5

Trends Shaping The Future of Printing and Packaging Facility Management

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5 Trends Shaping The Future of Printing and Packaging Facility Management

Executive Summary

In 2015, the printing industry experienced a 3.5 percent increase, the largest single year growth since 1996, based on U.S. Commerce Department statistics.[1] To stay competitive, this industry is taking advantage of emerging technologies by offering new services such as web-to print, on-demand and 3D printing. In fact, according to the market research firm MarketsandMarkets, the global digital printing and packaging market is projected to grow at a compound annual growth rate of 13.9 percent.[2]

In the print and packaging market, humidity control is essential to maintain productivity at all stages of production to avoid machine downtime and waste.

Printing and packaging facility managers, tasked to reduce energy usage and maintain indoor environments, also face changing ASHRAE (The American Society of Heating, Refrigeration and Air Conditioning Engineers Inc.) standards, the push for greener solutions and rising customer demands. In an increasingly competitive market, facility managers can't afford to make costly mistakes. For this reason, staying ahead of the curve requires a focus on using the latest technologies available. This is the key to developing and maintaining efficient and cost effective solutions that meet the needs of the growing printing and packaging industries.

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Evolution of the Industry

A large supermarket offers over 40,000 packaged products, each competing with others to grab the eye of the consumer. It's easy to see, from this one market alone, at just one point in the supply chain, why the importance of packaging is so great. The protection, preservation and presentation of the products are crucial. Combined with the need to be innovative, competitive and environmentally aware, modern packaging producers often lead with the best practices in design, converting and printing. Quality and productivity are essential, and the right humidity plays an essential role in many areas of production.

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 has experienced steady growth. Advancements in 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 persists today. Printing presses, and their feed stock, react differently when it's 70 degrees in the shop versus 105 degrees in the shop. They also respond in different ways to humidity changes. Most printing and packing facility managers can regulate their indoor temperatures with HVAC technology, and achieve consistent temperatures year-round. Yet, what managers may not realize is the effect that seasonal fluctuations of relative humidity have on paper and packaging manufacturing.

Papers and cardboard stock are hygroscopic materials, meaning

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Evolution of the Industry - *continued*

they absorb and release moisture into the surrounding environment until an equilibrium is reached. Paper loses moisture rapidly when exposed to dry environments and gain moisture rapidly when exposed to humid environments. This creates changes in the paper's shape, dimensions and physical properties. These problems extend to dry presses and web printing where low humidity and electrostatic build-up can cause misfeeds, adhesive and substrate stability issues, curling, sticking, creasing and tearing. Color mismatches also may occur because of the effects of humidity on the electrostatic process. Maintaining consistent moisture levels in the facility helps reduce static reduction and machinery downtime, while assisting with dust suppression and proper gluing.

Printing and packaging manufacturing facilities are challenged to reduce operating costs while, at the same time, improving humidity control. Additionally, facilities are encouraged, and sometimes regulated, to implement "green" technologies in their manufacturing, with goals that include reducing electricity and water use and increasing the use of recycled materials. Humidity control helps increase productivity, decrease source material waste and reduce the cooling load for these facilities.

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5 Trends in Printing and Packaging Facility Management

Regulating the indoor environments of printing and packaging manufacturing facilities is critical when inconsistent temperature and humidity levels can lead to equipment failure, unplanned downtime and loss of revenue. Also, the push for greater energy efficiency and greener options 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. The Energy Independence and Security Act of 2007 requires all new commercial facilities built after 2025 to achieve zero-net-energy use and owners of existing commercial buildings to upgrade by 2025.[3]

Achieving these energy saving goals in the time allotted will be challenging for printing and packaging manufacturing facility managers, which makes addressing these issues today essential. To accomplish the goals, here are five industry trends that are shaping the printing and packaging industry.

1

HYGIENE AND LEGIONELLA CONTROL

#1 Hygiene and Legionella Control

> “ASHRAE Standard 188-2015, 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 and maintaining sterile surfaces are a commonly accepted practice in the healthcare and pharmaceutical industry, but what about hygiene in the operation of mechanical and ventilation equipment? Failing 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 of legionella in major cities highlight the importance of maintaining clean cooling towers and have been the impetus for a broader movement to improve the cleanliness of building water systems as whole. ASHRAE Standard 188-2015, Legionellosis: Risk Management for Building Water Systems, is a must read for facility managers and provides a Hazard and Critical Control Point 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, more equipment than just 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 systems or evaporative type. These fea-

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Hygiene and Legionella Control *continued*

tures include flushing cycles, drying cycles and anti-stagnation drains. 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.

