**Final Assessment**

July 31, 2020

**Instructions**

Solve the problems following the next steps:

A) Rephrase the problem indicating very clearly what you have been asked to do.

B) List all the data provided.

C) Make a list of the assumptions, justifying each of them.

D) Write down an algorithm for the solution you are proposing (no calculations are needed at this stage)

E) Solve the problem

F) Ask yourself if the result is reasonable and, if needed check in the web for technical papers to support your answer.

G) List the references used in the solution of the problem.

This procedure is a must for this part of the exam to be considered for grading.

1. Work by yourself from A to D, afterwards you will work E to G with your team.
2. Upload your individual proposal in the Google Drive in the folder 10 Final Aseessment in your personal folder, as: **MY NAME. FINAL EXAMINATION PART ABCD.**
3. Upload your team´s solution with the Subject: **TEAM NUMBER** **FINAL EXAMINATION PART EFG**

**Problems(60 points) PROBLEMS**

1. The manufacturing plant where you work, The Mexico Supply Chain, has been requested, by the China Car Company, to inject a flat piece with the following dimensions (W=10 cm, L=20 cm y H= 0.5 cm) **{20 pts}**

W

L

y

z

x

The injection can be done in a multicavity die and the plant manager wants to produce 10 specimens per minute, considering two different type of resins, but before he accepts the request of the China Car Company, he asks you

1. To determine the pressure required to produce those pieces using the resin that requires the lowest pressure drop.
2. To propose he best multicavity configuration (justify your answer)

Consider that the injection happens at 200oC and that the density of the material at that temperature is 0.75; the viscosity can be represented by a power law and their respective parameters are given below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Resin | MFI | o (poises) | Critical shear rate (s-1) | Power law index |
| **1** | 1.5 | 54000 | 1.5 | 0.48 |
| **2** | 2.5 | 29000 | 2.5 | 0.48 |

1. You have decided to start a plastic recycling company and Mr. Good Die is selling you an extruder with a 500 holes die, each of them has a length of 1.25 inches and an radius of 0.05 inches **{20 pts}**







You need to *estimate the pressure drop* across the die since that information is needed to determine how much energy/ton of recycled plastic you have to pay. You will use that information together with other data (energy for platicizing the plastic, extruder maintenance, etc.) to estimate the investment and the ROI. You want to make sure that can get recycled pellets at 1,000 kgs/hour. The viscosity curve is that given in the first problem for resin 2.

1. You are requested to get the TTS curve of a PP-HDPE Copolymer (MFI of 2 g/10 min) and its composite loaded with 3% of CNT to get their complex viscosity curves at 195oC. Also, using the master curve of the G”(w) you are requested to get the First normal stress difference at steady state. Make any comments/observations you consider important.**(20 pts)**
2. What type of melt distortions can be observed in polymers, give some examples on different polymer extrusión processeses and how can be avoided. **{10 pts} BONUS**