human Services, long-term care facilities served approximately 8 million Americans in 2012. This number is expected to rise to 27 million in 2050 due to the projected growth of the older adult population. Due to aging baby boomers, the population is expected to become much older, with the number of Americans over 65 expected to more than double from 40.2 million in 2010 to 88.5 million in 2050. Perhaps even more alarming is the estimated increase of the "oldest old," those over 85, by more than 300 percent from 6.3 million in 2015 to 17.9 million in 2050. On a global scale, North America has the longest life expectancy at 79.9 years and this is expected to increase to 84.1 years by 2050.

Today's long-term care facility managers wear many hats as they oversee the operations of nursing homes, assisted living facilities, rehabilitation centers, and other health-related operations. In addition to facing concerns about energy usage and environmental concerns, facility managers shoulder the burden of ensuring optimal indoor air quality for the health and quality of life of residents and employees alike. In an increasingly competitive market, facility managers can't afford to make costly mistakes. Therefore, staying ahead of the curve requires staying up-to-date on the latest solutions, technologies, and research. This is essential to developing and maintaining efficient and cost-effective solutions that are vital to the longevity and well-being of long-term care facilities, their patients and staff.

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Evolution of the Industry

Over the past century, long-term care in the United States has evolved from an informal family-based system to a system of larger corporate providers who find themselves strained under a shortage of skilled professionals and increasing government regulations. Although nursing homes are still a major provider of long-term care services, additional facilities designed to provide a variety of short-term, post-acute care and rehabilitation continue to grow. These facilities include day care centers, assisted living facilities, residential care communities, and hospice centers.

As treatment of residents in these facilities has grown, indoor environmental quality has become a key issue that needs to be addressed. As such, from the time the first modern electrical air conditioning unit was invented by Willis Carrier in 1902, the heating ventilation and air conditioning (HVAC) market is a logical starting point and one that has experienced steady growth. Advancements in HVAC technology have led to a greater understanding of air flow, while evolving building designs have prompted the need for greater HVAC performance. A prime example is the trend for airtight construction, first popularized in the 1970s, and still persisting today.

In this setting, the demand for healthier indoor environments is prompting further changes in building design and facility

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Evolution of the Industry - *continued*

management. In addition to monitoring air quality to ensure occupant comfort, facility managers are expected to keep up with increased compliance regulations, integrated technologies and computerized systems, and continued education on industry trends. Long-term care facilities face additional challenges with maintaining healthy indoor environments. Lowering healthcare-associated infections (HAIs) and reducing incident reports due to poor indoor air quality and unacceptable relative humidity (RH) levels are also critical to providing quality patient care. Failure to do so can lead to spread of illnesses, delayed Medicare payments and even facility closures mandated by regulatory committees.

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5 Trends in Long-term Care Facilities

Regulating indoor air environments of long-term care facilities is essential to patient healing, staff health and comfort, and prevention of electrostatic damage to medical equipment. Also, the push for greater energy efficiency and greener operation is creating a need for higher performing HVAC options.

While today's facility managers continue to shoulder increased responsibility with ever-changing technologies and market needs, new building regulations are adding to already full plates. For example, the Energy Independence and Security Act of 2007 (EISA) requires that all new facilities be constructed to achieve net zero energy usage by January 1, 2030. Additionally, owners of existing commercial buildings must complete upgrades within 20 years.

Achieving these energy saving goals in the time allotted will be challenging, especially for long-term care facilities that operate 24/7 and are occupied by hundreds of residents, employees and visitors. Addressing future issues today is essential for long-term care facility managers. To accomplish these goals, here are five trends shaping the long-term care industry.

1

HYGIENE AND REGULATORY COMPLIANCE

#1 Hygiene and Regulatory Compliance

> "ASHRAE Standard 188-2005, Legionellosis: Risk Management for Building Water Systems, is a must read for facility managers."

