

An Outlook on the U.S. HVAC Industry Evolving Contractor Response to Market Forces

Introduction

Somewhere between servicing their residential and commercial building customers, looking after their own employees, and ensuring that their businesses are properly managed, contractors in the U.S. HVAC market must contend with a multitude of varied issues that appear innocuous ... but, that portend long-term implications. The issues in Figure 1 are a microcosm of the underlying trends and drivers that will significantly, and forever, change the U.S. HVAC marketplace over the next decade.

Key Trends and Drivers

A number of drivers and underlying trends are likely to have significant impacts on U.S. HVAC contractors in the years to come. Obviously, the changes that contractors need to undergo in response to market drivers are similar to the response needed from the entire HVAC industry (including equipment manufacturers, equipment distributors, and others) if the industry is to remain responsive to a shifting marketplace. For the purposes of this discussion, several key aspects are reviewed for each of four drivers:

- transforming markets,
- societal changes,
- changing business environment,
- evolving technologies and practices.

DRIVER 1 - Transforming Marketplace. During the past few decades the U.S. HVAC industry has undergone a quiet evolution in terms of products and services, and how same were marketed in various building sectors. Over the next decade, the U.S. marketplace will continue to be transformed. Key aspects are related to customers building use, and the evolving distribution of equipment in buildings.

Discriminating Customers: HVAC users are developing increasingly higher expectations concerning desired comfort levels, health, safety, and equipment choices related to performance and reliability. HVAC contractors need to transform their business practices to ensure that offered products and services meet these new expectations.

Tomorrow's customers will be more information intensive, take a more interactive role in their purchasing decisions, and will consider a wider range of alternatives before buying. Because of their use of information to develop an informed perspective about the products and services that they are buying, they will be less likely to be swayed by the influence of others ... whether it is by a company or particular product brand.

Increasing customer discrimination will require contractors to expand their professionalism, embrace new diagnostic tools and capabilities,



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Figure 1: Broad Industry Issues

moisture management ... first cost vs. life cycle ... indoor air quality ...
equipment controls ... safeguarding the environment ... insurance coverage ...
customer expectations ... new products ... quality contractors ...
quality manufacturers ... customer knowledge ... energy costs ...
preventative maintenance agreements ... technician training ... green buildings ...
compete vs. cooperate ... prognostics and diagnostics ... energy efficiency ...
attracting/retaining employees ... contractor licensing ... new refrigerants ...
internet ... vertical manufacturing/distribution ... Manual J® ...
improving industry image ... new distribution approaches ...
equipment sizing/selection ... codes, regulations, standards ... level playing
ground ... cooperation ... selling added value ... terrorism ... mold/mildew ...
utility competition ... keeping up with rapid technological changes ...
equipment serviceability ... commissioning ... certification ... Manual D@ ...
profits selling-up ... promotion/advertising ... alternate fuels

and convey greater information about the value that their products provide customers. Increased responsiveness will be required from contractors to address key consumer concerns:

- Health awareness and healthcare costs,
- Increasing apprehension about moisture/mold problems,
- Pressure to reduce building O&M costs,
- Occupant productivity,
- Energy efficiency,
- Extraordinary events (natural disasters, catastrophes, terrorism, etc.).

Changing Focus for Building: With their increasing sophistication, building owners and operators are changing the way they view their building requirements. Their focus is becoming less on the lowest-installed, first-cost of equipment and subsystems, and more on the lifetime costs and values that different options offer. The implications are that higher-quality, more efficient, higher performance HVAC systems will be demanded by the market. Contractors need to ensure that they develop and maintain the skills to sell, install, and maintain the more capable equipment. Additionally, manufacturers and distributors will need to support and offer training on the newer, more complicated equipment.

At the same time, this growing consideration for lifetime value is becoming less focused on the bricks and mortar that comprise a building, but, rather on the *business inside* the building. There is a growing awareness and focus on the efficiencies and operations of the underlying activities within the business. Some predictions for future buildings:

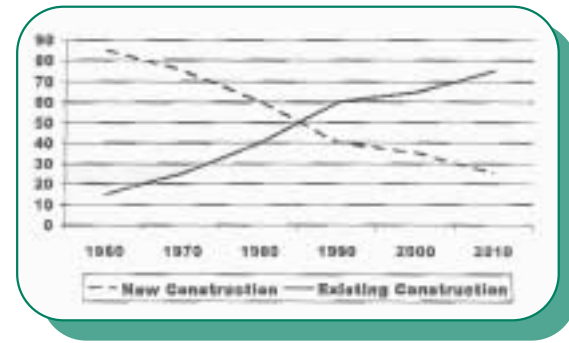
- Space flexibility will become a critical demand,
- High-tech buildings will become the norm,
- The impact of comfort on worker productivity and tenant occupancy will become greater recognized and valued.

