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Overmolding design guide

Pick-n-place molding This method uses two molds and works in batches. 1. 6. Spiral flow testing results for GLS products are presented below using injection speeds of 3 in/sec and 5 in/sec. The most popular example of products that combine both scenarios is the rubber grips on bicycle handles. Provide a 0.003" to 0.005" (0.076 mm to 0.127 mm) interference when using plastic inserts or substrates, to take into account shrinkage, sinks and tolerances. The over-molding process allows for a soft, rubber-like material to be molded over a hard plastic or metal substrate. Low Costs Overmolding can minimize production costs. To achieve this, you can choose to handle the design yourself. An advancing core should be used when the mold opens and the elastomer should be allowed to deflect as it is ejected. Over mold mechanism This step-by-step guide outlines the critical phases in designing an overmolding project, ensuring clarity and success from concept to completion. Ideal for Low-Volume Production Pick-n-place overmolding is a perfect choice for low to mid-volume production. The coefficient of friction of a resin is directly proportional to its tactility (the degree of grip it possesses). This step requires precise engineering to ensure the mold accurately reflects the product design and allows for efficient material flow and solidification. Production and Quality Control With the mold designed and the process parameters optimized, production can begin. Answering this question satisfactorily will help choose the right material and map out your overmolding design guide properly. Meanwhile, adjusting the injection speed may also help eliminate air traps. Even though it is stronger compared to the mechanical method, it is relatively harder to achieve. There are two primary ways in which this bonding occurs: 1. One method is to make holes, grooves, or cuts in the substrate which the resin can flow into. In that case, it is advisable to contact material suppliers and molders to know the most compatible materials that can provide maximum adhesion. A: Insert molding follows just the same process as overmolding. A drill with an overmolded grip 2. If you would like to improve safety when using the product (or absorb shock and vibrations). MATERIAL RECOMMENDED WALL THICKNESS ABS 1.143mm - 3.556mm Acetal 0.762mm - 3.048mm Acrylic 0.635mm - 12.7mm Liquid Crystal Polymer 0.762mm - 3.048mm Long-Fiber Reinforced Plastics 1.905mm - 25.4mm Nylon 0.762mm - 2.921mm Polycarbonate 1.1016mm - 3.81mm Polyester 0.635mm - 3.175mm Polyethylene 0.0762mm - 5.08mm Polyphenylene Sulfide 0.508mm - 4.572mm Polypropylene 0.635mm - 3.81mm Polystynene 0.89mm - 3.81mm Polyurethane 2.032mm - 19.05mm * The table is adapted from manufacturingcenter.com. Overmolding is an injection molding process where you cast a layer of resin (usually a rubber-like plastic known as TPE) over an already molded or machined material to give it properties it doesn't singlehandedly possess. This is especially true for long, thin parts or parts where the substrate is thinner than the overmold or if a low modulus substrate material is used. The mold design must also incorporate features for easy part ejection and minimal defects. There are two primary overmolding methods: 1. When starting your overmolding design guide, you must consider a few factors that will help make the design turn out successfully. This is one of the reasons why the machinist has to plan the overmolding design guide properly. Flash Formation Excess material that escapes from the mold cavity forms a flash. If your product's goal is any of the reasons below, you should choose overmolding as your manufacturing process. This technique strengthens the chemical bond. This scenario also requires minimal materials and only requires low-scale production in most cases. A clear definition of requirements is crucial for guiding the subsequent design and material selection processes. This is because the TPE part to be produced has to be thick enough to absorb the substrate's vibrations you want to cast it on. Examples of factors that affect chemical bonding include the degree to which the resin can wet the substrate. For example, when making a TPE overmolding design guide for a TPE (rubber-like) to be cast on a handle, the intended use of such contraption is either for vibration absorption, ergonomics, grip, or comfort. What is the intended goal for the part? Prototype Development Developing prototypes is essential for testing the design's feasibility and the selected materials' performance. Due to the wide application of overmolding, knowing your product's goal is essential in knowing the process to use. Ergonomic Grips for Tools One of the most common applications of overmolding is the addition of ergonomic grips to tools such as power drills, screwdrivers, and garden shears. If the two materials are compatible, they form a strong chemical bond that will serve its purpose excellently. 3. While there are many combinations of substrate and resin materials that are compatible, other factors affect resin choice apart from compatibility and adhesion. Sealing Making an overmolding product for this scenario will require a longer cycle time and more material. However, it uses a metal substrate, unlike the plastic used in overmolding. This is because it can use multiple parts to make a single product using assembly, unlike standard injection molding. 