Traditionally, hygiene is considered care of oneself, including activities such as hand washing and bathing. However, the practice of hygiene extends beyond the individual and applies to the upkeep of buildings and equipment in which people frequent and work. Disinfecting surfaces is a commonly accepted practice in the healthcare industry, but what about hygiene in the operation of mechanical and ventilation equipment? Failure to maintain a high level of cleanliness in these systems can result in contaminants to the building or become a source of infections. That's why recent outbreaks in legionella in major cities highlight the importance of maintaining cooling towers and have been the impetus for a broader movement to improve the cleanliness of building water systems as a whole. The American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE) Standard 188-2005 Legionellosis: Risk Management for Building Water Systems is a must-read for facility managers and provides a Hazard and Critical Control Point (HACCP) approach to identifying and managing risk within water systems.

In addition to the disinfection and risk-management methods discussed in Standard 188, facility managers may find benefits in upgrading older equipment to more modern designs. Since the 188 standard requires a comprehensive water system analysis, equipment beyond cooling towers are being considered. For example, modern humidification systems have introduced a variety of new features to help ensure clean and hygienic operation, regardless of whether they are steam or evaporation systems.

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Hygiene and Regulatory Compliance *continued*

These features include flushing cycles, drying cycles, and anti-stagnation water management. Many systems now also include sterilization features such as ultraviolet water treatment and silver ion dosing. Combined with regular water system maintenance and flushing, these new systems are safer to operate than ever before.

For more than a century, steam humidification has been the typical source of humidity control. Boiled water kills off bacteria and produces hygienically safe, humidified air. However, evaporative humidification, also known as “adiabatic humidification, a process by which liquid water is introduced directly into an airstream, has advanced considerably and now provides an equally safe option. Today, adiabatic systems offer a dual benefit of humidity control and cooling, which can help reduce mechanic cooling needs in many climates. Yet many facility managers are reluctant to embrace this emerging technology. Part of the reason stems from concerns with liquid water in ductwork and concerns over the quality of water being used. However, a growing number of states, countries, cities, etc. now mandate that HVAC engineers follow water safety guidelines issued by the ASHRAE.

#2 BACTERIA AND AIR QUALITY MANAGEMENT

#2 Bacteria and Air Quality Management

> "With close monitoring and consistent cleaning of HVAC systems, facility managers can help reduce dangerous pathogen growth."

Whenever a person enters a building, they shed approximately 37 million bacteria per hour into the surrounding air and onto surfaces.[3] The resulting community of microbes, or microbiome, is unique to each facility based on building construction, operations and activities of staff and residents or patients. Most of the microorganisms shed by people are harmless or even beneficial to health, however, some are pathogenic because they cause disease.

Historically, in-patient departments have developed and employed protocols and checklists which focus primarily on the behaviors of staff in an attempt to mitigate contamination. While these procedures, such as frequent hand-cleaning, can limit transmission of pathogens spread through short-range contact, they do not address another critical travel mode of microorganisms—airborne transmission in tiny droplets.

In fact, one of the reasons that bacterial, viral and fungal pathogens persist in buildings is due to their ability to survive and travel great distances over prolonged time-periods in an infectious airborne state, thereby creating distant reservoirs. For this reason, HVAC systems are an essential component in the control of pathogenic bacteria and other microorganisms. With close monitoring and consistent cleaning of HVAC systems, including all air handlers and ductwork, facility managers can help reduce dangerous pathogen growth. Scheduling testing of cooling tower water systems to determine the presence, type and number of microorganisms is equally important, followed by immediate disinfection when issues arise. It is important for facility managers to be aware of and regularly inspect potential common problem areas. These include areas around

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Bacteria and Air Quality Management - *continued*

cooling coils, outside air, return air mixing box, blocked drains, and standing water in drain pans. Additionally, it is crucial to avoid standing water within ventilation systems as this promotes the growth of mold and bacteria. Regular audits of these areas can help identify problems early before a major overhaul is required.

Maintaining the cleanliness of water used in the HVAC system is also imperative. In addition to ASHRAE Standard 188, the Center for Disease Control offers a Water Management Program toolkit on its website (www.cdc.gov), which provides useful information and checklists to help facility managers implement better water hygiene practices.

