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Steady Growth for HVAC&R in Spain

BY WS COMSTOCK, CONTRIBUTING EDITOR, EUROPE & MIDDLE EAST

MADRID—At Spain's largest biennial HVAC&R exhibition, suppliers and visitors alike spoke about “steady growth.” Ended is government funding for large projects like airports and arenas and incentives for alternative energy applications. Health care, data centers, privately financed commercial construction, and residential retrofits drive the market as suppliers react to European Union (EU) regulations for refrigerant transition, energy efficiency and indoor air quality. Some manufacturers have posted 20% gains over the past two years.

CLIMATIZACIÓN Y REFRIGERACIÓN (C&R), held February 26 to March 1, attracted 54,781 trade visitors from 88 countries, 9.7% more than in 2017, and 374 direct exhibitors. Non-Spanish visitors increased by 20.7%, accounting for 11% of all attendance.

The show's technical program topics tell the story of issues facing the industry: “Reality of near-zero energy consumption buildings”; “Relevant aspects of refrigerants”; and “Updating regulations on thermal installations in buildings to meet Ecodesign Regulations and the Technical Building Code Requirements.”

The European Commission's renewable energy directive requires the EU to fulfill at least 20% of its total energy needs with renewables by 2020. That is an opportunity for the HVAC companies, says Pilar Budi, managing director of AFEC, the Spanish air-conditioning manufacturers association. “I think the market is turning,” she said. “Some companies are adding new products to their offerings, like heat pumps. The need to comply with the European directive for energy

Fisair's air dehumidifiers use an exclusive high-performance silica gel desiccant rotor for the retention of water vapor.

efficiency and to decrease CO₂ emissions creates another opportunity,” she said. “There also is heightened interest in indoor air quality and of course in the refrigerants with a low GWP.”

At Systemair, representatives explained how eliminating contaminated air, replacing it with fresh air and processing it can improve the indoor environment. “We see a trend to apply our technologies in the health-care field to the residential market,” said Juan Madrid, Managing Director for Systemair in Spain. “We are now talking not only about airflow and temperature but also about other factors for IAQ and comfort like CO₂.”

Luymar's entire range of recovery and filtration units is manufactured in Spain. The company was established to serve the industrial market, adding commercial products several years ago. Now it is moving into domestic solutions. “Because our products are manufactured in Spain, we are agile in meeting our customer's needs. We maintain adequate inventory, and for turnkey projects, we work to have our products delivered as soon as possible,” said Antonio Lara Lorente, a Luymar analyst.

The market driver Luymar sees on the horizon is residential IAQ regulation by the European Commission. “Humans require high quality air. Regulations are going to address that,” said Lorente. “The second objective will be to provide it at reasonable cost, with minimal emission of CO₂ and at low power consumption.”



(Left) Eduard Roig said Lennox was launching a new chiller with R-32 gas, the first chiller in the market with an inverter scroll compressor. (Center) With the theme “For Indoor Life Quality,” TROX displayed how it uses digital technology to increase the perceived well-being of building occupants to make daily work easier and to protect the environment with energy-efficient systems. (Right) Luis Mena explains the third generation Daikin Altherma 3, which provides heating for new houses using heat pumps. Altherma 3 uses a combination of Daikin compressors and refrigerant R-32 to achieve A++ seasonal efficiency.

The biggest Spanish-based company in the industry is Soler & Palau (S&P), whose product line has more than 10,000 models covering industrial buildings, residential buildings, the tertiary sector, industrial processes and OEMs. “Every six seconds S&P places a product in the market,” said Damian Fernandez Garcia, the company’s commercial director. “Our distribution structure, through subsidiaries and exclusive distributors, allows us to be present in all world markets. That enables us to take innovation from one market and apply it in others.”

First and foremost, manufacturers need to deliver energy efficiency and, to an increasing extent, indoor air quality, said Fernandez. “In the EU this is driven by regulation, especially in the residential sector, which has greater oversight than the commercial market. Because of our reach throughout the entire EU, we focus on achieving full compliance with all the applicable regulations. We push for compliance to deliver the best system performance possible.”

