Contribution ID: **14** Type: **not specified**

# Influence of process parameters on part dimensional tolerances: An Industrial Case Study

*Tuesday, 14 September 2021 11:00 (20 minutes)*

Injection molded parts are widely used in power system protection products. One of the biggest challenge in an injection molding process is shrinkage and warpage of the molded parts. All these geometrical variations may have an adverse effect on the quality of product, functionality, cost and time-to-market. Our aim is to predict the spread of the functional dimensions and geometrical variations on the part due to variations in the input parameters such as, material viscosity, packing pressure, mold temperature, melt temperature and injection speed.

The input parameters may vary during batch production or due to variations in the machine process settings. To perform the accurate product assembly variation simulation, the first step is to perform an individual part variation simulation to render realistic tolerance ranges.
We present a method to simulate part variations, coming from the input parameters variation during batch production. The method is based on computer simulations and experimental validation using full factorial Design of Experiments (DoE). Robustness of the simulation model is verified through input parameter wise sensitivity analysis study performed using simulations and experiments, all the results shows a very good correlation in the material flow direction. There exists a non-linear interaction between material and the input process variables. It is observed that the parameters such as, packing pressure, material and mold temperature plays an import role in spread on the functional dimensions and geometrical variations. This method will allow us in future to develop the accurate/realistic virtual prototypes based on trusted simulated process variation.

## Keywords

Design of Experiments, Correlation, Molding process, Tolerance, Sensitivity analysis, Variation simulation

## Special/invited session

**Primary author:** Dr AKHADKAR, Narendra (Schneider Electric Industries)

**Presenter:** Dr AKHADKAR, Narendra (Schneider Electric Industries)

**Session Classification:** Design of Experiment 1

**Track Classification:** Design and analysis of experiments