Historically, steam humidification has been a common 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 a very fine mist of water and the resulting droplets rob heat from the air and changes it from liquid to a gas, 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. Facility managers are often hesitant to embrace this emerging technology. Part of the reason for this stems from the fact that there are no regulations regarding the quality of water used in evaporation. Yet, a growing number of states, counties and cities now mandate that HVAC engineers follow water safety guidelines issued by ASHRAE.

With close monitoring and consistent cleaning of HVAC systems, including all air handlers and ductwork, facility managers can help reduce dangerous bacterial growth. Scheduled testing of water systems to determine the presence, type and number

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Hygiene and Legionella Control *continued*

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 cooling coils, the 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 because this can promote mold and bacterial growth. Also, using high pressure atomizing adiabatic humidifying systems in open spaces eliminates the need for ducts, decreasing the bacterial growth risk. Regular audits of these areas can help identify problems early before a major overhaul is required.

Maintaining cleanliness of water used in HVAC systems also is imperative. In addition to ASHRAE Standard 188, the Center for Disease Control offers a Water Management Program Toolkit on their website (www.cdc.gov), which provides useful information and checklists for facility managers to follow.

#2

AIR QUALITY MANAGEMENT

#2 Air Quality Management

> "Paper, the principal material used in printing, is hygroscopic and very sensitive to variations in the humidity of the surrounding air."

There are air quality issues unique to the paper and packaging industry. First, a tremendous amount of heat is generated by the printing process, which makes it essential for air conditioning systems to control the temperature in the facility. Second, paper dust particles, generated from anti-offset powder used in the stitching, folding and cutting processes, can become airborne and must be controlled because maintenance and cleaning costs increase when these pollutants infiltrate pressroom equipment. In addition, there are volatile organic compounds emissions from press operations using inks and glues as well as ink mist entrainment. Special ventilation is required due to the use of some of these chemicals. Finally, the lack of humidity adds to the problem of managing air quality as the dust pollutants and emissions tend to remain suspended in air in dry environments.

Because the speed of the equipment is the priority, air quality management is not always considered by printing and packaging manufacturers when designing equipment. Therefore, it's up to facility managers to seek out solutions to these air quality issues. The 2015 ASHRAE Handbook states, "Paper, the principal material used in printing, is hygroscopic and very sensitive to variations in the humidity of the surrounding air. Printing problems caused by paper expansion and contraction can be avoided by controlling the moisture content throughout the manufacture and printing of the paper."[4] The handbook

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Air Quality Management - *continued*

provides the requirements for air-conditioning and humidification for several printing operations. One of the best solutions for managing the moisture content and other air quality issues is evaporative cooling.

Evaporative cooling introduces liquid water directly into the air without the need for adding thermal energy (heat) to the water. As the water evaporates, it draws heat from the air to drive the phase change from liquid to vapor. This means that evaporative or adiabatic systems used directly in a ventilation airstream result in both increased humidity and cooling of the air. In fact, the process removes approximately 1,000 btu of heat for every pound of humidification, reducing the air temperature. Plus, when moisture is added to the air through humidification, the water droplets suppress the dust and other pollutants, reducing the chances that these particles will enter and obstruct the equipment. In addition to decreasing pollutants and equipment downtime while offsetting heat from the printing and packaging processes, adiabatic systems, such as direct space fogging, offer precise humidity control with minimal maintenance and operating costs.

Reducing mechanical cooling requirements offers significant energy savings. In climates where direct evaporative cooling in the ventilation air stream is not practical due to warm and humid outdoor conditions, a different approach called indirect evaporative cooling can be employed. Indirect evaporative cooling involves placing

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Air Quality Management - *continued*

an evaporative cooler into the exhaust airstream. The air is then cooled as much as possible and directed through an air-air heat exchanger where it pre-cools incoming supply air. The moist air is then exhausted from the building. The result is a reduction in mechanical cooling requirements without adding moisture to the building.

Unfortunately, facility managers and building owners make the mistake of associating evaporative cooling with dampness, biological issues and odors. As a result, they miss out on the energy reducing and air quality management opportunities of this process. Modern evaporative cooling systems address many of these issues with intelligent controls, drying and washing cycles and sterilization systems. Control accuracy has improved greatly over the years, which facilitates better tracking of set points and part load operation in the shoulder seasons.

#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."

