

COMPANY

Honeywell Aerospace

LOCATION

Pune, India

SOFTWARE

Autodesk®Moldflow®

Autodesk Moldflow plays a major role in Honeywell's Aerospace product development.

"This job was complex due to the fact that the part cannot be modified structurally because that would affect its integrity. Reducing a part warpage was an important aspect in order to keep precision within the limits to ensure a proper part assembly. However, it was challenging to control or eliminate the defect merely based upon the experience and molding knowledge. To make a confident decision, a specialized tool like Autodesk Moldflow is a must"

—**Mr. Ramaiah Chowdary**
Sr.Engineer -AERO AME-VE MECH
ISC
Honeywell Aerospace

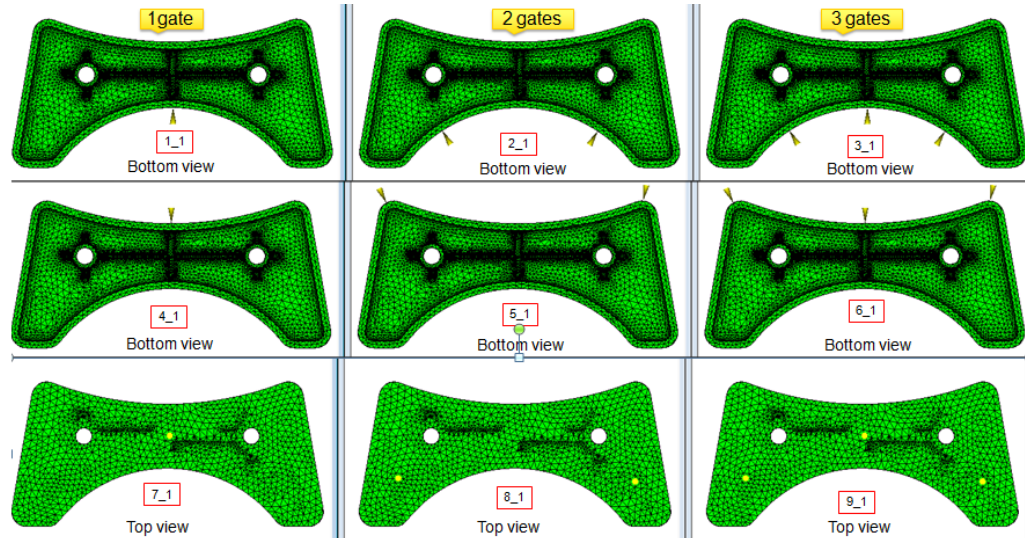


Image courtesy of Honeywell Aerospace

Honeywell is a Fortune 100 diversified technology and manufacturing leader, serving customers worldwide with aerospace products and services; control technologies for buildings, homes and industry; turbochargers and performance materials.

Honeywell invents and manufactures technologies to address some of the world's toughest challenges initiated by revolutionary macro trends in science, technology and society. With more than 127,000 employees worldwide including more than 22,000 engineers and scientists, Honeywell has an unrelenting commitment to quality and towards ensuring qualitative deliverables and results.

Honeywell Aerospace products and services are found on virtually every commercial, defense and space aircraft and its turbochargers are used by nearly every automaker and truck manufacturer around the world. The Aerospace business unit develops innovative solutions for more fuel-efficient automobiles and airplanes, more direct and on-time flights and safer flying and runway traffic along with aircraft engines, cockpit and cabin electronics, wireless connectivity services, logistics and more. The business delivers safer, faster and more efficient and comfortable transportation-related experiences worldwide.

Honeywell's presence in India dates way back to the 1930s when the first UOP oil refining unit was commissioned in the country's first refinery

in Digboi in the northeastern state of Assam. Today, India is an integral part of Honeywell's global growth strategy. Honeywell directly employs more than 12,500 people across several Indian cities including Delhi, Pune, Bangalore, Hyderabad, Chennai, Gurgaon and Madurai.

Challenges:

Recent advances in material science have resulted in high-performance polymers with unique properties like dimensional stability at high temperature, longer life at higher loads and speeds. These enhanced performance properties; along with low weight and fire behavior have opened doors to applications once considered unsuitable for polymers, including in the aerospace sector. One of the clients from aerospace sector approached Honeywell to replace the metal part with some suitable polymer.

In order to find the replacement for the metal part without compromising quality, consistency and dimensional stability, a well-designed part along with the right material and processing parameters is critical. Changes made on the basis of experience may have a significant effect on the molded part. True understanding of the material behavior is required to reduce the manufacturing risks. Slight change in the process can cause the part dimensions to fall out of the specification limit. The trial and error method is laborious, expensive and ineffective, making it infeasible to be conducted in today's fast moving industry.

