get it right®

Bilcare Research

Bilcare optimizes its package design and development process using plastic thermoforming simulation

THE CHALLENGE

Bilcare Research aims to innovate and develop pioneering packaging solutions meeting the complex needs of the pharmaceutical industry. With PAM-FORM, Bilcare Research engineers benchmarked blister cavity design, packaging film selection based on its formability and barrier properties, and optimized process parameters.

THE BENEFITS

- Cut the packaging production line time by more than 50%
- Improve packaging design by choosing the most appropriate material
- Reduce quality defects
- Improve the process parameters by validating with simulation
- Save on material and production costs by eliminating the need for a physical prototype

"To select the right barrier packaging material and optimize the package design and processes, we were able to rule out the traditional trial and error method by adopting scientific methods like Bilcare Optima™ and advanced package design services with PAM-FORM."

Samir Bagalkote,
Assistant Manager, Research & Development
Bilcare Research

Due to their ease of production, low cost and high performance, thermoformed plastic blisters are widely used to package pharmaceutical dosages. However, thermoformed parts are generally not uniform in thickness. Non-uniform thickness and thinning in the corners of the container are major limitations of thermoforming.

Because of stringent regulatory and extended stability requirements, the packaging of new and existing pharmaceutical products is increasingly demanding on moisture barrier. Therefore if a change of packaging material is to be considered, the challenge is to respect efficiency, cost and environmental concerns by providing sufficient water vapor barrier at an acceptable cost.

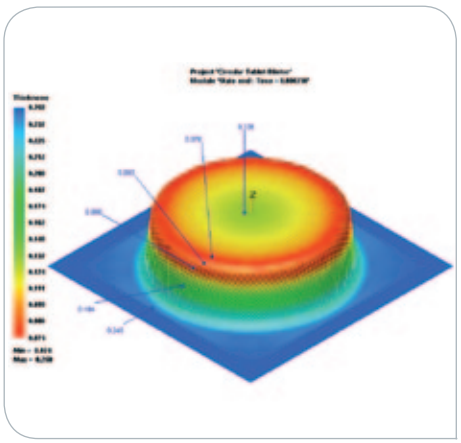
Predicting the thickness distribution with simulation

Bilcare has developed a scientific packaging development method which is first of its kind globally called BilcareOptima™. This method studies the degradation profile of the drug formulation and thereby determines the barrier property required in the package to protect the product during its shelf life and thus define the most optimal packaging (packaging material) for the product.

Developing a bottle or pouch packaging for pharmaceutical dosages is straight forward, but developing a blister packing option is more challenging as packaging material undergoes heavy deformation during the forming process which affects the barrier properties. The barrier properties of thermoformed blister are directly associated with the thickness distribution of plastic film after the cavity formation.

The thickness distribution throughout the blister is based on the thickness of the base film, die design and thermoforming conditions.

The different parameters like forming temperature, pressure/vacuum range, visco-elastic deformation properties of plastic material, die geometry, contact and friction between the blank and die, have a direct effect on wall thickness distribution in thermoformed blister. Thus, it is important to predict the wall thickness distribution on the blister cavity formation of the barrier films to determine the barrier property of the final blister pack.



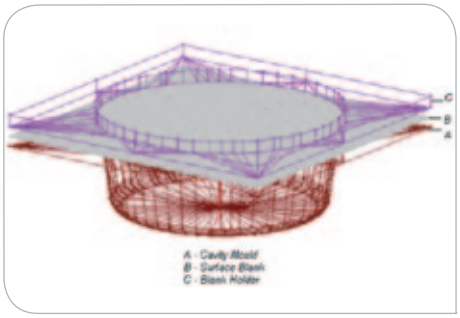
Thickness distribution simulation in PAM-FORM.

Validating virtually the blister cavity and the packaging film selection

The main objective is to develop a system which can predict the wall thickness distribution and change it in barrier properties of polymeric films after thermoforming to a blister pocket, with respect to material properties, cavity design and processing parameter. This information will also be used to develop a benchmark for deciding the optimal blister cavity design.