Among Soler & Palau’s services displayed was EASYVENT, an online selection tool to guide designers from the beginning of the project and let them adapt to the different

situations that may appear. Its principal features include fan selection from a required working point, heat recovery unit selection, pre-calculation of airflow, possibility to reconfigure a product after being added to the project, and BIM objects download.

Trox showed its new line of air diffusers that blend invisibly into ceiling tiles. Air is added to the room in an individually regulated manner. The objective is to obtain the best possible air quality in the occupied zone and stable, homogeneous ambient temperatures. The diffusers act as design elements for architects while fulfilling ventilation and acoustic requirements.

The big story, though, is how companies are expanding their range of services to better serve their customers, moving from a focus on individual components to systems. Suppliers like Trox are packaging diffusers, fire dampers, silencers and air handling units with control systems to improve service and monitoring through cloud-based services. “At Trox we are offering a complete solution,” said Javier Aramburu, technical director in Spain.

Trox X-AIRCONTROL manages airflow from AHU to diffusers. The

demand-based system allows individual room control, optimization of the air-handling unit based on ventilation and air-conditioning parameters, fan speed control, and control of the recirculation damper based on the air quality. “It is a small EMS that connects to the building EMS,” said Aramburu.

With new regulations requiring reductions in energy consumption and greater use of energy recovery, system solutions are how manufacturers are responding.

“Building systems need to be designed according to energy consumption during the year,” said Aramburu. “Now we design for the extremes. We must change to design for the whole year, address power, capacity and energy. We need improved simulation tools and CFD reports, using big data to design for actual conditions throughout the entire year, not just the worst conditions.”

Big data is going to change how Fisair, a Spanish company that manufactures solutions for the control of air and humidity in materials and industrial processes, designs and delivers its products. The company, which celebrated the 50th anniversary of its founding at the fair, produces hygienic

humidifiers capable of high-precision relative humidity control, dehumidifiers for industrial applications that require dry air, and evaporative coolers that use dry air's natural capacity for cooling by exchanging heat for water. Its clients are both end users (industries and public buildings) and manufacturers who use Fisair components for humidity control inside their facilities or units.

“Currently, we design products in the lab based on modeling and put them in the market,” said Juan Boeta Tejera, the company's director general. “Shortly, we will be able to design products based upon feedback about how the product is performing. By using big data, we will really know what is happening with the system and if it is delivering what we expected.” Knowing what data to select and to analyze it will become a new business model for Fisair. “The data is owned by the client. But we will offer a service to collect the data and provide guidance to the client showing if energy is being wasted and if the drying is being done effectively. We will be able to provide this from the factory to reduce the cost of on-site support. We are hoping to reduce the need to send someone to a remote location,” said Boeta.

As is the case at any HVAC exhibition today, the path exhibitors have chosen for refrigerant transition was prominently displayed.

Lennox introduced at C&R 2019 the extension of its eCOMFORT range—from 170 to 400 kW (48 to 114 ton)—for comfort applications. Available from Q4 2019, the chiller—equipped with inverter compressors and EC fans—is designed to deliver the highest performance at the lowest cost. Optimized for part-load operation and low-GWP R-32, it increases seasonal efficiency by 30%—exceeding Ecodesign 2021 tier—and reduces greenhouse gas emissions. The heat pump version is scheduled for a 2020 release. “The big challenge for the industry is F-gas regulation,” said Eduard Roig, an engineer at Lennox. “We are pleased to launch the first R-32 scroll chiller on the market. In addition, we will help our customers to make this transition smooth with service, information and training too.”

“Our industry is in the middle of a storm, a storm centered on F-gas regulation,” said Luis Mena, Daikin Spain



ASHRAE's Spain Chapter displayed Spanish translations of ASHRAE standards and guidelines.

Director General. “Our industry has to transform whether the economy is good or bad. It is difficult for technology to change as rapidly as the regulations demand. That puts pressure on the manufacturers to find not only the right product solution but also to put in place training, servicing, security, after life requirements, and so on. It also requires we communicate with customers about how the new regulations impact their buildings.”