4. In either case, after the molds' production, the production process is sped up quickly compared to standard injection molding processes. Overmolding plastic and other materials improves the user's comfort during extended use and enhances grip strength and control, reducing fatigue and the risk of accidents. Next, the adaptability of silicone to intricate designs further solidifies its standing as a preferred material for overmolding, meeting both functional and aesthetic product requirements. This technique involves molding silicone over another material, offering improved grip, aesthetics, and durability. It's a critical step for validating the functionality and aesthetics of the product. Special TPEs can achieve up to 40 inches at an injection speed of 5 in/sec. Wall thickness in the range from 0.060" to 0.120" will ensure good bonding in most overmolding applications. The four common scenarios in which we use overmolding products include: 1. Suppose you want to use chemical bonding as the preferred choice of bonding for your overmolding process. Due to the complexity of the design, you need to be careful when making the overmold design. So, this scenario is similar to the former in most cases. To be able to do this, you should ask yourself some questions about the part such as: 1. The use of radii (0.020" minimum) in sharp corners helps reduce localized stress. We offer you cost-effective service with premium client satisfaction. Transitions between wall thickness should be gradual to reduce flow problems such as back fills and gas traps. Q1: What is plastic overmolding? Due to the tolerance on metal and other non-compressible inserts, it is necessary to include Belleville disc springs (or high tension springs) in the design to prevent flashing of minimal thickness inserts or crushing of oversized inserts. It is often due to excessive injection pressure or poor mold fit. Do you plan to make the part on a large scale? Why are you overmolding the part? Poor Adhesion One of the most frequent issues in overmolding is inadequate bonding between the substrate and the overmold material. What type of exposure will the part face? An accent groove of 0.015" to 0.030" (0.381 mm to 0.762 mm) depth and 0.030" to 0.040" (0.762 mm to 1.02 mm) width helps to develop a good shut-off. Pick-n-place molding is more cost-effective as it is a manual process and doesn't involve robotic machines like the former. Examples of Overmolding Part Designs Here are three practical examples of how overmolding can be applied to part designs to add value and functionality. Long draws should have a 3° - 5° draft to help ejection. At RapidDirect, we know that an excellent communication system between our clients and us is the secret to getting the parts just right. Getting it right is vital to the success of the whole production process. Prototyping allows for the identification and correction of potential issues in the design or material choice before moving into mass production. Examples of such factors include: Designing an overmolding part starts with fully comprehending the function of the part. Our sheet metal engineering team has been in the industry for decades, with over 20 years of experience. Prevent the TPE from flashing over areas on the substrate. Chemical method The chemical method occurs at the molecular level and involves quite a lot of factors. The type of overmolding method used for the manufacturing process is also an important factor to consider when mapping out the overmolding design guide. After ensuring your part's function fits in with your design, the next step is to examine the stance in which you will use it and how that will affect its physical features. 2. Therefore, you'll get all the technical support needed from us during protection. This phase involves brainstorming sessions, market research, and consultations with stakeholders to align the project's objectives with end-user needs. Additionally, optimizing processing parameters such as temperature and injection pressure can improve adhesion. Adding Grip to a Substrate Products such as drills, garden hoses, or kitchen utensils need an amount of grip to help the user control the product even in wet conditions. After going through the pre-design considerations for overmolding, there are also some other factors that you should consider while making the design. At RapidDirect, we fit that description perfectly. The whole process uses only a single mold and is an automated process. However, this will take a long time and increase the duration of production. Clients apply this scenario to high-energy machines like pumps and drills. Quality control is integral throughout the production phase, with continuous monitoring and testing to ensure the final products meet the predefined standards and requirements. If you need prototypes of the product before full-scale production begins, pick-n-place overmolding is a better choice. 7. If you submit your design to our website, you can get a quote within 12 hours. If you need to add a type of design to a ready-made product. While the two-shot molds can take months to complete parts' production, the pick-n-place overmolding only requires a few weeks for production. Deep unventable blind pockets or ribs should be avoided. With the multiple varieties of materials available for overmolding, you can always find the cost-efficient pair for your production process 2. However, it might not attain maximum adhesion and can only handle low production volumes of up to 10,000 parts. Also, if you need to redesign the part, pick-n-place productions allow you to redesign the molds at lower costs than two-shot molds. For example, if the part will face harsh radiation like UV light, you can use specific plastics for this type of product. Making such a product could be very expensive, but it might be worth the price if you only want a few pieces. A few examples of mechanical interlock designs are shown below: Even though the mold design is expensive, it eliminates having to assemble the same part over a thousand times. Design Preliminary Concepts With the project scope and materials in mind, the next step is to develop preliminary design concepts. Recognizing and addressing these issues promptly ensures high-quality outcomes and efficient production. While you can find various overmolded materials suitable for overmolding applications, some resins like Versaflex are specifically suited for overmolding processes. 