Again, contractors need to recognize this shifting landscape and change their business practices and offerings to meet the evolving needs of customers.

Existing Buildings are a Growth Market: Over the decades, the extent of the built infrastructure in the U.S. has continued to expand and, obviously, age. As a result, the replacement market has dramatically grown. As seen in Figure 2, the replacement market has become the dominant sector within the U.S. HVAC industry, and continues to represent the area for future profits. The implications for contractors are:

- The replacement market is a series of one-on-one sales transactions. Each customer needs to be cultivated and sold on the value of a contractor's solution and equipment offering. This calls for personalized approaches for individual applications.
- Technician capabilities must include strong diagnostic abilities, not just equipment installation skills. Being able to correctly diagnose and repair aging equipment is a greater and more valued skill set than installation know-

Figure 2: Existing Buildings, A Growth Market
Percent HVAC Equipment Sales by Sector Type



wledge alone. Just as important, technicians need to develop strong interpersonal skills so that customer interactions go smoothly and consumer confidence is maintained.

In this new market, contractors need to move from selling "heating and cooling boxes" to providing ecosystem services that fully meet customer needs. This takes a different mind-set and requires the industry to broaden its approach in marketing HVAC equipment and services to residential and commercial customers.

DRIVER 2 - Societal Impacts. The adoption of comfort conditioning in the U.S. had a dramatic influence on the style in which structures were built (from tall office buildings with fixed windows to sprawling shopping centers that are conditioned year round). Even more dramatic was the opening of inhospitable areas (i.e. desert climates to high humidity areas) and the vast migration patterns it enabled. Comfort conditioning in the U.S. now has a 90%+ penetration in new construction, including temperate locations that otherwise did not have high levels of air conditioning usage. In the future, emphasis will be on resolving issues related to improving indoor environmental quality, sustainability, and the aging of the population.

Indoor Environmental Quality: To a great extent, thermal comfort is the single important indoor air quality (IAQ) attribute tracked by building operators. In the U.S., complaints of "too hot" and "too cold" are the most cited reasons for tenant dissatisfaction with leased facilities. However, humidity and mold concerns have recently taken the spotlight in the U.S. IAQ area.

Emphasis is slowly changing from indoor air quality to indoor *environmental* quality (IEQ). In addition to the IAQ fundamentals of controlling particulates and volatile organic compounds (VOC), IEQ includes other considerations that impact the perception of occupants to the conditioned space around them, and influences occupant performance. Just like temperature and particulate / gaseous control, other elements such as relative humidity levels, drafts, noise, vibration, and lighting greatly impact the comfort, satisfaction levels, and productivity of building occupants. To offer the IEQ solutions that customers will

require in the future, contractors will need to expand their skills, and partner with others, to provide new equipment options and support capabilities. In the next decade, indoor environmental control will become health- and productivity-based as opposed to only comfort-based. The metrics on how this will be accomplished are still to be developed. However, the challenge will be for the contracting community to increase their skill sets to support a higher level of indoor environmental monitoring.

Sustainability: There is a growing movement to assess the relative impacts that utilization of one component over another entails. This assessment is likely to address the environmental impact involved in the extraction, fabrication, shipment, usage, reuse, and ultimate disposal of building systems and subsystems.

End-life disposal will become more important in the upcoming years. How building systems and subsystems are decommissioned, the process followed, and the manner by which materials are recovered and recycled may be legislated in the future. HVAC equipment contains more than 90% recyclable content – steel, copper, aluminium, bronze etc. This aids the material recovery process as the existing U.S. recovery infrastructure is utilized. However, future HVAC equipment will be assembled with end-of-life disassembly and component recovery/reuse in mind. Hence, special requirements may be required from the U.S. contracting community at some point in the future.

It is also likely that energy consuming equipment may be ranked in terms of primary power. This could cause gas technologies to gain favor at the expense of electrically-driven equipment - especially valid if rankings include extraction and energy conversion losses. This would result in contractors specifying and installing an increased number of gas-fired equipment, absorption chillers, and give rise to the use of distributed, on-site power generation such as micro-turbines and fuel cells. Again, contractors need to develop new skill sets to remain competitive in the future U.S. marketplace.

Aging Population: In the U.S. and the rest of the industrialized world, the average age of the populace is increasing. As supported by a prosperous society, elderly people are more willing, and better able, to afford enhanced comfort and control of their individual environs. As such, this trend supports the sales of high-end equipment that provides for improved indoor environments. As noted earlier, these same folks are more discriminating than the generations before them. They are becoming more involved in the selection process, and are seeking knowledgeable contractors who offer innovative solutions and treat them as partners in the process.