Long term, Mena sees pressure to reduce cooling and heating demand. “The average capacity will be reduced dramatically,” he says. “I think Daikin is in a good position in this environment because we touch upon all the business pillars. We offer small units for apartments to centrifugal chillers of 20 megawatts and everything in between. It is a full product range with maintenance and control.”

Another complication for Spain's refrigerant transition is a Spanish regulation covering pressure equipment and accompanying guidance for technicians. Dating from the 1970s, the regulation was changed only last December to allow use of low-GWP refrigerants.

Monica del Fresno, an HVAC engineer in Spain, believes the regulation penalized Spain. As the rest of Europe started the transition from F-gases several years ago, in Spain, the process was delayed because of the regulation. “Installers were not able to prepare their clients about the transition. Now we need to move quickly to tell building owners about the new refrigerants and the new equipment that is needed.” Her company offers

a full range of mini-split systems for Spain's residential market. "We offer high efficiency products with pricing that reduces one of the barriers to the refrigerant transition."

Data center cooling is one of the sectors leading private investment. "Cooling represents the biggest slice of the total cost in a data center," said Systemair's Madrid. The most efficient data centers use products that can reach PUE value close to 1.0 as well as focus on Energy Resource Effectiveness (ERE) to recover as much energy as possible in all types of geographies and climate zones. "Systemair's free cooling solutions are a highly efficient method that use low temperature outdoor air to control the data center, reducing total energy consumption. It is possible to free cool all the time or for some time of the year in most countries," said Madrid. The company says calculations based on a one year power saving of approximately 180,000 kW in Madrid show that it is possible to estimate over a five-year period an average energy saving of 3,600,000 kWh. In terms of money, cost reduction would add up to a total of more than 432,000€ during the same period.

Abel Pedros of Eurofred sees Spain as a new HVAC&R leader in Europe, saying that while some European economies are contracting, Spain is growing at 2.8% or 2.9% per year. "The heat pump market for us has grown 50% compared to last year," he said. "And IAQ is increasingly important as the air quality in Spain's cities worsens. The equipment we sell can provide indoor conditions for living that are like cleanrooms for industry." After the Spanish recession of 2008–2014, Spanish companies also learned to increase their exports. "We sell in

Chile and Morocco," said Pedros, the company's marketing director for air and food sectors.

"Besides the European market we have cultural connections to the Americas," said Fisair's Boeta. "In Spain we are in a good location for the global market." That along with economic stability have brightened prospects for HVAC&R in Spain. ■

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ASHRAE-NREL Workshop

Buildings and Grid Experts Convene

BY ANDREW WALKER, PH.D., P.E., AND HUGH CROWTHER, P.ENG., MEMBER ASHRAE

GOLDEN, COLO.—ASHRAE President Sheila Hayter's theme of Building Our New Energy Future achieved another milestone on March 28 and 29 when the grid and building industries came together at the National Renewable Energy Lab (NREL) in Golden, Colorado. Hosted by NREL and ASHRAE with the support of the U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy, the two-day workshop included building owners, building and grid consulting engineers, utility operators, equipment and controls manufacturers, EPA, RMI, DOE, and lab staff from NIST, PNNL, LBL, ORNL, and NREL.

Rapid changes in both the grid sector and building sciences sector made the workshop both timely and necessary. Previously, buildings were passive consumers of energy (kWh), and goals were related primarily to percent energy reduction. The shift to renewable energy generation (e.g., photovoltaics, wind power) and smart grid chemical energy storage (batteries) is changing how the grid needs to operate, with the focus on when and where those kWh are delivered.

With buildings representing about 75% of the grid's load, these changes are impacting how buildings need to operate, optimizing when those kWh are consumed, generated, or stored. Grid-friendly buildings are known as Grid-interactive Efficient Buildings (GEBs). (<https://www.energy.gov/eere/buildings/grid-interactive-efficient-buildings>). Valuable services that a building could support in concert with the grid include: automated demand response; on-site generation; thermal and electric storage; phase balancing; reactive power (kVAR); and regulation of frequency and voltage.

