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Cycletime Tips - Automotive

Volume 26: Screw Boss Design

Many of the parts that we produce have stringent surface sink mark requirements. When incorporating a screw-receiving device for assembly purposes, the task of designing it to obtain a part to your customer's expectations can be critical. This brief tip is devoted to the topic of aesthetic screw boss design.

Wall thickness at the boss/wall interface is key to obtaining sink-free surfaces. As a starting point, we would like to target a boss inside diameter of 75 to 80 percent of the diameter of the screw. Depending on the material and the pullout requirements (dictated by your customer), we may need to vary this dimension in the final part. If using a prototype mold, it's a good idea to experiment with different i.d. scenarios (via drill bits) in an attempt to minimize the wall thickness for that material. Often times, prototype tool building materials have a higher thermal conductivity vs. steel and this provides a sink mark reduction ability. Reducing to the minimum will avoid a letdown when we go to steel.

Ideally, the boss should separate from the adjoining wall before the screw strips out. This part design feature will often drive which material is selected for the part.

Generally speaking with boss wall thickness, we want to have designed an o.d. so the result is a dimension of 60 to 70 percent of the connecting wall. This number will depend on the distance that the boss is placed from the gate.

Boss height is probably the most often violated design principal. The concept of demanding a boss no taller than three to four times the wall thickness is intended to alleviate the mass at the base and prevent flow hesitation or air entrapment issues at the boss ends. Gussets are also a helpful feature for boss stability and filling. Ribs are also used to connect the boss to a wall or another rib. The same thickness rules apply.

We've all seen the many "fixes" implemented in an attempt to deny the inevitable, but the end result is always a highly stressed part and extended development times. Alternatives to unrealistic pullout specs would be to utilize a stronger material or utilize molded-in brass inserts.

Please let me know if we can provide more assistance with this and other design parameters.

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