Research confirms a strong connection between air quality and disease transmission, from the common cold to more serious illnesses such as bronchitis and pneumonia.[4] Similarly, there appears to be a connection between air quality and chronic illness. Knowledge obtained from the completed sequencing of the entire human genetic code has allowed scientists to identify which chronic diseases have a genetic basis and which are impacted by the environment. In fact, approximately 85 percent of chronic diseases, such as asthma and autoimmune diseases, such as myelodysplastic syndrome and lupus, are thought to be related to indoor environmental conditions. Studies show that dry indoor air increases the transmission of pathogens which cause acute infections as well as chronic inflammation. These findings emphasize the need to prioritize indoor air management in healthcare facilities.

Along with the increased risk of illness in building occupants,

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Bacteria and Air Quality Management - *continued*

dry indoor air impacts human mental performance. Dehydration as little as one percent of total body weight affects energy, concentration and short-term memory.[5] In addition to feeling fatigued, people perform more slowly and make more mistakes. As well, chronic dehydration worsens the effects of many diseases. Exposure to dry indoor environments increases the rate at which the body loses moisture, and thus increases the risk of dehydration effects.

As a result of restricted budgets, facility managers may be reluctant to upgrade or replace HVAC systems. At the same time, the process can be time consuming. However, with people spending more indoors and the increasing prevalence of occupant focused building standards such as LEED® and WELL®, indoor air quality management is becoming an increasingly important issue. Healthy indoor environments start with the facility manager; identifying issues and implementing a plan to resolve them is crucial to the ongoing success of the facility. Managers should consider undertaking a retro-commissioning program to establish a baseline for facilities and identify opportunities for improving operation. Simply having the building operating as designed is an important first step and can often generate energy savings from optimizing the equipment already on-site. In many places, incentives exist to support retro-commissioning, which can offset the financial impact and help further stretch budgets.

3

LONG-TERM SUSTAINABILITY

#3 Long-term Sustainability

> "The global green building sector continues to double every three years, with survey respondents from 70 countries reporting 60 percent of their projects will be green by 2018."

Energy management plays a significant role in maintaining a cost-efficient building, especially for hospitals, which use approximately 2.5 times the amount of energy as other commercial buildings.[6] Achieving this goal requires a commitment to invest in best-practices facility management. Yet, in committing to critical issues such as energy savings, too often facility managers underestimate the impact of the HVAC system. Citing budget constraints or lack of skilled staff, they disregard product updates and, as a result, miss out on energy saving opportunities.

Understanding the need for high-performing HVAC systems begins with recognizing how individual components interact. For instance, updating ventilation equipment to provide increased airflow falls short if existing sheet metal ductwork cannot accommodate the increased pressure. Similarly, replacing something as simple as air filters will do more harm than good by releasing particles and contaminants throughout the building if existing ductwork is not cleaned beforehand.

Consistent follow through is the key to getting the most out of any HVAC system. According to a report by the Institute for Building Efficiency (IBE), regular maintenance of HVAC systems can reduce energy 10 to 20 percent, regardless of the climate zone.[7] For instance, failure to accurately document replacement parts on work orders makes it difficult to identify problem areas when issues arise, order parts, and install them correctly. Overall, effective energy management requires three important protocols: 1) checks and balances; 2) the right people overseeing the system; 3) continued monitoring of energy savings to ensure that goals are met.

In addition to energy efficiency, increased public demand for greener workplaces, better hygiene and improved air quality challenge designers and engineers to focus more on sus-

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Long-term Sustainability - *continued*

tainable buildings. Surveys show these types of facilities attract and retain more employees. This is particularly true of millennials. Research published in "The 2020 Workplace," and conducted by Cone Millennial Cause, found that 80 percent preferred to work for a company that cares about its impact on society.[8]

For facility managers, long-term sustainability is a two-fold concern. From a financial standpoint, creating and maintaining a sustainable facility are costly. Updated equipment and the required operating software consume a substantial portion of any budget. For example, installing a more efficient $10 million HVAC unit may require an additional $40 million in operating costs over the life of the building.

Maintaining sustainable environments is also a time-management issue, especially with the push for Leadership in Energy and Environmental Design (LEED) certification. According to Dodge Data & Analytics, a leading provider of data, analytics, news and intelligence serving the North American construction industry, "the global green building sector continues to double every three years, with survey respondents from 70 countries reporting 60 percent of their projects will be green by 2018."[9]

In addition to energy management and long-term sustainability, the drive toward increased water conservation is gaining new importance, especially in the shadow of high-profile water shortages in the United States. Because copious amounts of water are required to operate commercial HVAC systems, this can be challenging. In the healthcare industry, facility managers face tougher challenges. In addition to heating boilers, cooling towers, and chilled water systems that are common in many buildings, central steam systems, laundry and washing facilities, increased cleaning and disinfection, and humidity-control systems add to increased water usage.

