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## GLASS COMBINATION THERMAL FORMING PROCESS

HP INC

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# Glass Combination Thermal Forming Process

Problems Solved and prior solution

Compare with Metal parts, we must reserve space for ANT cover area to solve RF performance impaction issue.

First step is using CNC or stamping process to remove partial metal for reserving space, then using insert molding to fill with plastic material in this space, adding putty to fill the gap, then using polish process to remove gap/step, finally we will get final parts using painting for surface treatment, then we could get finished good parts.

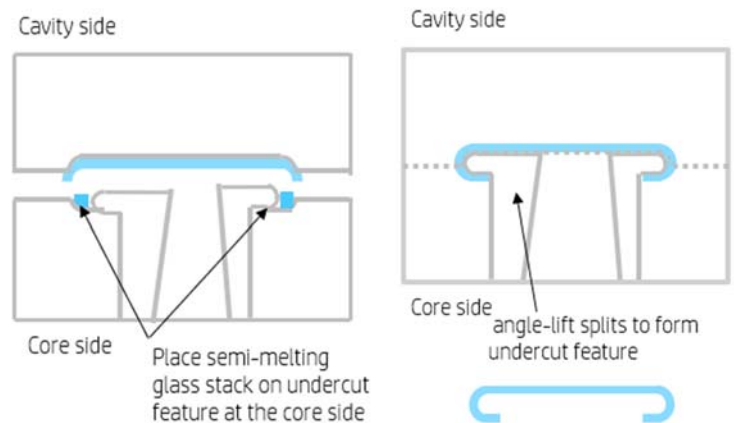
Compare with Glass parts, some persons study using glass material for laptop housing, but most of glass material only 2D and bonding with plastic frame for core side feature. First trim glass plate, then using forming process to get the 2D forming parts and using surface treatment to get the cosmetic surface side feature, then using molding to get the plastic frame, finally we will get final parts using bonding process.

## Example of Design Feature and Drawing

We should Trim glass plate first then do the Pre-thermal forming; key point is Forming Tooling Temp. 220~250 ° Angle-lift splits – Heating temp. 250~300°

After finish pre thermal forming, then we will place semi-melting and glass stack on undercut feature at the core side as picture 1

Then need to do the thermal forming again, key point is Forming Tooling Temp. 220~250 ° Angle-lift splits – Heating temp. 250~300° as picture 2.



Finally, we through CNC and polish process to remove flash, and printing and painting core side, also we do the surface treatment with AF solution, we get final finished good parts.

## Advantages

This solution compare with Metal parts, Good performance with RF solution w/o any signal impaction, Good appearance since we could printing logo and others we need in core side make near 3D result, Don't need to reserve space and add more others NON- Metal material for RF solution, Don't need to add insert molding process Don't need to add painting process to cover different material within one part .

This solution compare with glass of bonding solution, This solution could get one part with complex feature in glass material, This solution could as a undercut feature such as hook or hinge side undercut solution, Cost saving , since stack glass material be formed with main plate at the same time, no additional forming cycle time, Cost saving , Don't need to add core side bonding parts tooling, Cost saving , Remove bonding process.

***Disclosed by Jerry Chuang, Jack Hsu, Feng Gu, and Ocean Jia, HP Inc.***