

### C8.1.1.

Use of numerical simulation to develop a new semiconductive layer for HV cables

P. ARGAUT and E. THIZON

SAGEM SA, rue de Varennes Prolongée, 77876 MONTEREAU CEDEX FRANCE

When developing a new material for semiconducting screen of a HV cable, two majors aspects are to be considered:

- Compliance with specification
- A good processability of the material

Concerning the first point, laboratory tests (electrical...) can be carried out to select the formulation complying with the specification.

But to assess the processability, trials on the production lines are necessary.

So, using a simulation of extrusion software can be interesting to reduce both the number of trials and the cost of the development.

This paper shows that rheological results allow a better understanding of the flow of a semi-conductive layer.

First of all, tests are carried out with the RPA (Rubber Process Analyser) and a laboratory extruder to obtain viscosity curves of the compounds (generally two compounds: the new one and the reference material).

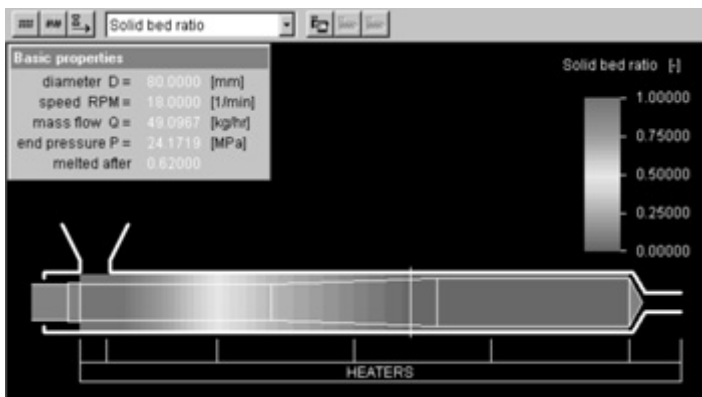
Then these rheological data are introduced as well as some thermal data, such as conductivity or calorific capacity, in the software.

The first simulation consists in validating the software. For this, experimental results are compared with simulation results.

Then, numerical simulation is used to observe the flow of the new material in the extruder, and compare it with the reference.

The main characteristics obtained from the software such as solid bed ratio, pressure or temperature along the screw are described in the paper.

For instance, in the given example, the solid bed ratio within the extruder for the new material will decrease gradually until the end of the compression zone. So, normally, there won't be unmelted material at the end of the extruder.



Solid bed ratio along the extruder for the new material

The numerical simulation shows that the new formulation could be extruded on the process line without changes of parameters (temperature profile etc.). But it predicted an increase of the throughput. So to obtain the same output as the reference, the velocity of the extruder has to be reduced from 24 rev/min down to 18 rev/min.

Finally a trial on the extrusion line is carried out. The experimental results match those predicted by the simulation program.

Therefore it can be concluded that numerical simulation of extrusion could be a very interesting tool to improve knowledges in rheology and to reduce the number of trials required for introducing a new material.