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 also is a time management issue, especially with the push for 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".[5] Responsibility for measuring and recording the results of the energy savings falls on the shoulders of facility managers, adding to an already lengthy list of job responsibilities.

Energy management plays a significant role in maintaining a cost-efficient building. Achieving this goal requires a commitment to invest in best practices facility management. Yet, in committing to important issues such as energy savings, facility managers often under-estimate the impact of the HVAC system. Citing budget constraints or lack of available skilled staff, they ignore product updates and thus 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 air flow falls short if existing sheet metal duct work 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. And, failure to accurately document

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Long-term Sustainability - *continued*

replacement parts on work orders makes it difficult to identify problem areas when issues arise, order parts, and install them correctly. Consistent follow through is the key to getting the most out of any HVAC system. Regular maintenance of HVAC systems can reduce energy costs by 5 to 40 percent.[6] Overall, effective energy management requires checks and balances, the right people overseeing the system and monitoring energy savings to make sure expected goals are met.

With recent high profile water shortages in the United States, the push for more environmentally friendly workplaces and the desire for increased energy savings, water conservation is gaining a new importance in facility management. Because copious amounts of water are required to operate commercial HVAC systems, this can be challenging. In addition to the heating boilers, cooling towers and chilled water systems that are common in many buildings, central steam systems, increased cleaning and disinfection, and humidity control systems add to increased water usage. In particular, humidifiers contribute to the overall building water usage. Determining the amount of water necessary to humidify a facility begins by calculating the load, which is based upon the size of the facility and the number of spaces that require humidified air. Heating the air causes a significant decrease in relative humidity (RH) even though the actual mass of moisture in the air has not changed. This means that ventilating with outside air cooler than the building set point tends to dry the building, an effect that is especially pronounced in cold climates. Overall, stabilizing the humidity requires adding water to the air, increasing overall water usage. The humidity added to the air represents only part of the water required for continual operation. Also, all natural water contains minerals. While these minerals are beneficial in drinking water, they contribute to scale formation within HVAC and plumbing systems. Regardless of the process, whether utilizing

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Long-term Sustainability - *continued*

boiled, evaporated or filtered water, keeping an HVAC system clean and running efficiently requires flushing out minerals. Depending upon the number 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 parameters 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. Because efficiency levels of water treatment systems have increased in recent years, many new devices can tolerate broader water quality ranges resulting 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.

#4

INTERNET OF THINGS (IoT)

#4 Internet of Things (IoT)

> "By allowing individual components of the same system to "talk" to each other, the efficiency of the system as a whole can be increased."

The Cisco Internet Business Solutions Group defines the Internet of Things (IoT) as the point in time when more "things or objects" are connected to the internet than people.[7] Gartner, Inc., the world's leading information technology research and advisory company, forecasts 6.4 billion connected things in 2016, up 30 percent from 2015.[8] Why is this important to facility managers? Today, many HVAC technologies are reaching their "peak" physical limits of performance and efficiency. This state creates several opportunities for improving performance in the future. Intelligent maintenance and diagnostics along with better interactivity between the individual products that make up a system will have a positive impact on internal environments. The IoT opens new opportunities to achieve both goals. By allowing individual components of the same system to "talk" to each other, the efficiency of the system can be increased by enabling individual components to operate longer at their peak level. Using IoT technology increases the ability to operate and run buildings more effectively. This occurs by ensuring less conflict between devices, such as simultaneous heating and cooling or operating humidification when the cooling system is drawing moisture out of the air. Further, the IoT goes hand in hand with building automation, permitting facility managers to oversee multiple automated buildings simultaneously. IoT-enabled devices provide facility managers and building owners with the ability to interact on a higher level with equipment and systems and troubleshoot more effectively. Their increased internal intelligence allows the devices to signal maintenance sched-

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Internet of Things (IoT) - *continued*

ules, indicate issues and suggest fixes. This can contribute to an increase in overall system reliability and the ability to remediate small problems before they become major failures.

With the integration complexity of the IoT, the skills and IT training required are typically beyond that of the traditional controls contractor. The result is that new smart device connectivity blurs the lines between building controls and IT. That's why ensuring a mix of the right skills is essential to a smooth integration of IoT-enabled devices.

Security also can be an issue that needs to be addressed with competent IT staff during the planning stage. For instance, a hacker who shuts down the heating or cooling system could render the facility unusable until the system is restored, halting data transfer from personal emails to critical business transactions.