DRIVER 3 - Changing Business Environment Obviously, all facets of the business environment are undergoing change. Several key issues are related to availability of skilled labor, utility competition, and the evolving business climate.

Technician Shortage: Like nearly every other service sector in the U.S., the HVAC industry is facing a severe technician shortage. Attracting and retaining technicians will become more difficult since there is intense competition for qualified labor from all industrial areas. Just to stay flat with today's need requires 20,000 new, entry-level technicians per year. Once on-board they need to be trained - both with the technical skills to do the job right, and the interpersonal skills that satisfy customers' needs.

It is very likely that in response to shortages of qualified technicians, computerized "expert systems" will be developed to allow lower-skilled service people to maintain complex systems at peak performance. This would entail that manufacturers produce equipment that incorporate sensors, built-in controls/diagnostics, and develop/embrace a common interface protocol so that technicians can use new servicing procedures to identify and correct deficiencies.

Utility Deregulation: It is clear that the continuing deregulation of the U.S. electric utility industry will produce significant changes in how power is produced, distributed, and marketed in the U.S. This bodes a host of implications within the HV AC sector:

- In the future, air conditioning may become a service rather than a product. A utility or energy service company (ESCO) becomes a supplier of conditioned air, and the customer does not own the equipment. If this occurs, equipment emphasis will go from the least first cost (as is prevalent in the U.S. today) to least life cycle cost. Service providers will seek the most energy efficient equipment that offers long-term reliability and longevity. This trend also has impact on contractors and equipment manufacturers as the ESCOs will be developing significant purchasing clout.
- With deregulation, it is likely that U.S. utilities will first partner, then ultimately buyout equipment manufacturers and mechanical contractors. Obviously, there will be a number of competitive issues for contractors to overcome as this new future comes about.
- Real time energy pricing exists in many markets for the commercial sector. Real time pricing is likely to extend its range into U.S. residential applications as well. This will be time-of-day pricing with variable costs from hour to hour. Rate charges may exceed \$1 kWh when demand exceeds available supply. Charges may approach zero during low-load, must run hours for the utility. Obviously, on-peak will cost more. Hence, consumers will look for alternative solutions to help them save energy dollars. Contractors learning more about thermal energy storage (TES) and other load shifting solutions will benefit from this trend.

Business Becoming More Complicated: It should be obvious by now that an already exceedingly complex business environment is becoming much more difficult. To the extent that contractors, distributors, and OEMs are unable to work together to meet customer

expectations, or there are gaps in the ability of an industry sector to meet customer requirements or building/jurisdictional codes, there will be the threat of dissatisfied constituents - in the U.S., this frequently leads to litigation. Unfortunately, even if a contractor does everything correctly, he is still subject to legal entanglement. In the future, it is likely that contractors will pause before blithely accepting new customers with buildings that have rampant mold or indoor air problems. This is just another facet of being in business, and is the reason why all prudent businessmen carry insurance. However, that insurance will become increasingly harder to secure and much more expensive, even as coverage levels are being decreased.

Increasingly, it will be evolving codes and standards to which industry participants will be held accountable against. To the extent that these prove to be inadequate, additional unwieldy laws and regulations are likely to follow. In the future, there will be a lesser number of contractors as the cost to do business will become too great for other than those who strive for excellence in their customer skills, problem solving, equipment selections, and knowledge base. Those businesses that strive to do *nearly* everything right, *almost* all of the time, will be at a disadvantage to the firms that are *always* right, all of the time.

DRIVER 4 -Technologies and New Practices. Twenty years ago it would have been exceedingly difficult for a clairvoyant to correctly predict what would transpire in the U.S. building sector. Likewise, it is just as difficult to fully ascertain the impact that new technologies, equipment, and building practices will have in the residential and commercial markets during the upcoming decade. However, three areas of interest are related to new communication avenues, better equipment control, and marketplace adoption of innovative HVAC technologies for varied applications.

Enhanced Communications: When it comes to advanced methods for improved communications - between field technicians, contractors, distributors, and manufacturers - the future is already here. The question is not IF contractors will embrace these new technologies ... but WHEN.

For the contracting community, being competitive means more than just having the lowest price and the right expertise. It means arriving at the job with the information, parts, and tools needed to complete the required steps in one service call. In the future, contractors will be autonomously notified by the building equipment that a malfunction *is developing* and a technician dispatched with the correct parts to fix the job. If the needed parts are not already on the truck, the dispatching computer will automatically place an order with the stocking distributor for pre-packing ... ready for pickup when the serviceman arrives or perhaps directly delivered to the jobsite. Once on the jobsite, technicians will routinely:

- Scan bar coded labels and secure the complete service history of a unit.
- Download schematics from an OEM's secure website onto a handheld PDA.
- Obtain operating performance information without gauge or hose hookups.
- Follow step-by-step instructions from on-board diagnostic equipment.