1. Vibration Dampening This type of use requires the most material and has the longest cycle time. You should also consider the type of exposure your product will face in the 'line of duty before making the design. If you plan to take production on a large-scale basis, you also have to consider this when making your overmolding design guide. Two-shot molding This method involves molding the substrate using a material and rapidly overmolding it with another material. Understanding why you want to design the part is very vital to the design part. A: Plastic Overmolding is a type of injection molding where a resin (usually a rubber-like plastic) is molded onto another material (mostly a rigid plastic/thermoset). Therefore, optimize the mold design with proper venting and gate placement. Regular maintenance to ensure mold parts align correctly can also prevent flash. For example, if you plan to mold a seal on a water-resistant case, a water-proof seal is the product's goal. However, the latter can handle larger volumes of production. Although this process is cost-effective and helps to provide excellent adhesion between materials, it requires proper planning. Mechanical Interlock Designs Mechanical interlocks are used in overmolding to improve attachment to the substrate in areas subject to high stress or abrasion. Another factor that affects chemical bonding is the presence of additives, fillers, or certain surface treatments that could interfere with the chemical bond's strength. The wall thickness of the substrate and overmold should be as uniform as possible to obtain the best cycle time. For example, the machinist has to pick the right materials to carry out the part's function and attain maximum adhesion. Conceptualization and Requirements Definition The first step is to define the project's scope, including the functional requirements and aesthetic goals. This phase ensures the highest quality of the final product by minimizing defects and ensuring strong bonding between the substrate and the overmold. Waterproof seals for outdoor Common Overmolding Issues and Troubleshooting Overmolding, while advantageous for creating multifunctional and aesthetically pleasing products, can present several challenges throughout the manufacturing process. This decision is based on the project requirements, including mechanical properties, environmental resistance, and aesthetic considerations. If your goal is to enhance a substrate's grip, the best way to choose a resin is by determining its coefficient of friction. Hence, besides offering the quality service you desire, we'll also provide you with technical suggestions for your projects. Overmolding offers an effective way to achieve this. Do you have an overmolding or injection molding project at hand and need a company with excellent machines and a workforce to perfectly execute this job? Although it is a more labor-intensive choice because of the manual labor involved, it doesn't have high operating costs associated with two-shot overmolding. Waterproof rubber seals 4. However, machinists use it only for large-scale productions above 10,000 parts due to its high operating costs. Rapid Cycle Times Once you create the molds for overmolding, the remaining parts of the process are faster than those that need assembly. If you need a cost-effective manufacturing process. Mechanical method Mechanical bonding occurs at the physical interface of both materials. The first batch involves molding the substrate parts and manually placing them in the second mold. * The table is adapted from manufacturingcenter.com. Examples include: Bonding between the resin and the already molded/machined material (substrate) makes the bulk of the overmolding process. Vibration Dampers for Electronic Devices Overmolding is also employed in the design of vibration dampers for electronic devices, including smartphones, tablets, and industrial equipment. Silicone overmold design has gained popularity due to its remarkable versatility and performance in enhancing product features. The reason you're using overmolding for the part will also help determine how complex the design should be. Process Optimization Before starting full-scale production, the over-molding process parameters, including injection pressure, temperature, and cycle time, need to be optimized. For example, an overmolding part meant for vibration dampening will have a thick wall, which will require more material and take a longer cycle time to produce each part. Mold Design and Fabrication After finalizing the design and successfully testing the prototype, the next phase is designing and fabricating the mold. Air Traps and Voids: These defects occur when air is trapped in the mold cavity, resulting in incomplete filling. A flexible, waterproof material is over-molded onto the equipment's outer shell, filling gaps and encasing joints to prevent water ingress. Overmold design is one of the most important parts of an overmolding project. Series Flow Length at 3 in/s Flow Length at 5 in/s Dynaflex D 13-15 18-20 Dynaflex G 12-22 18-30 Versaflex 9-16 13-26 Versalloy 18-20 30-32 Versollan 9-16 13-26 Spiral flow test performed using 0.0625" x 0.375" channel at 400°F Shrinkage and Warpage Most GLS styrenic TPEs (Dynaflex and some Versaflex) have fairly high mold shrinkage and cause the overmolding TPE to contract more than the substrate, which can result