The HVAC sector in the Middle East is observed to have undergone a substantial transformation in the past three years. For one, the economic pressure that the downturn placed upon the governments has prompted them to legislate and set up regulations, which, in turn, have led HVAC manufacturers to focus their attention on research and development efforts to create more energy-efficient and economically-viable products.

The end-user demand for savings in installation and lifecycle costs, on the other hand, has spurred the HVAC companies to offer products that provide design and installation flexibility and a higher degree of suitability and efficiency despite the region’s harsh climatic conditions.

Popularly regarded as an efficient, economical and environmentally friendly technology, VRF systems have been touted by the industry players to be the answer to the region’s growing concern about cost, efficiency and sustainability.

THE VRF MARKET IN THE MIDDLE EAST
Industry players are all of the opinion that while the technology is considerably new in the region, they can see the growth of the VRF market on the horizon. Michel Farah, Product Department Manager, Daikin, says that VRV technology is entering the GCC market at a higher growth rate than that of traditional systems, and that the VRV market is growing at a fast pace, as the technology is generally offered as an alternative to conventional systems. “Our estimation of the market,” he explains, “is that it is growing every year, as customers are becoming more familiar with the technology and its benefits in meeting cooling load and demands without exceeding the required power input at various conditions.”

Irfan Syed, Senior Marketing Engineer, VRF Systems, Johnson Controls, attributes the growth of the VRF market to the new energy regulations in the region, the ongoing campaign for zero-ODP refrigerants and to retrofit jobs, where VRF systems are installed as replacement to other air-cooled systems. Jones Wu,
In an exclusive interview with Climate Control Middle East, Edwin Young, Programme Manager for Estidama, Abu Dhabi Urban Planning Council (UPC), speaks about which rating systems are applicable to VRF systems and about how the huge government investment in housing in Abu Dhabi impacts the industry. Jerome Sanchez in conversation with Young...
Winning a bid to supply VRF systems to over 400 villa units, American Pro says that the recent feat boosts its campaign to establish good-brand recognition in the Middle East and to promote its digital scroll VRF system.

“The government of Abu Dhabi developed plans to build nearly 2,000 units of villas, and allot them to native citizens. The project was divided into two phases, with American Pro winning the bid to supply air conditioning products for the first phase, comprising more than 400 villas. American Pro is now aggressively bidding for the second phase of the project.

“The central air conditioning system employs tropical-condition digital scroll VRF outdoor units, with wall-mounted and duct-type indoor units. A sample system was installed in one of the reference villas for a non-stop, long-term reliability test, and a special team of consultants and experts from the UAE was invited to inspect the laboratory testing.

“The tropical-application series of products have shown excellent performance, high efficiency and reliability, even at the highest ambient temperature (up to 54°C). In order to meet the technical requirements of the owners and consultants, the R&D engineers set up a technical team to customise the corresponding control function and cooling system.

“The United Arab Emirates, as one of the largest economies in the Middle East, plays a very important role in the region. Winning the government project helps American Pro in establishing good-brand recognition in the area, in promoting its digital scroll VRF product. Concentrating on system stability and energy efficiency, American Pro has strong communication with its consultants and design engineers during the project consulting, the designing and the bidding. This makes the actual project requirement clear, and allows them to provide the appropriate proposal.”

“Trane, gives a higher figure, and qualifies that assuming a 22% year-on-year growth, the current estimated GCC market potential of VRF systems is USD 340 million.

Jin Kyu Choi, Director, AC RPM, MENA, Samsung Electronics, computes the highest estimate at USD 540 million, with approximately nine per cent growth compared to figures from the previous year.

THE PUSH AND PULL OF THE DOWNTURN
The economic crisis of the recent years had multifarious, and sometimes, contradictory effect on the VRF market. The most obvious offshoot of the downturn was, of course, a slowdown in construction projects, with the air conditioning market suffering a setback. “The economic crisis affected the entire field in the GCC, as well as globally, as the air conditioning business is related, as a main factor, to the construction sector,” Abu Alika points out. He says that numerous projects after 2008 were postponed or cancelled, even those that had gone past the concept design stage.