Enhanced Control: To meet energy and monitoring control factors, buildings of the future will use a wide array of smart products. These future buildings are likely to support:

- Voice activated products (air conditioning and heating equipment, lighting, window shades, computers, appliances, etc.).
- Widespread use of "health monitors" that track physical comfort and productivity factors (say, human physiological changes or activity levels) and adjust internal conditions appropriately.
- Wall sensors that ascertain optimum comfort levels for multiple individuals within a room.

Using the internet or radio signals, future buildings will sense an impending change condition. Perhaps a commercial building is "informed" that a new weather front is moving in, and the systems automatically adjust to ensure proper conditions are maintained during occupied hours. Perhaps the home is signaled when the occupants are heading home, and certain aspects of the home systems are activated.

As before, these new products and applications imply that HVAC contractors will need an enhanced understanding on how the comfort conditioning system fits in. Again, new skills, and collaborations with others, are needed so that contractors can continue to optimize their offerings in concert with the evolving expectations of the marketplace.

HVAC Equipment & Applications: Near-term, there will be relatively minor changes in today's currently-available HVAC equipment ... more of the same. Everything will continue to become smaller, lighter, more efficient, quieter, feature-laden, good-looking, easier to maintain - all elements of competition. Increasingly, multiple- and variable-speed operation will become the norm.

Longer-term, there will be many changes. HVAC systems will become integral to the form and function of the building itself. There will be an increased use of innovative materials in new applications. Additionally, there will be a greater focus on systems that combine a number of indoor functions. As an example, future commercial rooftop units are likely to offer energy recovery, on-board monitoring of occupancy demand, contaminant control, and water heating - not just space heating and cooling. These will be add-on modules that can be mixed and matched to meet consumer requirements. Recognizing that such systems are more complicated, the equipment offerings will need to be user-friendly to ensure that contractors embrace the new technologies. Likewise, contractors desiring to remain compe-

titive will need to evaluate these future technologies and identify appropriate applications for applying same.

Conclusion

There are numerous changes in store for the HVAC industry. Customer requirements are becoming more focused and very much different than they were just a decade ago. Pressures from many comers are demanding that contractors become even more responsive. Those contractors that are successful in adapting with changing needs of future customers will:

- Provide superior customer value ... not necessarily the lowest cost.
- Focus on their core competencies.
- Stay abreast of new technologies and product applications.
- Build relationships and partnerships to fill in "holes" or "gaps" in their capabilities or knowledge base.

Those contractors who can adapt to the new business climate will thrive. Those who cannot adapt will find it increasingly more difficult to successfully compete.

Biography

Glenn Houraban, as the Vice President of Research & Technology for the Air Conditioning Contractors of America (ACCA), directs ACCA's technical activities. His principle responsibility is to assist the contracting community in developing tools and capabilities for energy-efficient, high quality indoor environments (comfort, health, and productivity). Related duties are in program development, identification/ generation of new approaches, creation of manuals and technical bulletins, standards/code interactions, and technical representation of the contracting community.

Mr. Houraban has 21 years of experience in the AC&R industry and is a licensed professional engineer. He holds a Bachelor of Science in Mechanical Engineering from the University of Connecticut, a Master of Environmental Science from John Hopkins University, and an MBA from the Rensselaer Polytechnic Institute. He is actively involved with various technical committees of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and serves on the U.S. National Team of the International Energy Agency (IEA) Heat Pump Program.

Prior to joining ACCA, Mr. Houraban was the Vice President of the Air-Conditioning and Refrigeration Technology Institute (ARTI) and Director of Technology at the Air-Conditioning and Refrigeration Institute (ARI). In this dual role he was instrumental in the creation of the industry's Research for the 21st Century (21-CR) initiative. Previously, he worked for Automatic Equipment Sales (an independent HVAC&R equipment distributor) and Dunham-Bush Inc. (a manufacturer of screw compressors and chiller packages).

ACCA is a non-profit trade association representing U.S. contracting business that design, install, service and repair air conditioning, heating, refrigeration, humidification, dehumidification, air purification and ventilation systems for residential and commercial customers. ACCA members include nearly 5,000 small businesses, employing 85,000 technicians in 50 state and local chapters across the U.S.

ARTI, a not-for-profit organization for scientific research in the public interest, is an entity associated with ARI. ARI is the national trade association representing 90% of U.S.-produced air-conditioning and commercial refrigeration equipment.

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