"We are able to develop a system to predict the thinning profile on blister formation and the barrier property using PAM-FORM which systematically studies the physical, mechanical and thermal properties and behavior of the film during its cavity formation process. With PAM-FORM we're able to predict this behavior more accurately with great flexibility and user friendliness, all of which has helped us speed up our process."

Samir Bagalkote



Representation of the mold, blank and blank holder.

The film visco-elastic deformation behavior is validated based on comparison of the experimental and simulated stress-strain data at various temperature and strain rates.

In the standard process, a preheated plastic sheet is clamped on the mold with the help of a blank holder and pressure or vacuum is progressively applied.

PAM-FORM performs the forming simulation in a 3D virtual environment and the post processor produces a unique topography of thickness, stress-strain distribution, forming zones, etc. in the thermoformed pocket.

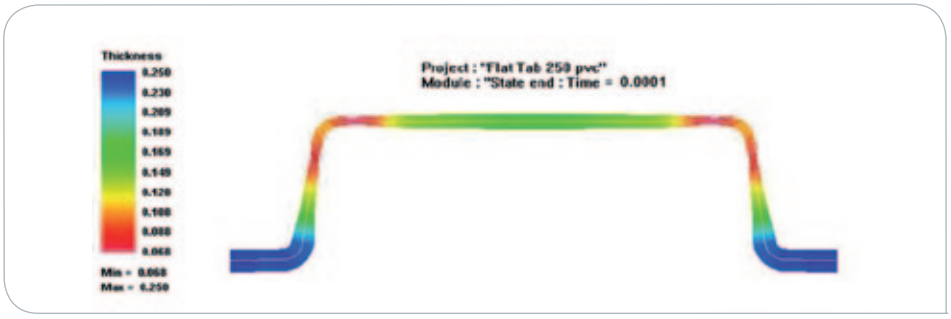
The difference between the predicted and experimental results shows the accuracy of the simulation method: the correlation between the experimental results and the simulation is validated.

"We have used scientific CAE tools for almost a decade, but switching in 2008 from the earlier tool to ESI's software PAM-FORM brought significant improvement in terms of accuracy and speed."

Dr. Ajith Sashidharan,
V P, US Operation & Global Research
Bilcare Inc.

For blister design and assessment of formability and barrier properties, Bilcare Research uses PAM-FORM to validate the changes made in blister cavity design, initial film thickness and thermoforming process parameters.

Results are very encouraging and give Bilcare Research immense confidence in trying new designs and materials which will bring productivity enhancements in the pharmaceutical business.



Simulated thickness distribution at various locations in a blister pocket.

To find out more about ESI's thermoforming simulation tool PAM-FORM, please visit: www.esi-group.com/pam-form

ABOUT BILCARE LTD

Bilcare Research is a leading full-service provider in the field of pharmaceutical packaging. As a global supplier with single-source capabilities, Bilcare offers a comprehensive range of pharmaceutical packaging solutions, from product-specific research to brand-building materials and design. With more than 500 employees, and 50% of the workforce based outside of India, Bilcare's operations are spread over 4 continents with more than 500 pharma customers globally.

ABOUT ESI GROUP

ESI is a pioneer and world-leading provider in virtual prototyping that takes into account the physics of materials. ESI has developed an extensive suite of coherent, industry-oriented applications to realistically simulate a product's behavior during testing, to fine-tune manufacturing processes in accordance with desired product performance, and to evaluate the environment's impact on performance. ESI's solutions fit into a single collaborative and open environment for End-to-End Virtual Prototyping, thus eliminating the need for physical prototypes during product development. The company employs over 800 high-level specialists worldwide covering more than 30 countries.

ESI Group Headquarters | 100-102 Avenue de Suffren | 75015 Paris | FRANCE | T. +33 (0)1 53 65 14 14 | F. +33 (0)1 53 65 14 12 | **info@esi-group.com**