Though some construction projects were not completely cancelled or shelved, the crisis caused the developers and the contractors to tighten their belts. Choi explains: “Most of the projects, originally planned with VRF systems, which were initially looking for more energy-efficient products compared to chillers and ducted splits, were changed to ducted splits, owing to

Amjad Abu Alika
Jafar Syed Imam
Michel Farah
Irfan Syed
Amjad Abu Alika
Mohammed Khaja

Irfan Syed
Amjad Abu Alika
Mohammed Khaja
their cheaper price compared to any other system.” He observes that during the crisis years, the demand for the ducted split system increased compared to that for VRFs and chillers.

“Due to the economic crisis,” says Wu, “the budget for the projects has shrunk a lot.” This, he explains, resulted in a more stringent requirement on the part of the developers and contractors to look for economically viable air conditioning products for their projects. “Ducted split units will definitely be one of the more economical AC solutions for their projects, compared with VRF systems,” believes Wu. The only factors, adds Wu, that deterred developers and contractors from overwhelmingly choosing ducted split units over VRF systems, considering the difference in initial cost, were government regulations.

When one scratches the surface, however, some industry players observe that the economic downturn, in fact, encouraged the growth of the VRF technology.

Farah is of the view that the crisis actually favoured the VRV systems over other traditional systems. He explains: “Some application-related targets have favoured VRV design features, such as lower lifecycle cost, individual tenant billing, part-load efficiency, fast project completion, long distance between outdoor and indoor [units], reduction in peak load power consumption without affecting comfort, and predictive component failure alerts.” He also shares Wu’s opinion that new energy performance regulations have tipped the scale in favour of VRV systems over traditional systems in some areas.

Throwing the spotlight on a specific case, Dharmesh Sawant, Senior Sales Manager, AC B2B, LG Electronics, says that complying with Estidama’s sustainability regulations was one of their main considerations when they installed LG’s VRF system in GEMS American Academy in Abu Dhabi. “Because of the possibility to mix indoor models with various condensing outdoor units, we were able to retain the school’s Arabic design and cut down on the electrical load seen in conventional air solutions…. The overall cost efficiency of these air conditioners is between 25 and 30%, making them a cost- and energy-efficient solution for building projects.”

During the crisis years, as mentioned earlier, many of the projects, which were originally planned to be mega-sized ones, were eventually scaled down, and the skyscrapers were resized to half, and turned into many medium-sized buildings and condominiums. “This formed a perfect germinating platform for VRF systems,” says Imam. “Where economy of scale made it hard to justify those mega district cooling projects and centrifugal chilled water systems, there came a perfect fit in the form of VRF systems.” He elucidates that the technology’s design and concept allow phase-wise installation, thereby limiting the burden of cash flow and offering financial flexibility.

“As the voice of the green evolution and energy-efficient solutions gathered momentum, although crippled with financial limitations, VRF emerged as the most sought-out solution that fit the bill. This era marked the rise of the VRF technology as a frontrunner rather than just an admired trophy, which remained untouched for a while.”

**THE POTENTIAL OF VRFs IN THE MIDDLE EAST**

The industry players are unanimous in saying that
the largest market for VRFs in the Middle East is presently the UAE, but that the technology is slowly gaining traction in other significant markets in the region.

**SAUDI ARABIA:**

“Saudi Arabia, in itself, has a huge potential. With much of the developments, be it in housing or infrastructure modelled on flat surface rather than vertical, VRF will certainly play a major role when it comes to meeting the energy mandates,” says Ajit Chandraraj, General Manager, RLC, AHI-Carrier. With the Kingdom’s aggressive determination to move away from burning fossil fuels to generate electricity, and find an alternative source of power generation to respond to the country’s growing demand, Chandraraj says that there is a conscious effort to adopt smart power generation and smart consumption. “There is an urgency to look at more energy-efficient products … and the need of the hour is to look at ‘smart air conditioning’ – a tag that has been synonymous to VRF systems in the developed world,” he says.