“This job was complex due to the fact that the part cannot be modified structurally because that would affect its integrity. Reducing a part warpage was an important aspect in order to keep precision within the limits to ensure a proper part assembly. However, it was challenging to control or eliminate the defect merely based upon the experience and molding knowledge. To make a confident decision, a specialized tool like Autodesk Moldflow is a must,” explains Mr. Ramaiah Chowdary, Sr.Engineer-AERO AME-VE MECH ISC, Honeywell Aerospace

In this case, it was found that the warpage was the main factor influencing the dimensional stability of the part. The greatest challenge was to accurately predict impact of gate locations on the warpage in a fiber filled thermoplastics part and make optimizations accordingly.

The Solution:

Migrating from metal to plastics has become a global trend in the aerospace sector. Fuel consumption economy and increasingly restrictive regulations enforce lightweight design criteria adoption and thermoplastic materials play an important role in this new scenario.

Nowadays, airplane parts’ plastic designs offer a convenient compromise between weight reduction and functional integration. Furthermore, since there is usually no need for additional processes such as welding or mechanization, production costs are reduced.

The goal of this project was to overcome the challenges during the concept phase instead of the mold trial stage. In this case, the Autodesk Moldflow was utilized for a detailed study and effective design optimization.

Given the warpage issue, a preliminary filling analysis was carried to check how effective the gate location was. Around nine gate configurations with one, two and three gate locations were examined virtually with the help of Autodesk Moldflow based on the analysis, i.e., looking at the graph of out of plane deflections of the bottom face and comparison of pressure and temperature over the iterations.

The Honeywell team successfully managed to identify the right combination for the gate location and number of gates; and selected 4_1 shown in the figure. Lesser out of plane deflection of the bottom face was observed for 4_1 compared to other eight scenarios. Considering various scenarios, pressure and temperature differences were observed using Autodesk Moldflow. The results for the temperature and pressures at the end of the fill were favorable for 4_1.

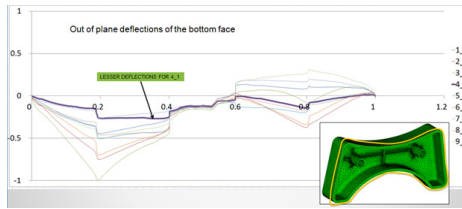


Image courtesy of Honeywell Aerospace

“Autodesk Moldflow plays a major role in Honeywell’s Aerospace product development. It helps us to look at different designs we would have not tried in the past because of the expense and time restraints involved in prototyping a new product. Now we can look at eight to ten different designs and evaluate the potential problematic areas well in advance. We can also incorporate more functions in the designs,” said Mr. Sunil Job Technology Specialist -AERO AME-VE MECH ISC, Honeywell Aerospace

Results:

The simulation results helped in finding the number of gates and gate location optimal for the geometry. Various possible combinations were examined with the help of the Autodesk Moldflow Insight. Based on the analysis of Autodesk Moldflow, Honeywell successfully managed to identify the warpage issue in the aerospace part in the early stages. Thus, ensuring the successful assembly and dimensional stability of the PBT-20% Glass Filled Fiber part.

“Autodesk Moldflow gives prompt results for the multiple design changes to find the most feasible and optimal design virtually. The potential product defects are predicted by the simulation and prevented in advance thus improving the final quality and meeting the stringent product requirements. Autodesk Moldflow is delivering a tangible contribution to the company’s success. The software’s functionality is absolutely well suited to our tasks.” concludes Mr. Ramaiah Chowdary

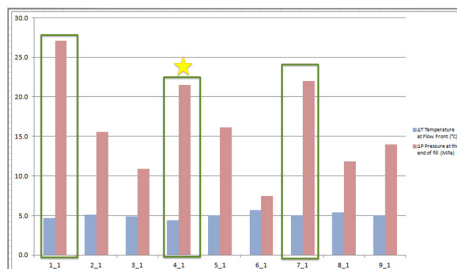


Image courtesy of Honeywell Aerospace

“Autodesk Moldflow gives prompt results for the multiple design changes to find the most feasible and optimal design virtually. The potential product defects are predicted by the simulation and prevented in advance thus improving the final quality and meeting the stringent product requirements. Autodesk Moldflow is delivering a tangible contribution to the company’s success. The software’s functionality is absolutely well suited to our tasks.”

—**Mr. Ramaiah Chowdary**
Sr.Engineer -AERO AME-VE MECH ISC
Honeywell Aerospace