

**Title:**

**Modeling and simulation of tool wear during orthogonal cutting process**

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**Abstract:**

Surface integrity is extremely affected by manufacturing processes conditions especially the evolution of cutting tool performance. Many researchers, in the domain of material machining, focused their works on the elaboration of models predicting tool wear combining both numerical and experimental approaches.

Most of published numerical cutting models simulate the chip formation for a few micro to millisecond time periods. For that, all corresponding experimental tests, needed for the model validation, are usually carried-out in special time conditions which not reflecting industrial situations. Indeed, the latters are characterized by tool wear whose evolution can affect extremely cutting force levels and the final workpiece integrity.

In this context, the main purpose of the proposed research work is to develop a FEM model, based on the commercial code ABAQUS, to simulate wear phenomenon of tool insert in the case of orthogonal cutting operation.

The present research work is based on a lagrangian approach including an explicit step with the cutting model simulating the chip formation and an Implicit step reproducing the equivalent thermo-mechanical loading applied on the tool. An energetic based wear criterion (EBWC) is integrated in the model to simulate tool wear.

Moreover experimentations are carried out to put out wear phenomenon and results are used to validate numerical simulations. They permit to quantify the energy dissipated by friction, which is at the base of the elaboration of the EBWC.