He points out that, in Saudi Arabia, many mega housing projects, like the one in Qurtoba, is being designed with VRF systems. “In the next two years, Saudi [Arabia] will be one of the biggest importers of VRF products. A major shift is about to happen, moving [away] from the traditional ducted splits and packaged units, which are currently used generously throughout the Kingdom,” Chandraraj predicts.

Farah seconds Chandraraj’s view and adds that Saudi Arabia has legislated a new minimum energy performance standard, the first phase of which will be applicable from September 2013. “We believe that the energy efficiency regulations will boost the VRV share of the total market.”

Khaja, however, voices a different opinion when he says that Saudi Arabia is not as a significant market for VRF systems as some may assume. “It has been gaining some popularity over the last three years, but it still represents only five per cent of their total HVAC market potential,” he points out.

Abu Alika supports Khaja’s view and says that the only major market in Saudi Arabia, in his opinion, constitutes commercial projects, and that there is an observed general absence of demand in the residential projects.

**QATAR:**

“With growing power demand, Qatar is an ideal candidate for embracing the VRF product line, and has rightfully done so,” says Viraj Vartak, Regional Manager, VRF, AHI-Carrier. He explains that a sizeable portion of Qatar’s oil and gas resource is being burnt to generate power, and with Qatar’s 2030 vision, huge developments are being planned across all sectors. “The World Cup 2022 has already set the ball rolling, and the market is booming in anticipation.

The next few years will see nationwide developments, particularly in infrastructure, housing and hospitality,” he says.

He shares his view that projects in Qatar are being designed with VRF systems right at the concept stage. “Today, be it government-aided projects, commercial space, housing and other infrastructure projects, VRF systems have been in the central scheme of things,” he reiterates.

Choi and Khaja also regard Qatar a booming market, owing to large development projects in the pipeline, most of them in connection with the upcoming World Cup 2022.

Though generally optimistic about the growth of the VRF market in Saudi Arabia and Qatar, Wu observes that the markets here are different from those of other GCC countries.
countries. “Things in these two countries always move very slowly,” he says. “These two countries just started to shift from window AC to wall-mounted split units in recent years…. I think it will take more time for these two markets to accept the VRF technology.”

OMAN:
“Oman today has more VRF projects by proportion than any other GCC countries,” says Imam. He reveals that four in every 10 major

Another pair of eyes

Arguing that a performance certification scheme, by providing comparable third-party-certified data, allows for a sound technology selection, Erick Melquiond, President, Eurovent Certita Certification, discusses the status of the certification regimen for VRF systems and sheds light on the testing standards that it follows. Here are the highlights...

Viraj Vartak

Peck Zhao

Basil Khayat

Zakir Ahmed

Erick Melquiond

During the 1st Annual Middle East Variable Refrigerant Flow Conference, held in February in Dubai, you mentioned that one of the newer certification regimens in place was the one for VRF systems. How is the VRF industry receiving the certification process? Have you seen an increase in the number of participants in the certification scheme in the past several months? The Eurovent Certified Performance for VRF has now started, and the first test campaign is in progress. At the moment, seven manufacturers have completed their pre-registration, two have finished registration, and some pieces of equipment are on their way to a lab location for the test to be carried out. First batch of certified data will be published by the end of October.

What were the key parameters that you considered in establishing a certification regimen for VRF systems?
Key parameters being considered must be according to the selected testing standard and must cover key market information needs, such as energy efficiency or performance, as well as noise efficiency.

Which equipment is included in the scope of the certification programme for VRF systems?
The following are included in the scope: Outdoor units used in Variable Refrigerant Flow (VRF) systems with the following characteristics: ■ Air or water source ■ Reversible, heating-only and cooling-only

VRF systems with data declared and published as combinations, are, however, excluded in the scope. Heat recovery units are included, but the heat recovery function is not certified. In addition, high ambient systems are included, but tested under standard conditions as specified in RS 6/C/008.