in warpage or cupping of the substrate part. The second batch then involves injecting the resin on the molded substrate to produce the finished parts. If you want to create a single part from multiple materials. A better choice is to outsource to a well-experienced company like RapidDirect, which will help you make an excellent design and deliver an outstanding report within weeks. Provide a spring-loaded area if the inserted substrate is a metal or other non-compressible material. Manufacturers can significantly reduce the transmission of vibrations by over-molding a vibration-damping material around internal components. Silicone overmolding example Silicone's unique properties, such as its flexibility, temperature resistance, and hypoallergenic nature, make it an ideal choice for many applications, from medical devices to consumer electronics. The degree of wetting increases the level of contact and allows stronger bonding. Pick-n-place Overmolding Although it requires meticulous planning and complex plastic overmolding design guidelines, it is one of the best injection molding processes. After the resin cools in these holes, it locks into these holes. Here are a few reasons why: 1. These seals usually have water-resistant properties and need to achieve maximum adhesion with the substrate. To prevent this, ensure material compatibility with a thorough review of the over-mold material compatibility chart and enhance surface preparation techniques. If you still need some help knowing more about overmolding design guides, you can reach out to us. Step-by-Step Process to Design an Overmolding Project Designing an overmolding project requires a thorough understanding of the materials and the functional requirements of the final product. Comfort When adding grip to a substrate, it also serves as a source of comfort when using the product. Q2: What is the difference between insert molding and overmolding? Also, try to ensure the overmolded material surfaces aren't exposed, as this could lead to peeling. Before designing this type of part, you have to find the material that would give the best adhesion with the substrate and provide the best water-proof capabilities. If the part requires the use of thick sections, they should be cored out to minimize shrinkage problems and to reduce the part weight. So, calibrate injection pressure and clamp force accurately. The best way to measure a material's softness is the flexural modulus, which is the measure of a material's resistance to bending. Provide a distinct cavity for the TPE that is capable of being vented. In these scenarios, the best way to add grip to these products is by casting a rubber-like plastic over their handles. This can result from incompatible materials, improper surface preparation, or incorrect processing parameters. Subsequently, consider the thermal properties of both materials during the design phase to minimize stress. If you want to improve the ergonomics and feel of an already-made product. The solution is to adjust the cooling system design to ensure uniform cooling. 3. We provide you with overmolding services for different materials and can produce both low-volume prototypes and high-volume parts. By following a structured approach, you can navigate the intricacies of overmolding to create aesthetically pleasing and highly functional components. This article will help give useful tips on the principles you should consider when making your overmolding design guide. If you only want to cushion the substrate, the resin's thickness is just as essential as its softness. There are three types of two-shot molding: transfer overmolding, rotational overmolding, and core-back overmolding. The softness of the material is inversely proportional to the flexural modulus of the material. This can be managed in several ways: Use a higher modulus substrate material Add stiffening ribs to the substrate part Minimize the thickness of the soft TPE Use a lower hardness for the TPE Relocate the gate to minimize the flow length to thickness ratio Shut-Off Design Shut-offs should be designed to: Reduce the potential of peeling and provide a sharp transition between the TPE and the substrate. The tactile, non-slip surface ensures the tool stays securely in hand, even in wet or oily conditions. Bicycle handle grips 3. It creates a seamless, watertight seal around casings and entry points. The three methods utilize chemical bonding by casting the resin on a warm substrate. These initial sketches or CAD models should consider the over-molding process's constraints, focusing on areas like parting lines, gate locations, and the integration of mechanical interlocks for enhanced bonding. Material Selection Selecting the appropriate materials for both the substrate and the overmold is pivotal. 5. This type of process might not require much material and only requires low-quantity production most time. Properly designed deep undercuts are possible with GLS overmold TPEs. Care should be taken to minimize sharp corners. Before even starting the overmold design, you should determine if overmolding is the best manufacturing process that fits your product's manufacture the most. To further strengthen the mechanical bond, you can wrap the overmolded material around the substrate. Its ability to create watertight seals also makes silicone over molds indispensable in waterproofing products. Waterproof Seals for Outdoor Equipment Outdoor equipment, such as waterproof cameras, outdoor lighting fixtures, and marine devices, often requires robust waterproofing solutions to protect sensitive electronics from water damage. Warping or Distortion Differential cooling rates between the substrate and the overmold can lead to warping.

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