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Long-term Sustainability - *continued*

All natural water contains minerals. While these minerals are beneficial in drinking water, they contribute to scale formation within the HVAC and plumbing systems. Regardless of the process, whether utilizing boiled, evaporated or filtered water, keeping an HVAC system clean and running efficiently requires flushing out minerals. Depending upon the amount of minerals present, the waste water used in the process can be considerable.

Many products that utilize water allow users to configure drainage, flushing, and automatic cleaning cycles, but these are seldom adjusted from factory default parameters. Taking the time to understand and optimize these considerations can result in significant water savings and, at the same time, sustain the benefits the equipment offers to the building. Newer equipment may offer other benefits. That is because efficiency levels of water treatment systems have increased in recent years, and many new devices can tolerate broader water quality ranges in less water treatment. In areas where water treatment is required to remove hardness and minerals from the water, consider using blended streams of treated and municipal water directly to reduce the loads on the treatment system. The tradeoff will involve an increase in descaling of equipment, but will often reduce overall water losses at the treatment system.

Responsibility for measuring and recording the results of the energy savings, long-term sustainability and water conservation fall on the shoulders of facility managers, adding to an already lengthy list of job responsibilities. Facility managers should consider retro-commissioning as a method for gaining a more complete understanding of the facility operation. As well, many product manufacturers offer services and check-ups for mechanical equipment. Engaging a factory-trained expert to tune up equipment can extend its life and yield hidden performance optimizations. Expert service is also a great way to resolve issues with troublesome equipment that consumes facility management resources.

#4

HUMIDITY CONTROL

#4 Humidity Control

> “Studies have shown that dry indoor air actually facilitates the spread of pathogenic microorganisms, including viruses, bacteria, funguses and parasites.”

The word humidity often conjures up negative connotations, from muggy summers to dangerous mold growth. It’s no surprise that many facility managers assume humid indoor air is a problem. However, it is not that simple. With buildings designed by engineers and managed by facility managers, both typically lacking a medical background, understandably, the primary focus is on building codes rather than occupant health.

Studies have shown that dry indoor air actually facilitates the spread of pathogenic microorganisms, including viruses, bacteria, funguses and parasites. Cough and sneeze droplets released into the air with mid-range relative humidity (RH), ranging from 40 to 60 percent, remain larger and heavier, and tend to settle out of the breathing zone within three feet of the individual responsible. In dry air under 30 percent RH, these same droplets dehydrate and shrink, becoming considerably lighter. This allows them to float greater distances, travel through ventilation systems, and remain suspended in the breathing zone.

Equally important, dry air is harmful to humans. The average individual requires a body composition of 75 percent water to support basic organ systems. Healthy hydration allows the body to breathe effectively, digest food and produce energy, build tissues, and keep the structure and integrity of the skin intact. Most importantly, sufficient water intake allows the immune system to respond appropriately to allergens and to prevent infections. This explains why people who move to overly dry environments and fail to hydrate adequately often develop dry eyes, asthma, or skin conditions such as dermatitis and eczema. Colds, flus, sore throats, dry eyes, and itchy and cracked skin are all signs and symptoms that are prevalent in the cold dry months of winter when the indoor RH is at its lowest. Literature shows that in the Meningitis Belt in West Africa, dry winds precede large meningitis outbreaks. But

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Humidity Control *continued*

when the RH is 40 percent and above, the epidemics are largely eradicated.