Building sciences are evolving with a continued focus on the human experience in the built environment while driving lower energy use. The energy focus is on low annual energy use intensity (EUI, kBtu/ft²-yr).

Considering the rapid changes, the workshop covered four main topics:

- Grid Services: How can buildings help the grid?;
- Energy Efficiency: Expanding the capabilities of existing solutions;



ASHRAE President Sheila Hayter, P.E., and Juan Torres, associate laboratory director, Energy Systems Integration at NREL, meet with buildings and grid industry experts.

CREDIT: NREL

- Energy Storage: The power of space, temperature, and time; and
- Integration and Interoperability: Bringing it all together.

Industry experts kicked off each session with an update, followed by breakout sessions that identified opportunities and barriers related to each topic.

The goal of the discussions was to bridge the gap between the grid industry and the building science community, identify areas of common interest, and most importantly identify areas where analysis, research, and practical tools are required. The workshop also helped inform planning by exploring priority areas and sharing interests across disciplines by identifying some key takeaways.

Research and Analysis

There are several gaps that we must better understand to take advantage of the new energy future. Much of this work will fall to the national labs and engineering consulting firms under the leadership of the DOE Office of Energy Efficiency and Renewable Energy.

Utilities understand their new challenges and how they would like their customers (i.e., buildings, industry, electric vehicles) to behave for them to take full

advantage of technology changes in their sector. Analysis and research are required to understand and prioritize what goals buildings can help meet. For example, load balancing and energy storage are very helpful to the grid, and buildings can play a significant role, while demand response, voltage control, and frequency control are not as mature.

Designing GEBs is not well understood by the building sector. With evolving goals set by utilities, work is required to understand how to meet these challenges. An example is leveraging passive and active building envelopes not just for thermal comfort and low EUIs but to help load balance.

The gap between the grid and building sectors' understanding of each other's challenges and opportunities was a major takeaway and supported the need for workshops such as this.

To manage load balancing, grid loads must be understood well enough to know what can be adjusted to optimize the grid. The smart grid will provide the means to communicate needs and opportunities. The work to

provide the standards for communication needs to be completed as quickly as possible. Signals from utilities could evolve from pricing signals buried in utility bills to real-time integration of controls.

The grid needs to see a building as more than just a block load. Research is required to understand, from a load balancing perspective, the internal building loads such as HVAC, lighting, process loads, electric vehicle charging stations. For example, it is not possible to load shed a chiller plant (HVAC load) if the building is in economizer mode and the chiller plant is not operating. Research needs to identify what various loads can be used for load balancing, how to prioritize them, and how to communicate between buildings and the grid.

Cybersecurity, the Internet of Things, big data, and balancing the need for privacy will evolve as building-grid communication expands. There is a role for artificial intelligence in building-grid optimization and this too needs to be researched. Autonomous systems will be required for both rapid response and machine learning.

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INDUSTRY NEWS

Tools and Applications

Available technology can be applied to make buildings grid friendly. Applying this technology requires applications, guidance, tools, and training. This is a role where ASHRAE with its 57,000+ members and its fellow industry association partners can play a leading part. Some of the technologies identified at the workshop include:

- Courses on what a GEB is, both for the design professional and building owners and operators;
- Leveraging integrated design to deliver a grid-friendly building;
- Operating a building to be grid friendly;
- Electrochemical and thermal energy storage for energy storage;
- Leveraging passive and active building envelopes for load balancing;
- Developing building controls strategies that are grid friendly;
- Applying smart grid protocols to building design and operation;
- Considering cybersecurity in building design and operation; and
- Grid-friendly applications for existing buildings.

The next steps are to further define and prioritize both the research and the application tools in the next few months. The results of this effort will be published in an issue of the *ASHRAE Journal*. The analysis will also be shared with the ASHRAE Board of Directors and the Research Advisory Committee as they consider their respective strategic plans, DOE, and leading national labs such as NREL. ■

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