

Review of a Ph.D. thesis entitled

„Modeling of Film Blowing Process for Non-Newtonian Fluids by using Variational Principles“

Presented by Ing. Roman Kolařík, Tomas Bata University in Zlin.

The author has studied the tubular film blowing process of polymer films. Both experimental and theoretical approaches were used. Numerical scheme for modeling of non-isothermal film blowing process considering non-newtonian polymer melts were used in order to understand the complicated relationship between processing condition and material parameters on one side and bubble stability on the other side.

It was found that model prediction is in a good agreement with the experimental data. Significance of biaxial extensional viscosity was demonstrated as well as temperature sensitivity of material viscosity.

Also, the role of processing parameters is discussed, claiming its high influence on process stability. On the other side, rheological parameters appear to have major impact when trying to modify final film thickness.

Author has proven his ability to handle some relatively difficult areas, such as rheology, polymer physics and mathematics. The results were summed up into understandable conclusions.

I consider the thesis to be in a good quality for achieving a Ph.D. level.

Some comments.

A – Why there is used a plural in words "... variational principles" when just one principle of energy minimum was used?

B – Numerical methods applied for calculation were not described in detail. Is it possible to get use of the presented variational method as a basis for any finite element method numerical simulation?

C - The process is supposed to be quasi-stationary. Would it be possible to use it for a dynamic stability analysis? How about viscoelasticity?

In Zlin, June 14th, 2012

Karel Kouba, Ph.D.

