

SEALING APPLIANCES TIGHT

By David Simpson, Contributing Editor
Reprinted from Appliance Magazine

Gaskets help keep appliances together and operating properly around liquids and gases, as well as playing a role in noise and EMI/RFI suppression.

Exotic they may not be, but gaskets and seals are important in appliance assembly. Without proper gaskets and seals, one could have liquid leaks—think washers and dishwashers—and gas leaks—think refrigerators and air-conditioners. Gaskets and seals help in the opposite direction as well—by keeping rain and snow from critical parts of outdoor appliances. They are also important in noise reduction and in shielding EMI/RFI emissions.

Among gaskets and seals applications mentioned by Joe J. Bruce, vice president and general manager at Automated Gasket Corporation (Kirkwood, MO, U.S.) are air-conditioning compressors and HVAC sealing, small engine sealing, and control valves and switch sealing. Other appliance applications include fiber-based materials for sealing of internal valves and mechanisms, plastic tape with die-cut holes for sealing around control knobs, and a large variety of die-cut washers for sealing of lids and spouts.

“An interesting application we completed recently involved the development of tooling and feed systems to cut-to-length and notch a half-circle into an extruded shape for application in a dollar bill changer for vending machines,” he says.” This is an example of one of the rare instances where we are not die-cutting a flat material.”

Gaska Tape Inc. (Elkhart, IN, U.S.), provides PVC (polyvinyl chloride) foam tapes and gaskets. “They are used in any application to seal out air, moisture, light, and dust,” points out Sales Manager Rica Holtzinger. “They also provide sound deadening and insulation. In HVAC applications, our products can be used around service/access doors for sound deadening and sealing. Under compressor mounts they can supply damping and cushioning, while behind a motor they supply vibration damping and sealing. Another HVAC use is between two sheets of metal for damping and heat resistance.”

HIGH HEAT EVOLUTION

Gaskets are a critical application for ovens and range doors. Many of these gaskets are silicone rubber. However, in self-cleaning ovens, which can get up to 900°F, a silicone gasket would be inadequate. “What is available today is a fiberglass and stainless knit 304 stainless steel bulb that is overbraided with fiberglass,” says Rick Schlee, director of Sales of Davlyn Manufacturing Co., Inc. (Spring City, PA, U.S.). “Earlier, door construction used two pieces of steel. The gasket was tadpole shaped, with the ‘tail’ captured between the steel pieces and affixed to the door. But in order to save money, most manufacturers have gone to one-piece doors. That asked us and other suppliers to develop an alternative gasket to affix to the single piece door.



Here, a high-temperature gasket is being installed in the corner of an oven door.
Photo courtesy of Davlyn Manufacturing Co.



We came up with wire-formed diamond shaped clips of 304 stainless that are braided into the structure of the gasket. The method is proprietary and patented. The clips are pushed into holes that are pre-drilled in the oven door. Assembly takes just 15 to 20 seconds.”

He adds that each gasket is custom made for the application. “The oven manufacturer relies on the gasket manufacturer to develop the proper design. We work with each new platform as it comes up, looking at such things as diameter, compressive strength, and layout. The gasket makes a difference in how much heat leaks out the door, and how hot the door gets.”

MATERIAL CHANGES

Heat is a broader consideration than just in oven doors. “Products today are getting smaller and hotter, so we have started to use more materials that can stand higher heat, are thinner and softer,” observes Rachel Magee, marketing coordinator at LGS Technologies (Dallas, TX, U.S.). “We’ve seen materials evolve into compression set resistant, and have higher flame ratings.”

Reed Rubber Co. and Reed Rubber Products (St. Louis, MO, U.S.) supply molded, die cut, and extruded parts to the appliance market. “For years, the market has been dominated by traditional thermoset rubbers,” observes Nelson Reed, co-president. “We view the appliance market as primed for a conversion to a co-processing of thermoplastics into composites for improved functionality at a lesser cost. The functional applications include improved tensile memory, sealing in fluid environments, compression set, and part weight reduction.

“New TPEs continue to come on the market and, combined with the use of high-speed automation, make high-volume rubber parts used in the appliance market an ideal conversion,” Mr. Reed adds. “The greatest opportunity as we see it is in redesigning multiple components into a single component using the broad range of TPE materials and available processes. This can be achieved through insert molding or two shot molding. However, due to mold cost, these methods are ideally suited for medium to high volume parts.”

“New materials become available from our suppliers on a regular basis,” observes Mr. Bruce of Automated Gasket. “In the area of fiber-based materials, new technology has led to the development of materials with superior sealing performance at lower flange pressures. These materials are available for a wide range of applications and temperature ranges. One supplier has developed a combination of fiber material with polymer edges applied to selective openings for improved sealing in unevenly loaded joints, with the ability to apply different polymers in the same gasket where multiple working fluids are used.”

FORMED IN PLACE

An alternative to a die-cut gasket is one that is formed-in place. “Our formed-in-place gaskets provide appliance producers the fastest and easiest way to automate and assemble gasketed parts,” asserts Clair Bachmann, vice president of Marketing for Dymax Corp. (Torrington, CT, U.S.). “Our UV-curable resins are unique products in that they can be applied and cured in seconds. Unlike other FIP products, these gaskets completely cure with UV light and require no additional heat or moisture to cure, so no delays nor special ovens nor humidity control are required.

“Automated equipment can dispense the gasket in any configuration in seconds,” she continues “This process eliminates quality problems, labor, and inventory costs associated with precuts. In addition, form-in-place gaskets allow the engineer to quickly change the design of the gasket or opening without waiting for months for a prototype precut.”



Ms. Bachmann notes that the gaskets are particularly useful for applications requiring sound dampening as well as closure. For example, their use in speaker design resulted in higher tonal quality due to their reduction of sound diffusion from the speaker cones into the surrounding materials of construction.

Master Bond Inc. (Hackensack, NJ, U.S.) has developed two liquid one-component, 100-percent reactive elastomer compounds with properties especially for form-in place sealing and gasketing applications. The company's Polymer System UV21 is a liquid one-component UV curable urethane elastomer compound. It cures essentially upon demand when exposed to a source of UV light emitted at 320-365 nanometers. The Sil 711 compound is a one component, non-corrosive type, flowable silicone elastomer compound that solidifies within as little as 2-3 min at ambient temperatures and then achieves full cure quickly.

They do not contain any solvents or other volatiles. The cured elastomer compositions exhibit flexibility, physical strength properties, electrical insulation properties along with long-term resistance to water and other hostile environments. Additionally, these products can be stored at ambient temperatures for as much as 6 months and reportedly show very low shrinkage upon cure.

Liquid Control Corporation in North Canton, OH, U.S., reports its gasket and seals are used in glass ceramic cooktops, refrigeration systems, seals for air filtration, washer transmissions, and furnaces, among other applications. It is now working with UV material gaskets. Brad Smith, business manager for Composites/General Assembly, says "They are easy to process, and UV materials are more economical to use for gaskets and seals." Among the applications for its Posimeter FR meter, mix, and dispense machine is a wine storage unit from Sub-Zero Freezer Company, Inc. (Madison, WI, U.S.). The machine dispenses seals for the doors, which have UV-resistant glass.