Extrusion, Mixing, and Heat Transfer Modeling with OpenFOAM at Goodyear

Gilles Reichling

The Goodyear Tire & Rubber Company, address: Avenue Gordon Smith, L-7750 Colmar-Berg, Luxembourg, phone: +352 8199 3692, e-mail: gilles_reichling@goodyear.com

As one of the world's leading tire manufacturers, The Goodyear Tire & Rubber Company is interested to continuously advance in the area of tire manufacturing processes. As to support this progress, OpenFOAM is employed at Goodyear for the prediction and improvement of manufacturing processes involving fluid dynamics, such as extrusion, mixing, and heat transfer. A focus will be drawn upon the extrusion and co-extrusion processes of tire tread and component designs, the fundamental understanding of the advective and diffusive mechanisms in rubber flow mixers, and the heat transfer taking place in vulcanization systems. OpenFOAM is particularly applied as modeling tool for processes involving complex physics, where predictive methods are value-adding and where it complements the understanding of empirical and experimental methods. Providing the key advantages of

- a high degree of flexibility in user input and numerical simulation settings,
- a transparent software code,
- no license constraints, and
- a strong, worldwide user community,

The high amount of flexibility in numerical simulation input and numerical settings offered by OpenFOAM provides the analyst with a large degree of freedom for tuning the simulation setup, the accuracy and convergence of the numerical simulations. However, it also

1. entrains a steeper learning curve for the simulation analyst,
2. challenges the deduction of 'standard' numerical simulation processes, and
3. opens 'pitfalls' for inconsistencies in the closure of numerical methods.

Besides providing numerical simulation examples for tire manufacturing processes involving extrusion, mixing and heat transfer, this talk will provide insights into balancing this essential aspect and outline the future direction of OpenFOAM at Goodyear.