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Energy Efficiency & Environmental News: Home Appliance Trends[1]

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HOME APPLIANCE TRENDS AND WHAT SHAPES THEM

What is happening in the appliance world? What is in store for the appliance consumer in the future? There are forces at work today that will shape this future. Consider the effects of new technologies, energy and environmental concerns, changes in the appliance market and the globalization of the world of consumers and producers.

Dream Appliances

The appliance industry has always been driven by what the consumer wants and will buy. What does the consumer want? Joy Schragge, Consumer Communications Services, a consultant in the appliance industry has described dream appliances at the 1993 International Appliance Technical Conference. Here is what she told the audience of appliance manufacturers, university engineers and educators at this conference:

> "The appliance industry will need to offer the same or better quality and price as appliances today. These appliances should be user-friendly and hopefully more flexible, but require simple - or no - instructions to operate.
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> "New appliance designs should offer safety and accessibility for a wider variety of users than we've ever experienced. These products must also be very forgiving of less-than perfect installations and user practices. Environmentally friendly appliances are a given. They must not damage the environment in production, use, servicing or disposal. The appliance must be operable by phone and work automatically to meet the user's schedule."

Some examples given were:

"After loading itself properly, a dishwasher or washer captures used water, recycles it, and stores it for re-use. At the end of a cycle, the dishwasher checks the clean load and puts dishes away, using its programmed memory to store them correctly. The washer transfers its load to the dryer, which dries fabrics to the correct moisture content, then removes load items and folds them or puts them on hangers.

"New CFC-free refrigerators and freezers use a bar-code system to inventory food items, note their useful shelf life or freshness date, and keeps storage records. Items removed

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and not returned are automatically deleted from inventory. Foods stored past their normal shelf life are highlighted in the inventory to alert the user. Waste heat from the refrigeration appliances is captured and diverted to specific uses in the home.

> "These dream appliances operate so quietly that they require displays or lights to indicate they are running. They have built-in diagnostics and make their own service calls, and they alert the consumer of impending demise. The appliance is then transported to a regional center for disassembly, materials separated and recycled."

These really are "dream machines" and won't be on the market soon, though manufacturers will continue to look for ways to provide innovations to please and entice the consumer and sell their appliances.

The Driving Forces

The appliance industry and the appliances produced are driven by an explosive technology, environmental and energy concerns, the evolving appliance market and industrial globalization.

Technology

The electronics proliferation will continue - likely reaching into the very most basic offerings. Sensor technology will comprise an important part of this. Appliance producers around the world will develop units with energy and water consumption levels a fraction of what they are today, and at the same time, the units will operate at noise levels greatly reduced from those with which consumers are currently familiar. Voice recognition will likely improve the unit-user interface.

The growth of the use of electronics and microelectronics in appliances will be slowed until the development of sensors has advanced. Sensor technology is coming down in price and there is an increasing variety of reliable, low-cost sensors available.

An intuitive approach to controlling appliance systems is what the appliance industry has needed, and the industry is showing signs it will definitely be taking advantage of this approach.

Example: Sensors to detect load size and measure the dirtiness of the water, intelligence to control variables such as wash time, wash speed, agitation degree, water usage, and so on, and with a control strategy like "fuzzy logic" capable of making sense of all this data, a much more efficient wash can be performed automatically.

Piezo film sensors which hold great potential for use in appliances consist of a thin film of polyvinylidene fluoride (PVDF). When the film is stretched and subjected to an intense electric field at elevated temperatures (polarization) it develops the characteristics of a transducer and can convert mechanical energy into electrical energy, infrared into electrical energy and electrical energy into mechanical energy. These properties can contribute to fuzzy logic control systems.

Built-in self-diagnostics may evolve beyond today's initial forays into HVAC equipment, business appliances and commercial appliances.

Tomorrow's appliances will probably be constructed of lighter metals and will be coated with the most wear-resistant finishes ever formulated.

Environmental and Energy Concerns

We are moving toward the establishment of a secure, stable and sustainable relationship between the built and natural environments. The reintegration of the natural and built environments is doing more with less. Utilities are beginning to realize that it is less costly to invest in efficient use and optimization than it is to invest in delivering more electricity. This is stimulating alternatives to the "lock-step, formulaic manner of relying on appliance standards and codes" and the failure to pursue optimization and basic, achievable efficiencies in designing buildings.

To reduce energy consumption drastically without skyrocketing costs, the Rocky Mountain Institute advocates integrated design. The use of a broad variety of energy conserving designs, materials and applications (chiefly in lighting, appliances and water heating) in new homes requires only about three-fifths of the energy now used in many homes.

Motors account for about 67 percent of total U.S. electric energy use. Consumption is heavily skewed: Only 2% of the one billion motors operating in this

country are larger than 5 horsepower, but the large motor fraction accounts for more than 70% of the electric energy use. This may account for why motors for domestic appliances (usually quite small) are not currently a target for better energy design. A new generation of innovative motor designs, which feature advanced power electronic converters, is on the threshold of commercial introduction for appliance applications from small hand tools to major home appliances. The new motors' capability for efficient variable-speed operation promises performance well beyond that of conventional AC units when optimized to the size and operational needs of the use.