With advanced technology, such as smart devices and building automation, today's building owners and operators can monitor facilities from a central control room. This cost-cutting technology reduces the amount of staff and effort needed for on-site monitoring of individual buildings. At the same time, remote monitoring allows manufacturers to provide new levels of service previously unavailable. For instance, when issues arise with a device or piece of equipment, a call to the manufacturer's support hotline allows expert factory service technicians to remotely access the device, understand the complexity of the situation, diagnose the problem and determine the appropriate fix. In addition, remote monitoring technology can reduce the number of non-essential and expensive service visits, such as problems resulting from incorrectly configured

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Internet of Things (IoT) - *continued*

controls or questions concerning equipment operations or general maintenance. Simple changes to HVAC systems can be made remotely, enabling the system to resume operations without having to send someone to the site. Remote monitoring allows technicians to simultaneously identify and order the spare parts or replacements necessary to resolve the problem, thereby further reducing costs by eliminating the need for replacement visits. Remote technology is a win-win for the manufacturer and the end-user alike. Yet, because it involves the installation of additional IT equipment and requires extra operational training, some facility managers hesitate to take advantage of this technology.

#5

HUMIDIFICATION / DEHUMIDIFICATION

#5 Humidification / Dehumidification

> “Humidity and temperature ranges must be maintained for the equipment to optimally perform.”

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. Many facilities are equipped already with humidification equipment; however, it is not always used or maintained to the fullest capacity. Tracking moisture levels in the building over the course of the season can help facility managers identify dryness issues and maintain appropriate levels. In most North American climate regions, additional moisture needs to be added in the facility environment during the cooler months to compensate for dryer air, for several reasons. The printing and packaging industry uses expensive equipment, and in many cases, specific humidity ranges must be maintained for the equipment to optimally perform as well as to keep it under warranty. Further, in low humidity, static electricity increases and interferes with some of the printing and packaging processes. Evaluating the state of humidification equipment, ensuring it is correctly installed and commissioned and regularly inspected all contribute to efficient and trouble free operation when moisture is required.

Indoor air humidification is typically associated with in-duct humidifiers. Humidity introduced through the HVAC equipment is distributed by means of the ventilation ductwork. Direct room high-pressure humidification systems change this equation. Utilizing a high-pressure pump system, these systems deliver an ultrafine mist directly into a space, providing humidity control exactly where it is needed.

Additionally, energy-saving opportunities and ease of operation of the high pressure direct room systems set them apart. Without the need for an air handler and ductwork, these

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Humidification / Dehumidification - *continued*

systems can operate autonomously or in locations where ducted systems are impractical. They also can simplify retrofit costs, by reducing the need to install additional ventilation systems to resolve humidity issues. Strictly a humidification process, high pressure systems can respond very quickly to changes in space conditions, regardless of the temperature settings. In addition, they can track set points with a high level of precision. Pumps and water treatment systems can be located in a separate mechanical room from the spray nozzles so that business operations are not disrupted during servicing. This results in less down time and lost revenue. As an additional bonus, the cooling effect of water evaporation can provide cooling directly to the room, 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 high pressure system and ease of operation make this system ideal for many facilities.

5 Trends Shaping The Future of Printing and Packaging Facility Management

Challenges and Solutions

Facility managers are confronted with a pressing need to control the humidity of the air in their facilities. Being able to precisely configure the humidity throughout the production process is an essential factor in ensuring product quality remains consistently high. Using dehumidifiers and dryers helps to ensure that these processes remain safe and stable. Additionally, humidification levels play a critical role when it comes to reduction of static in the air. Depending on the type of machinery, friction caused by static can reduce speed and efficiency. Static can impact the success of chemical reactions and can be highly detrimental for electronics, where friction has been shown to short out circuit boards. Finally, from a safety standpoint, such as working with flammable liquids, high levels of static can lead to explosions. The main goal of printing and packaging manufacturing facility managers is to meet the needs of their facilities by maintaining operations and preventing downtime. Providing exceptional air quality is an essential part of this puzzle.

