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REPORT

Reaching Design Engineers at the OEM Level

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Converted Material Solutions for Noise, Vibration, and Harshness

BY JOE BLISS

It's no secret that when it comes to appliances, consumers equate quiet to quality. No one wants to talk over the noise of a dishwasher, subject themselves to the constant drone of a furnace or air conditioner, or deal with the constant hum of a refrigerator. And yet by their very nature, the motors and fans that power these appliances create noise, vibration and harshness. Fortunately, there are a myriad of performance materials that design engineers can use to absorb, damp, or even eliminate the source of the excess sound in new products they are bringing to market.

This article touches on the science of sound, provides high level insight into performance material options, and hits on five ways the right converter can positively impact your outcomes.

5 Factors to Consider When Designing Noise Reduction Die Cut Components

When addressing the problem of unwanted sound, the first step is to identify the source and then the method by which the sound transfers. Airborne noise transfer is direct radiation by pump or motor. Structural transfer is different in that it passes through the

structure and radiation of panels.

While the ideal solution is to eliminate it at its mechanical source, that is not always practical. After all, how do you eliminate the water rushing through a dishwasher? And, even if the sound is purely motor driven and the airborne sound omitted from the source is minimal, the structure-borne sound may still exist.

When approaching a noise solution, there are multiple factors to consider -- from the job to be done to the way the die cut gasket or seal that achieves that objective is presented for deployment on your line.

1 - Job to Be Done

Do you need to absorb the sound, block the sound, reflect the sound or keep the sound from occurring altogether? Do you have a lot of room to work with, or do you need to minimize the footprint of the insulation in order to maximize the space in the appliance cavity? Narrowing the material selection and part design down starts with identifying how you want to eliminate the sound: damp it, absorb it, or block it.

Damping - If you cannot stop the sound at the source, you can often isolate it by damping the vibrations so they don't propagate into the rest of the structure. Damping can be achieved by changing the resonant frequency through either the addition of a heavy elastomeric material to the surface, or by applying a thin visco-elastic polymer protected with a dead soft aluminum foil facer called a Constrained Layer Damper (CLD). Either method must be securely coupled to the vibrating surface.

Absorbing - If space allows, another way of attacking the problem is to put material within the structure that absorbs sound waves through energy transfer. When properly sized fibers are exposed to certain sound frequencies the interlocked fibers

microscopically vibrate and create heat. This motion converts acoustical energy into thermal energy causing a reduction in sound. Although almost any fibrous material will reduce sound, better results are achieved when using a sound absorbing insulation that is specifically engineered to mitigate sound at the offensive frequencies. Synthetic blankets such as 3M Thinsulate® and Aim Fiber Autozorb® are extremely effective in reducing noise, vibration, and harshness, are hydrophobic, and resist moisture and bacterial growth. Depending on your application, PVC also provides ideal sound and vibration absorption as well as strong UV resistance.

Block or Isolate - Another way to inhibit sound transfer is to block or isolate it. This can be done using dense, closed cell and high density microcellular foam materials which create and maintain a mechanical separation when applied between two surfaces. Examples include Rogers Poron®, and many K Flex® materials. Fiberglass and foil-faced composites can also absorb and block unwanted noise and are ideal for both acoustic and thermal control.

2 - Environment

Where and how the gasket and the appliance itself will be used also plays an important part in material selection. What is the operating temperature range the gasket must withstand? Is UV resistance important? Do you need a material that has hydrophobic properties? Is outgassing a concern? All of this must be considered. Not only do you want to make sure the material you choose meets the required properties, you also want to make sure that you don't over-engineer the gasket. This is where our deep relationships with material manufacturers comes into play. Quite often, we find that engineers design in materials that come with a high

price tag, when there are other less expensive options that are more than adequate for their application.

3 - Material Availability

In converting, yield matters. A lot. Every bit of material that goes into the scrap bin adds cost to the piece price of the part that goes out the door. For this reason, it is important to start working with your converter as early in the design stage as possible. Any material choice has a limitation on its manufactured production width. The larger the die cut part, the more important consideration should be given to the raw material width in order for the engineer to make an informed choice on how that material is used for their part. By doing so, we can help you design for optimal yield and work with our supply chain partners to provide master rolls sized to enable the best possible efficiency.

4 - Manufacturability

Some materials are easier to work with than others. There is quite a bit of engineering acumen that goes into turning roll goods into finished parts. With over 30 years of process engineering and design for manufacturability under our belt, our team can help you specify solutions that are not only effective at solving your noise challenge, but can be made efficiently.

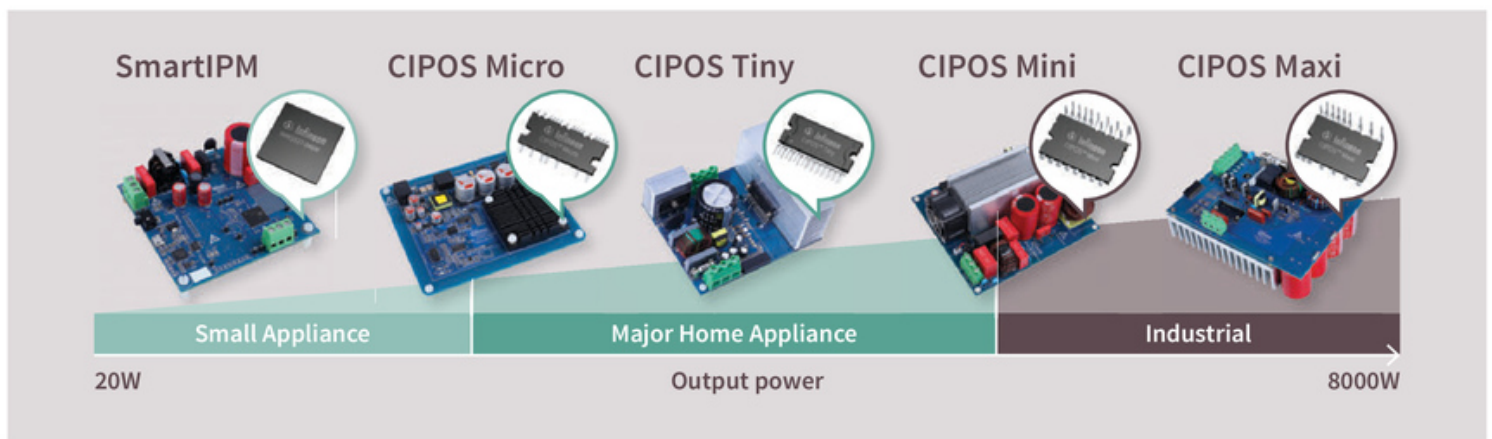
5 - Part Presentation/ Deployment

There are quite a few ways in which a die cut gasket, seal, or insulation panel can be presented for deployment on your line. They can be kiss cut to a liner, butt-cut, gapped, or individually through cut. They can be on large rolls or small rolls with varying core sizes. They can be adhered to plastic clips using automated assembly. They can be

boxed, bagged, or supplied in totes. The point is that there is a nuance to every requirement and it is important to look at the entire process -- from the way the part will function, to the way it will be applied in the next stage of the manufacturing process. By doing so, JBC can offer a solution that is easier, better, faster and lower cost. Sometimes it is as simple as adding pressure sensitive adhesive to aid with assembly or adding a pull tab for easier liner removal, other times it can be as complex as an automated assembly solution. ●



Joe Bliss Chief Executive Officer at JBC Technologies, Inc. JBC Technologies is a full-service manufacturing partner that converts flexible materials into custom die cut parts for leading manufacturers around the globe. To learn more, go to www.jbc-tech.com.



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