Each year, over 8 million old or broken appliances are discarded in the U.S. These appliances make up 1 percent of the country's municipal solid waste stream. Because steel is driving the recycling of appliances, landfill bans are not having a major effect. The infrastructure to correct this situation is already in place. There are 1,600 ferrous scrap dealers through the U.S. that are interested in buying steel scrap. The main concern for the steel producers is the increasing appearance of fluff, the non-steel appliance parts, in refrigerators and freezers of the 1960s and 1970s. As steel becomes less and less a percent of the total appliance, the ferrous scrap industry is concerned whether they will be able to economically handle recycling efforts. Because of this problem manufacturers are beginning to look at the appliance as an object that would be designed to avoid a landfill. The design-for-recycling movement simply aims to make an appliance easier to recycle.

We can see that the ever-dwindling landfill space situation is indisputable. As a result, industry executives are convinced a manufacturer's responsibility for a product is going to become cradle-to grave. Design-for-recyclability means design-for-dissemble. This will take work by both design engineers and manufacturing engineers, or such programs won't work at all.

Another approach may be to design appliances to allow the replacement of high-wear components that will enable the product's re-use.

The Appliance Market

The appliance industry is well aware of changing family needs and wants, that families are time and energy starved, and they desire safety and comfort in their homes and with the appliances they choose to use.

"People today expect the tedious aspects of housework to be dealt with by appliances, but they also expect appliances to help with the more creative and interesting activities, such as preparation of food," says Mr. Hawley of Creda. This trend is likely to become more marked and will be noted increasingly in the at-present underdeveloped areas of the world affecting export markets.

Consumer trends indicate a multiplicity of needs, segmentation and individualizing of demand, greater emphasis on design, plurality of styles, greater environmental/energy consciousness and increased orientation towards leisure activities Replacement buyers will be especially demanding.

Consumers' broadening knowledge of technology has changed their views of what they want in their appliances. Control systems with more sophisticated use of neural networks and fuzzy logic and perhaps input from human speech are becoming more accepted and even expected by a growing number of consumers.

The National Academy of Sciences estimates that by the year 2010, 60% of the U.S. population will be hypersensitive to chemicals. How will the appliance industry deal with this? New air cleaning equipment?

Noise is a primary and growing concern among consumers. In the push to reduce energy and CFCs from refrigerating appliances, noisiness has become more of a problem.

Globalization

As globalization continues there will be an emergence of new and potentially massive markets for appliances. India and China alone have between them 2 billion people and both could develop middle class populations large enough to rival that of the U.S. or Europe in the foreseeable long-term future. Poland followed by the Czech Republic and Hungary represent the greatest short term market growth potential for appliance production and sales.

Globalization suggests two trends for appliance development and growth that are not in complete harmony. Mass-production or mass-consumption is only a starting point. However, the middle class inclination to demand identical products will fade, giving way to a desire for products better matched to specific individual tastes.

Some challenges for appliance companies as they move toward globalization will be:

Washers with a horizontal axis (front loading) are now used by most people in Europe. They save water and energy, but will consumers in the U.S. buy them?

In refrigeration, it is mainly different climates (high air humidity requiring higher energy no-frost appliances) that set limits to further globalization. We assume that the European solution for CFC-free appliances (Using pentane as insulating gas, R-134a and/or isobutane as a refrigerant) will become accepted worldwide.

In cooking appliances, the great differences in cooking habits and customs around the world will result in the continuance of a wide variety of cooking appliances.

What will the mix of forces produce and when? Dishwashers now have a heating and drying system which uses a flow-through heater and a heat exchanger to conserve energy.

Fall, 1996 - the first HDTV (high definition television) sets may appear on the market. Major vacuum manufacturers are toying with a robot vacuum cleaner for the home.

Zoned air-conditioning has become very popular, but the possibility of personal comfort conditioning would take that one step further. To be able to deliver the humidity and temperature level for a specific individual while someone sitting just a few feet away may prefer different levels is not too far down the road.

Technology for more energy efficient motors for residential appliance motors is advancing. Under research/development at present include:

- Converter-optimized five phase permanent magnet (PM) synchronous motors for HVAC, compressors, fans, washers and dryers.

- High-speed fractional horsepower PM motors for electric hand tools and lawn mowers.

Balance will probably be the dominant design concept for appliance manufacturers during the next few years: the world against family needs, technology against nature and the ideas of simplicity against the reality of life's complexity.

The appliance market is a mature market with slow change. This means new appliances cannot saturate the market very quickly.

Finally, consider what would happen if appliance manufacturers were to sell what their appliances provide instead of selling the products themselves?

"Isn't this what is already happening? People buy frozen meals instead of cooking from scratch. People eat out instead of cooking. People pay to have someone to clean instead of doing it themselves. People use paper plates instead of having to wash dishes?" (John Lord, president, Carrier Corporation)

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