5 Trends Shaping The Future of Printing and Packaging Facility Management

Seven Environmental Tips for Printing and Packaging Facility Managers

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

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

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

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

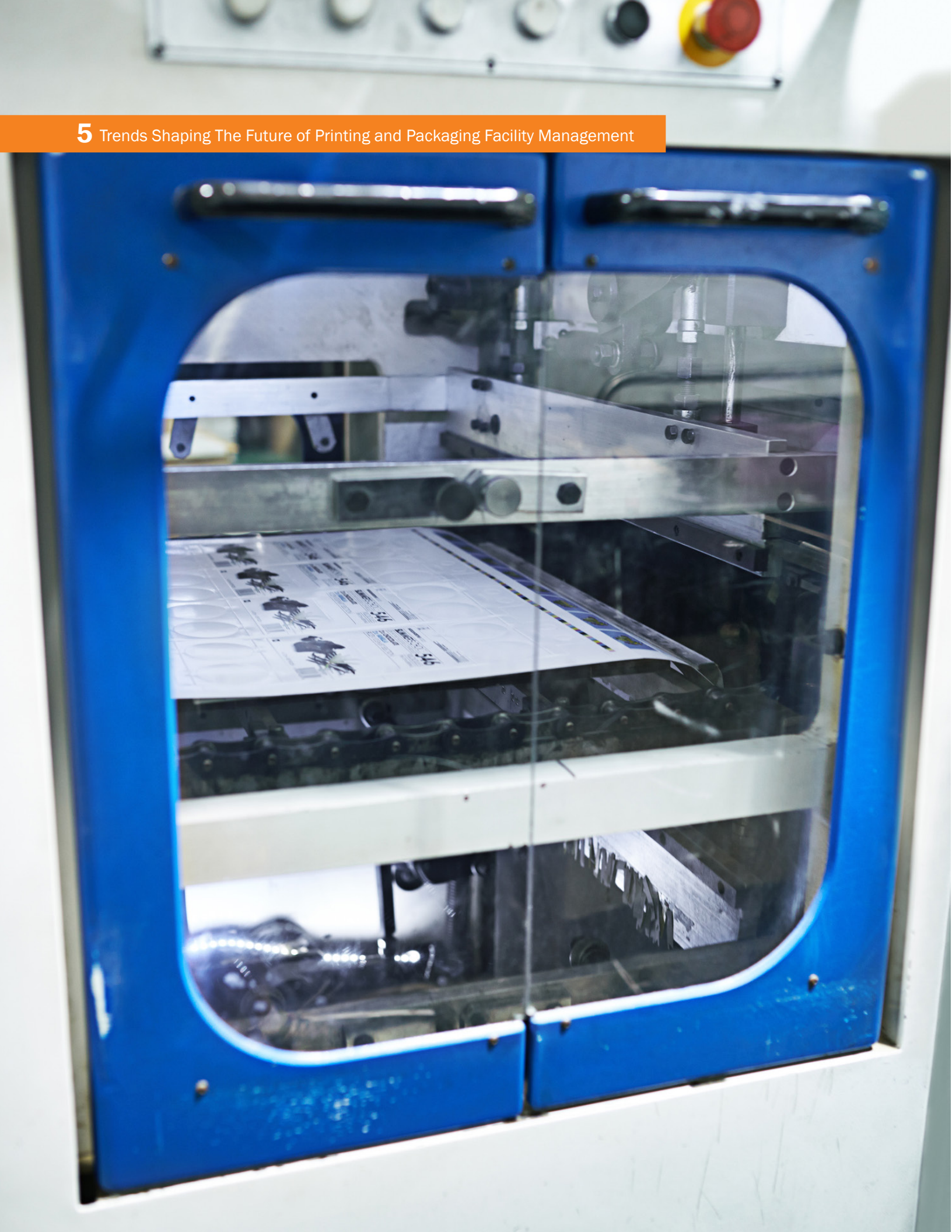
3. Set the bar high. Request hygiene tests on equipment as part of any maintenance contract. Onsite FDA approved bacteria testing measures are available that provide immediate results. Any concerns can be remedied immediately to prevent larger issues.

4. Inhibit bacterial growth throughout the HVAC system by paying close attention to primary water sources. Avoid turning off the water storage system. Instead, purge nozzles, pipes, etc., on a regular basis. Most newer systems have safety measures in place to eliminate standing water and prevent contamination issues.

5. Maintain RH levels between 40 and 60 percent. Invest in reliable humidity indicators.

6. Outsource facility management to companies that employ knowledgeable, skilled and certified staff. Be willing to share in the responsibility of keeping the facility functioning at top levels.

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



Conclusion

Today, regardless of the industry, a clean, uncontaminated, indoor environment is expected. For printing and packaging manufacturing facility managers and owners, who face an expanding global market, this statement takes on a whole new importance. For this reason, choosing a HVAC system that meets need of the specific facility is essential along with recognizing the relationship between humidification levels and disease.

Overall, 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 seek new technologies and solutions are confidently moving their printing and packaging companies forward today and into the future.

Contributors

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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.