

Tanawat Tungkeunkunt 2011: Influence of Processing Parameters on Weldline Strength of Natural Rubber Molded Parts. Master of Engineering (Mechanical Engineering), Major Field: Mechanical Engineering, Department of Mechanical Engineering. Thesis Advisor: Ms. Anchana Wongsto, Ph.D. 91 pages.

The objective of this work was to investigate primarily the influences of filler type and content, vulcanizing system, and processing parameter on the weldline strength of natural rubber (NR) molded by compression and injection molding processes. In addition, the computer aided engineering (CAE) programs (i.e. Cadmould and Neurosolution) were also employed in order to predict the flow pattern and weldline location within the mold. The results obtained from compression molded NR indicated that the weldline strength decreased with increasing silica and carbon black contents, while no significant change in weldline strength was observed for the loading of calcium carbonate. The reduction of weldline strength was due to the perpendicular orientation of molecular chains, the lack of intermolecular diffusion, and the occurrences of V-notch and micro-voids at the weldline interface. It can be seen that, after the thermal aging test, the weldline strength of NR vulcanized by conventional vulcanization (CV) was lower than that of efficient vulcanization (EV). Considering the effect of processing parameters, it was found that the weldline strength increased with increasing clamping pressure, while the increase of mold temperature did not produce any major changes in weldline strength. Furthermore, the mechanical results obtained from different types of weldline (i.e. hot and cold weldlines) which was produced by injection molding also indicated that the strength of cold weldline decreased with increasing mold temperature. In the case of hot weldline, however, the increase of weldline strength was found with the increases of mold temperature and flow distance behind an obstacle. The flow pattern and weldline location predicted by computer programs were found to agree reasonably well with corresponding experiments. The differences in the findings may result from the assumptions and insufficient data used in the calculation.

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