Which characteristics/performance indicators of VRF systems do you certify? Which testing standards are followed in the process?
The following are the characteristics that we certify:
■ Outdoor cooling capacity at standard conditions
■ Outdoor heating capacity at standard conditions
■ Outdoor energy efficiency ratio in cooling (EER)
■ Outdoor coefficient of performances in heating (COP)
■ A-weighted sound power level, outdoor side

These are the testing standards that we follow:

Performance testing using the calorimeter room method:
EN 14511 “Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling”

Performance testing using the air enthalpy method:
EN 14511 “Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling”
EN 12102 “Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling – Measurement of airborne noise – Determination of the sound power level”

In your opinion, what value will certification add to products of participant companies?
A performance certification scheme, such as Eurovent Certified Performance, will provide the market with comparable data for a new kind of technology, making a sound product or technology selection possible. Moreover, a performance certification scheme will allow for the possibility to work with third-party-certified performance data, instead of self-declared data provided by manufacturers.
projects in Oman are designed with VRF systems. Even the government institutions, he adds, have supported the idea of modernisation and of green evolution envisaged by the Omani leadership.

IRAQ: “Iraq, on the other hand,” Imam continues, “has been exposed to unlimited challenges in the last decade, from safety and basic amenities to electricity.” Most of the large projects in Iraq, he says, have been designed with VRF systems, which consume much lower power compared with other systems. “With hardly eight to 10 hours of electricity available in many of the prime cities in Iraq, I can say that they made the smart choice.”

KEY ISSUES ON VRF SYSTEMS

Though the industry players speak highly of the VRF technology’s benefits, especially in terms of energy efficiency and of lowering installation and lifecycle costs, they also highlight some key concerns in relation to the system.

Peck Zhao, Marketing Manager, Commercial Air Conditioner Division, Midea, cites the limitation on the maximum and minimum entering dry- and wet-bulb temperatures in the indoor coil as a reason why the units may be regarded as unsuitable for 100% outside fresh air applications, especially in hot and humid climates, such as that of the GCC. He adds that in such areas, a separate fresh air system may still be required in most applications.

He also points out that the piping length for VRF systems is still limited, owing to the issues of oil return and capacity drop. This concern, he says, continues to make chillers more popular in high-rise and large-scale buildings, such as those with a height of 100 metres or more, or those that have a heat load of higher than 1,000 RT.

Another key concern raised against VRF systems is the danger of refrigerant leakage, as the technology uses refrigerants as a cooling and heating medium. “In cases where the refrigerant pipes are more than 500 metres,” explains Zhao, “there is a perceived refrigerant leakage problem, especially in a system with multiple outdoor unit-combinations and numerous indoor units.” Though there have been very few cases of refrigerant leakage reported during the 30-year history of the VRF technology, Zhao says that this remains a concern for the industry.

In order to address the issue of the suitability of VRF systems in hot or humid climates, Zhao shares the information that his company has developed a fresh air processing unit, which makes its products capable of operating under temperatures of as high as 45°C. He also speaks of the availability of a heat recovery ventilator, which can pre-cool outside air of, say, 54°C down to 40°C or lower. “This makes the whole system capable of providing fresh air, no matter if the ambient temperature is 54°C,” he claims.

He also says that recent technological advancements in VRF systems make it possible to connect a total of 1,000 metres of piping length to the system, with less capacity drop and refrigerant charge volume. It is now also possible, he adds, to have a vertical piping length of up to 110 metres between the outdoor unit and the indoor units.

“The integrated pressure sensor will detect the real-
time pressure and, coupled with an intelligent detection programme, the system will give a warning signal once there’s a leakage,” he reveals.

Zhao predicts that, in the future, more intelligent programmes and more precise sensors, which could detect a leak point, making it possible to prevent a big leakage in the system, may be available.

One other pressing concern for the VRF industry is the perceived lack of information on the part of the market, and of training on the part of installers and MEP engineers. “As a new technology in the region,” says Farah, “the market awareness is still at a low level, and users still have to be educated.” He adds that the VRF technology is constantly growing, and that Daikin is supporting this expansion by training and qualifying installers in its own Academy.