Dry indoor environments are often inadvertently created when outdoor air that is cooler than indoor air is used for ventilating buildings. This is because cool air has a greatly reduced ability to hold water compared to warm air. Air humidity is measured in relative terms. That is, it is the amount of water in the air relative to what the air can actually hold. This means that while cool outdoor air may be quite saturated for a low temperature, bringing the air into the building and heating it will cause the relative humidity to decrease significantly because warm air can hold more gaseous water than cool air can. For example; air at 32°F (0°C) with 75 percent RH will have a decreased RH of only 17 percent when heated to 72°C (22°C), even though the absolute amount of water has not changed. This example demonstrates how indoor ventilation can result in overly dry air, despite solving many other indoor environmental quality problems. Tracking RH levels in the building over the course of the seasons can help facility managers identify dryness issues and maintain appropriate levels. In most North American climate regions, additional moisture needs to be added to indoor air during the winter months to compensate for low RH caused by heating the outdoor air.

A solution for building dryness is to employ a humidification system. Many healthcare facilities are already equipped with humidification equipment; however, it is not always used or maintained to the fullest capacity. In addition to reducing the risk of disease, properly humidified air reduces static electricity which can impact the performance and warranties of expensive medical and IT equipment. Humidification equipment needs to be commissioned and inspected regularly to ensure correct installation and efficient and trouble-free operation when indoor air moisture is required. Humidification technology has evolved rapidly in recent years and modern systems offer unprecedented control, reliability, hygiene, and efficiency. In

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Humidity Control *continued*

particular, direct room fogging systems have gained popularity, particularly when existing facilities are retrofitted to alleviate dry indoor environments. Direct room fogging systems are comprised of nozzle heads that introduce a fine mist directly into the spaces requiring additional air hydration. Water for the nozzles is supplied by a high-pressure pump module located in a nearby mechanical space. Because the moisture is being introduced directly into indoor air, the humidity control system is decoupled from the ventilation system, and ventilation operation sequences do not require modification to support the humidifier. Strictly a humidification process, high-pressure systems can respond very quickly to changes in space conditions, regardless of the temperature settings. In addition, they are able to track set points with a high level of precision.

Without the need for an air handler and ductwork, these systems can operate autonomously or in locations where ducted systems are impractical. They can also simplify retrofit costs by reducing the need to install additional ventilation systems to resolve humidity issues. Pumps and water treatment systems are located in a separate mechanical room from the spray nozzles so that business operations are not disrupted during servicing. This results in less downtime and lost revenue.

A free secondary benefit exists with evaporative humidification. As the water evaporates, sensible heat is withdrawn from the air, providing cooling directly to the room and reducing mechanical cooling requirements. The system lessens the HVAC workload, which is particularly important for organizations with spaces that require year-round cooling.

Facility managers may assume that the fine mist can lead to water issues. As a result, some are hesitant to invest in this humidification process. However, this resistance is unfounded. Benefits of a direct room fogging system and ease of operation make this system idea for many long-term facilities.

#5 HEALTHCARE ASSOCIATED INFECTIONS

#5 Healthcare Associated Infections

> "By maintaining the optimal range of humidity between 40 and 60 percent RH, and utilizing energy-efficient HVAC and humidification systems, facilities can lower HAIs and reduce operating costs."

Today's healthcare facilities face an in-house epidemic of healthcare-acquired infections (HAIs), which are the sixth leading cause of death in the U.S. Globally, HAIs kill more people than AIDS, breast cancer and automobile accidents combined.[10] In U.S. long-term care facilities, between 1.6 million and 3.8 million infections occur each year.[11] Further, the number of recorded cases has tripled in the last two decades and continues to grow every year.[12] HAIs cost the United States healthcare industry upwards of $30 billion annually. For long-term care leaders, these numbers are a wake-up call.

The most common HAIs include urinary tract, respiratory tract, surgical site infections, central line associated blood stream infections, ventilator associated pneumonia (VAP) and Clostridium difficile (C.diff) colitis.

Healthcare settings are a natural sanctuary for bacteria, microbes, and pathogens. Coupled with the reduced immunity of most residents or patients, the likelihood of HAIs increases. Further, pathogens are increasingly resistant to antibiotics and rapidly reproduce in indoor environments.

