1. Injection molding – pressure drop in a runner

Use Autodesk Moldflow Adviser software together with the analytical equations in the slides for this project.

- Assume a runner with length $L = 100\text{mm}$ and $3\text{mm}$ diameter (geometry provided)
- Use a constant flow rate of $25\text{cm}^3/\text{s}$ and standard mold wall temperature (e.g. $30^\circ\text{C}$)
- Select the Moplen EP 300L Polypropylene material from the database and copy it to your own Database so you can adjust the rheological properties
- Solve the model for a simple 100% fill situation using the original 2\textsuperscript{nd} order viscosity model.
- Adjust the 2\textsuperscript{nd} order model to a simple 1\textsuperscript{st} order model by adjusting the viscosity model coefficients in the software
- Use the remaining viscosity model coefficients to derive the $m$ and $n$ values from the power law model $\tau = m \dot{\gamma}^n$
- Compare the pressure results from the moldflow adviser software for both viscosity models with the analytical solution
- Explain any differences. (suggestion: plot the 1\textsuperscript{st} and 2\textsuperscript{nd} order viscosity model)
- Adjust the viscosity model coefficients of the power law and 1\textsuperscript{st} order model in order to improve the comparison between 1\textsuperscript{st} and 2\textsuperscript{nd} order model.
- Use the pressure results from the analytical solution and the moldflow adviser solution to estimate the thickness of the frozen layer during the injection of the runner. You can choose to do this with the viscosity coefficients before or after adjustment from the previous step
- Illustrate the importance of an accurate $n$-value on the pressure drop in a graph. (Typical $n$-values for polymer melts are in the range of 0,2 up to 0,5. Compare this with a Newtonian fluid pressure drop.
- Summarize your main conclusions and do not forget to link these conclusions to the injection molding process and equipment.