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PLASTIC INJECTION MOLDING

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DESIGN FOR SNAPS

TECHNICAL ARTICLES | PROPERTIES OF PLASTICS

Snap Design

Incorporation of snap features into injection molded parts is a great way for companies to reduce their part assembly costs. Using snaps in place of mechanical fasteners can save costs in material and labor as well as warehousing space and administrative costs by reducing the number of components in an assembly to be managed.

Although incorporating snaps into part designs can be beneficial in many circumstances this approach may not be the most logical in all situations. The addition of snaps to an injection molded part will likely increase the tooling cost and lead time due to increased complexities to the mold. Also a snap feature may not provide as strong of a retention force between two components as mechanical fastener would provide. If your annual part volume is low, your timing is critical, or there are safety concerns regarding the strength of the retention force between the two parts it may make more sense to use mechanical fasteners. If the part you are designing is a good candidate for snap features there are a many things you should consider.

1. The general rule of thumb that should be used when determining your snap stiffness is the ratio of the length of your snap (Lb) (distance from base to retention) to the snap thickness (Tb). This ratio should be in the range of 5:1 all the way up to 10:1. A 5:1 ratio would be most appropriate for parts that are not intended be taken apart. A 10:1 ratio is more appropriate for parts that will be snapped and unsnapped several times. If you choose to go with a ratio below 5:1 there will be a significant sheer force at the base which could result in the snap breaking. A ratio greater than 10:1 will reduce retention force and may take an undesired permanent set after retaining residual deflection as well as may be difficult to fill in the mold. (See image 1)

Image 1

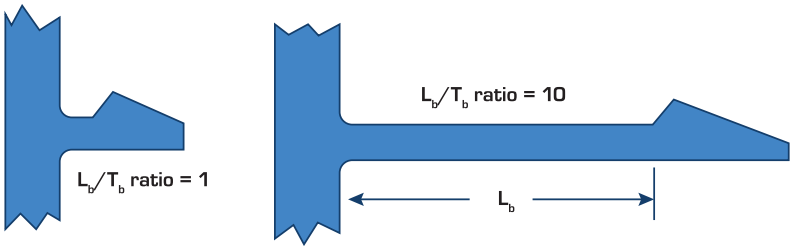
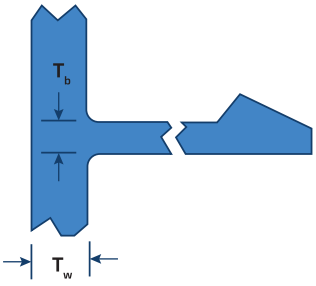


Image 2

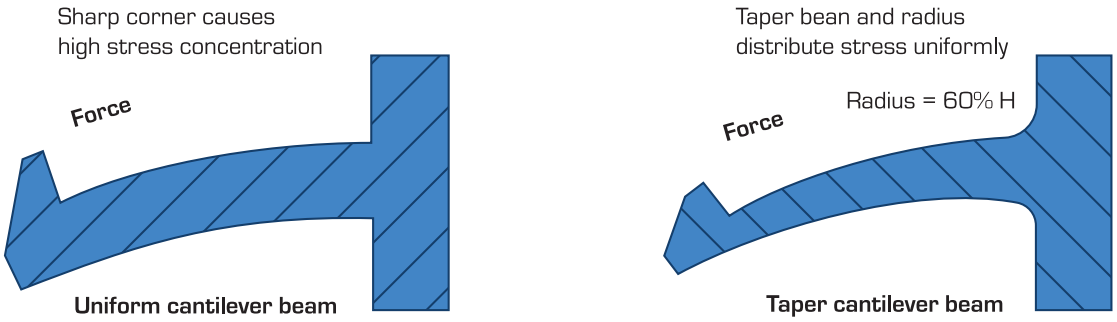


2. You should also consider the wall supporting the snap beam in relation to the snap thickness (Tb). The snap thickness should be 50 to 60% of the wall thickness (Tw) in order to avoid mold fill issues and also to reduce the chances of sink marks on the opposite side of the wall from the snap beam. (Image 2)

3. A robust snap design should always include a generous fillet at the base of the beam. The deflection of the beam will cause a large amount of stress at the base which could result in cracking or breaking. Adding a generous fillet can reduce the stress concentration by 25% or more. (Image 3)

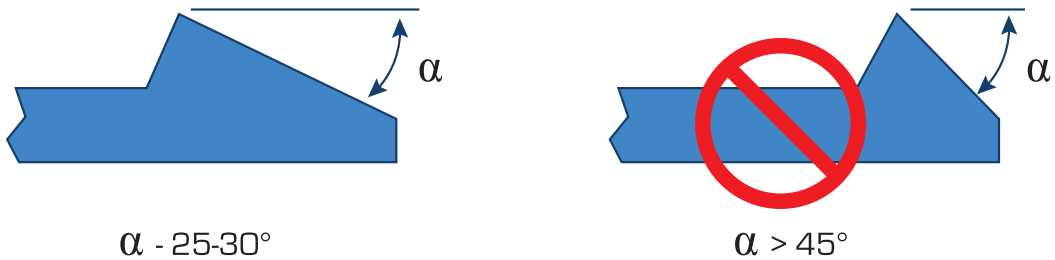
4. Adding a taper to your beam can also reduce residual stresses at the base. The taper will help to distribute the strain more evenly throughout the snap reducing your potential for the snap to crack or break. Adding a taper to a beam will prove to be most effective in shorter beams. (Image 3)

Image 3



5. The insertion face angle of your beam should be as low as possible in order to reduce the force required to engage the hook. An angle of 25o -35o is common. If you exceed 45o the snap will likely be difficult to engage. (Image 4)

Image 4



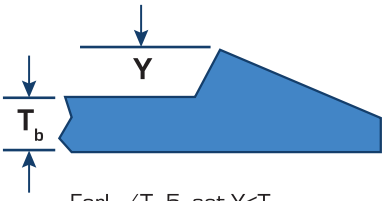
6. The retention force of your snap can be increased or decreased by adjusting the retention face depth (Y). This depth will determine how much the beam will need to deflect in order to engage. In general if your Lb/Tb ratio is approximately 5:1 your retention depth (Y) should be less than your snap thickness (Lb).

However if your Lb/Tb ratio is closer to a 10:1 ratio your retention depth (Y) should be equal to your snap thickness (Lb). (Image 5)

7. You can also increase or decrease your snap retention force by increase or decreasing the retention face angle. The steeper the angle the higher the retention force. (Image 5)

Image 5

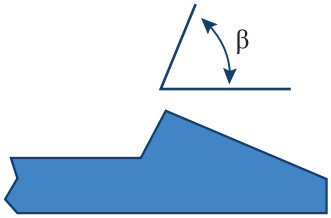
(a) Retention face depth



For L_b/T_b-5, set $Y<T_b$

For L_b/T_b-10, set $Y=T_b$

(b) Retention face angle



β -45 for a releasing lock with no external separation loads

β > 55 for a releasing lock with low external separation loads

β -80 -90 for a non-releasing lock with higher separation loads

8. A well designed snap should provide the assembler with a noticeable sound or vibration that would indicated a proper engagement of the snap

These guidelines will be a good start to your snap design however there are many more ways of designing a snap apart from the standard cantilever snap design described above. Be creative and don't be afraid to think outside the box.

Compo, E. Alfredo. *The Complete Part Design Handbook for Injection Molding of Thermoplastics*. Ohio: Hanser Gardner Publications, Inc. 2006
Bonenberger, Paul. *The First Snap-Fit Handbook*. Hanser Gardner Publications Inc., Cincinatti. 2000.

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