While current hygiene strategies such as hand washing and surface disinfection decrease direct contact transmission of pathogens that lead to HAIs, these practices do not curtail the transmission of microorganisms travelling through the air in tiny droplets. Studies show that optimizing indoor air parameters, especially RH, is a crucial, yet often overlooked, factor in reducing HAIs.[3] As indoor RH increases toward an optimal 40-60 percent range, HAI rates decrease. In facilities with a RH between 40 and 60 percent, the airborne spread of bacteria is reduced, resulting in fewer HAIs. But while bacteria fares poorly in properly

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Healthcare Associated Infections - *continued*

humidified air, patient health improves. Lung and respiratory functioning improves, and natural infection control is enhanced.

Yet many facility managers have the misconception that humidity creates mold. But it is possible to create indoor environments, including those with the optimal RH of 40 to 60 percent, without creating mold issues. Further, properly humidified air maintains temperature better, reducing energy costs.

The connection between humidification levels and disease is critical when choosing to invest in HVAC systems and/or replace components. The dry air in most healthcare facilities creates a habitat for microorganisms that contribute to HAIs. By maintaining the optimal range of humidity between 40 and 60 percent RH, and utilizing energy-efficient HVAC and humidification systems, facilities can lower HAIs and reduce operating costs.

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Challenges and Solutions

Facility managers are faced with a pressing need to control the humidity of the air in their buildings. Properly humidified air can reduce the spread of bacteria and microorganisms. It can support energy and water conservation, as well as contribute to greener operations and long-term sustainability. The appropriate levels of humidification also extend the life of expensive equipment, reduce the risk of hospital acquired infections, and improve patient health outcomes.

Finding the balance between reducing costs and providing quality care represent significant challenges for hospital facility managers. Ensuring exceptional air quality is an essential part of this puzzle.

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Eight Environmental Tips for Long-term Care Facility Managers

The following tips can help facility managers stay on top of the rapid changes in the industry and produce better internal environments:

1. Utilize effective, efficient, modern HVAC equipment. Seek out the advances in hygiene, energy and sustainability that are changing the marketplace.

2. Monitor building conditions consistently. Have a systematic process for review and maintenance. Be willing to adapt to changing conditions.

3. Set the bar high. Request hygiene tests on equipment as part of any maintenance contract. Onsite FDA-approved bacteria testing measures are available that provide immediate results. Any concerns can be remedied immediately to prevent larger issues.

4. Inhibit bacterial growth throughout the HVAC system by paying close attention to primary water sources. Take advantage of the freely available CDC Water Quality Toolkit.

5. Avoid water stagnation. Instead, purge fixtures, pipes, etc. on a regular basis. Many newer systems have safety measures in place to eliminate standing water and prevent contamination issues.

6. Maintain RH levels between 40 and 60 percent. Invest in reliable humidity indicators. Recent studies have confirmed that bacteria are significantly reduced and mostly ineffective above 40 percent RH.

7. Engage consultants and factory technicians to take advantage of their specialized knowledge. Be willing to share in the responsibility of keeping the facility functioning at top levels.

8. Stay current on evolving trends. Continuously look to industry leaders for products, procedures and technologies that can improve facility efficiency.

5 Trends Shaping The Future of Long-term Care Facility Management

Conclusion

In virtually every industry, a clean, uncontaminated, indoor environment is expected. However, when it comes to long-term care facilities, where lives are at stake, this statement takes on a whole new importance. For this reason, choosing a HVAC system that meets the needs of a facility and also provides a health environment for occupants is essential.

An increasingly competitive market demands cutting-edge technology, progressive thinking, and the ability to embrace changes coming down the pipeline. Facility managers who see the bigger picture, demonstrate leadership by challenging the status quo, and see new technologies and solutions are confidently moving their companies forward today and into the future.

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About Condair

Condair is the leading manufacturer and provider of complete solutions in the areas of humidification and evaporative cooling, with a comprehensive portfolio including products, services, experience and know-how. This enables us to create the ideal indoor climate while keeping energy consumption low and reducing impact on the environment. The company also offers humidifier design, manufacturing, supply, installation, and maintenance, as well as solutions for bacteria control, bacteria testing and energy efficiencies to significantly improve facilities and production. Today, with approximately 600 employees, Condair operates production sites in Europe, North America and China, are represented in 15 counties by its own sales and service organizations and is supported by distribution partners in more than 50 locations worldwide.

For more information or to contact your local Condair representative visit www.condair.com or call 1.866.667.8321.