Sheet Die Design Analysis

Overview
KYDEX is a leading manufacturer of thermoplastic sheet specializing in custom products. During production, the color of the plastic is changed frequently. Due to the flow profile of plastic through the die (Figure 1) KYDEX wastes around 131 lbs. of plastic per color change-over. KYDEX would like to reduce this waste and better understand the factors that affect the flow inside their dies.

Objectives
It was the team’s task to help KYDEX understand the flow path of their product through their thermoplastic sheet dies using ANSYS. This project analyzed the velocity profiles of the flow through the die to order to understand flow uniformity. These results will give KYDEX insight into how to improve die tuning and design to reduce waste as result of the color changeover.

Approach
• Talked to KYDEX and visited their facility to better understand their process and needs.
• Did background research on thermoplastic sheet die flow and computational methods.
• KYDEX supplied data on their product and measurements of one of their sheet dies.
• Generated parameters thought to effect the flow based on research.
• Created a 3X4 Taguchi array of the parameters.
• Created 16 SoldWorks models of the die flow path for each Taguchi combination.
• Imported Models into ANSYS and ran flow simulation on each model.
• Compared velocity profile of base model with color change-over to validate the results.
• Collected velocity profile data from each run can generated Taguchi level averages.
• Uniformity was judged on the centerline velocity to average velocity across the die.

Outcomes
Finally, list the outcomes for this project making sure to clearly convey their implications for the sponsoring company:
• Each parameter improved uniformity as predicted.
• After ranking the 16 models, the best case improved in uniformity by 31%
• If die flow is improved by 31% this could translates to a savings of over $250,000 annually