Speaking for Trane, Khaja says that as VRF applications need careful designing by trained professionals with genuine experience and system knowledge, his company has formed a team especially dedicated to VRF projects. “We are also conducting various training programmes and sharing our knowledge with our business partners. So, in the case of our current undertakings, we share our knowledge, and our customers have been able to make informed decisions, rather than relying on open-ended statements,” he claims.

Basil Khayat, AC Division Manager, United Electronics, distributors for Mitsubishi, points out that there may also be an information gap on the part of architects and MEP consultants. “In order to overcome this, we constantly update and share with them information about the system. We also arrange factory visits, enabling them to have a better understanding of the system and its applications,” he says.

Aside from training and information dissemination, Wu believes that there is also a need to make performance data publicly available. “As a new solution, there are very limited number of reference projects for VRF in the Middle East region.” This, he says, leads to the situation where project owners are still not fully convinced about the performance of VRF systems, especially under the tough climatic conditions in the region.

Zakir Ahmed, Managing Director, NIA, during the company’s Dealer Meet in March (For a related story, please see the May 2013 issue of Climate Control Middle East), shed light on why it may be difficult to provide operational data of VRF systems: “In the case of VRF systems as a whole, it is difficult to tell, because there are a number of variables, such as speed, temperature and a varying load all the time.” He, however, points out that VRF systems could give the user operational data at each zone through wall-mounted controls and PC software. The available features, he adds, can tell the user the consumption by the hour and by the zone.

A CLOSE LOOK AT THE FUTURE

Energy efficiency has become a concern in the Middle East, especially where its extreme conditions pose a continuous challenge to air conditioning equipment.

“The governments of the UAE and of Saudi Arabia,” says Imam, “have been engaged in commissioning sustainable design pilot projects, and in one of such prestigious green projects in the UAE, Toshiba has signed an Memorandum of Understanding (MoU) for partnering in research activities. The research is aimed at studying contributions VRFs can make in the Middle East, when it comes to energy-efficient solutions.”

He reveals that his company’s VRF system, equipped with the latest vector-controlled inverter technology, can provide excellent energy efficiency with a COP of 6.42 for a 50% load operation, and a COP of 3.77 for a 100% load operation at high ambient conditions. He adds that his company’s next generation VRF system will be equipped with smart controllers, which can remotely control air conditioners using GSM-based smart phones.

Zhao believes that in the future, it will be possible to connect more indoor units to one single system, reducing initial equipment cost and installation costs. He also says that they are looking to introduce outdoor units with capacities of up to 18 HP, which could save on installation space and piping materials.

Wu says that his company’s new system will be based on full DC inverter VRF technology with built-in energy-saving control module on the PCB board. “It can optimise the power consumption of each electrical component in order to reach a maximum IPLV of 6.72, which is the leading energy efficiency [system] in the industry.”

Speaking for Trane, Khaja says that high-ambient operation and energy regulation requirements are the prime consideration in developing new products. He adds that his company is also focusing on advance building management systems. “Daikin has recently introduced new product enhancements, such as the Air Conditioning Network Service System (ACNSS) and the Eco spray,” reveals Farah. He explains that the ACNSS is a VRV installation network that allows operators to monitor and predict malfunctions before breakdown occurs. The Eco spray, on the other hand, is a technology that allows for the reduction of power consumption at peak hours, without affecting user comfort, he says.

Choi points out that his company’s new system is equipped with dual smart inverter compressor, making it suitable for temperatures of up to 54°C. He reveals that his company’s system can accommodate a piping length of up to 220 metres and a level difference between the outdoor and the indoor units of up to 110 metres. This, he says, gives flexibility to the system’s design and ease in installation.

CONCLUSION

VRF has been regarded as a technology that could minimise efficiency losses and offer lower lifecycle costs compared to traditional systems, and that it could provide a sustainable solution to the increasing concerns over energy efficiency and the growing demand for electricity. In these times of economic uncertainty, when reduction of cost and optimisation of energy usage are the top priority for the governments and for the industry and its stakeholders, VRF systems could definitely be the right kind of fit.