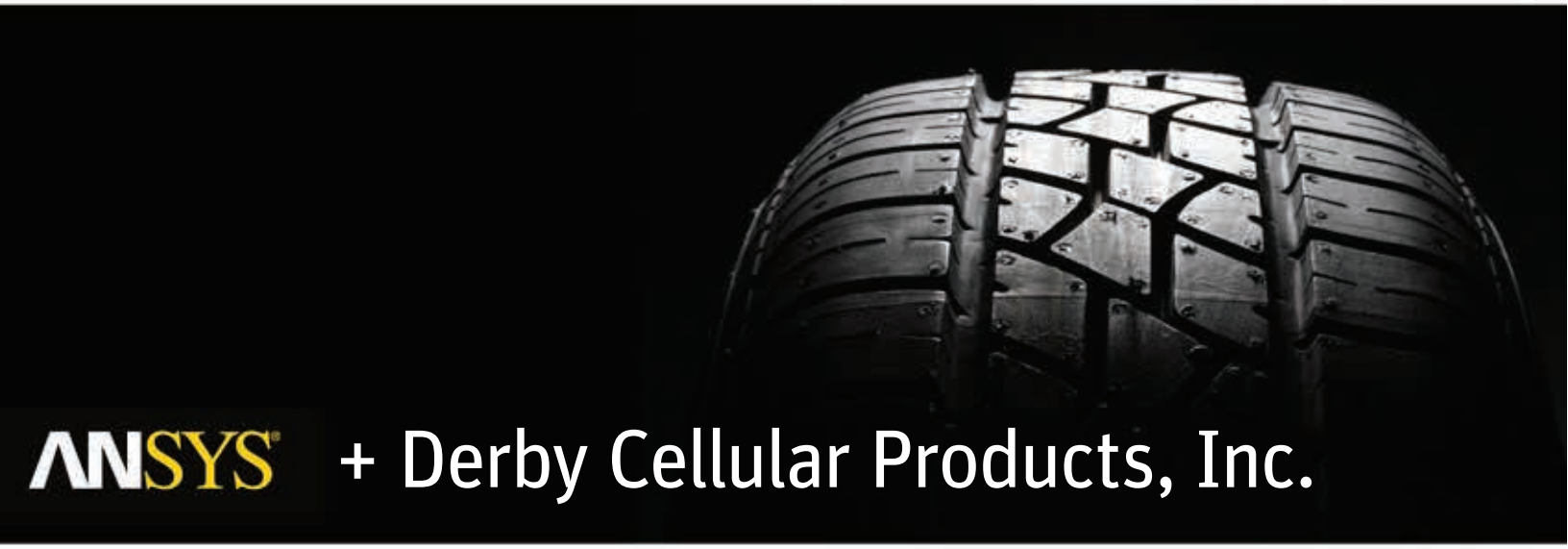
**Case Study**



# ANSYS + Derby Cellular Products, Inc.

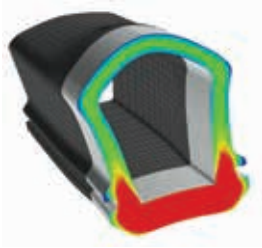
*We selected ANSYS Polyflow because it has the capability to handle complex polymer flow problems involving nonlinearities, such as viscoelasticity, shear-thinning, viscous heating, free surfaces and irregular geometries, and it offers a unique inverse die design feature that instructs the software to compute the required die lip and adaptor shapes.*

**Adnan Saeed**
*Project Design Engineer*
*Derby Cellular Products, Inc.*

**Derby Cellular Products, Inc.**

# Computer Simulation Helps to Reduce Extrusion Cost by 50 Percent

Fluid model extracted from solid CAD model



Velocity profile across a die land inlet section. Using the inverse die design capability of ANSYS Polyflow software, the die land can be automatically created to generate the correct extrudate after all deformations.

Derby Celluar recently found it difficult to profitably produce an EPDM environmental seal for a complex geometry. The initial plan was to produce the part using a single-cavity die. As a result of the complex geometry, approximately 20 trials on the extrusion line would have been required at a total cost of about $16,000 for a single profile. Because the production rate of the single-cavity die was too low to compensate for the expense of operating the extrusion line, Derby Cellular decided to use computation fluid dynamics (CFD) to evaluate whether or not the part could be produced using a two-cavity die.

**Technology Used**

ANSYS® Polyflow®

**Engineering Solution**

The team selected ANSYS Polyflow to perform the analysis to model the dual-cavity extrusion die.

- Engineers imported the solid model of the initial concept into Polyflow for die flow balancing.
- The team specified material properties and operating conditions for the components, which included the two cavities.
- After balancing the flow between the two cavities, they optimized the die land length to reduce die swell.
- Engineers ran an inverse extrusion analysis to determine die lip geometry, taking into account the role of the wall slip factor to properly model the die swell.

**Benefits**

- The resulting profile shape extruded with the first die was close to, but not exactly the same as, the desired geometry because of uncertainty about the slipping coefficient.
- The polymer was found to be slipping more than 25 percent against the die wall, leading to an adjustment of the coefficient that could be used for various profiles in the future.
- The second fabricated dual-cavity die produced a profile that perfectly matched the desired geometry.
- An optimized dual-cavity die design was produced on the second trial.
- The cost of producing the part was reduced by approximately 50 percent by using Polyflow simulation to replace the prior time-intensive trial-and-error process.

**Company Description**

Derby Cellular Products, Inc. specializes in producing molded, extruded and fabricated ethylene propylene diene monomer (EPDM) polymeric seals for the automotive, truck, agricultural, off-road, air filtration and appliance markets.



**ANSYS, Inc.**
www.ansys.com
ansysinfo@ansys.com
866.267.9724