Physics-Based Material Modeling

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Third Wave Systems (TWS) provides predictive machining modeling technology for improving new and existing cutting tools and NC programs. Our not-so-secret ingredient: a database of more than 130 physics-based material models developed using our proprietary material characterization technology. Instead of requiring that users manually determine an improvement strategy based on trial-and-error testing and prior experience, TWS software automatically suggests improvements with consideration for material properties, cutting tool geometries, toolpath approach, and calculated tool forces and temperatures. Material models are not only utilized by AdvantEdge FEM, but also within the company's physics-based NC program optimization software, Production Module.

Material Characterization

Third Wave Systems engineers utilize test data gathered from a variety of material tests to build physics-based machining models. From these tests, a material model appropriate for machining conditions is developed, providing attributes such as work hardening, thermal response, and strain rate sensitivity. Material samples are either to be supplied by the customer, or created by TWS at an additional expense to the customer.

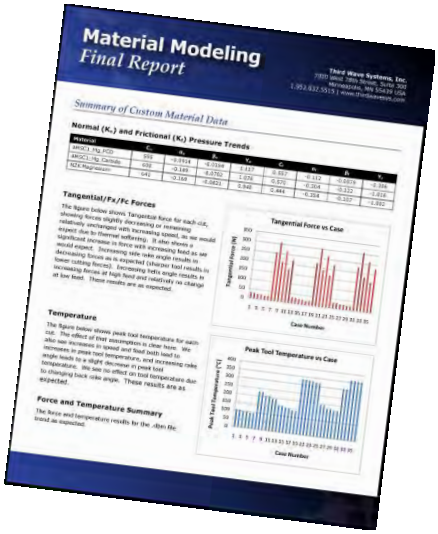
Model Verification

Once measurement data has been collected and converted into a material model, TWS conducts a series of AdvantEdge FEM and Production Module simulations using the material model to ensure expected feed, speed, and cutting geometry trends are captured.

Delivery & Documentation

Once all verification efforts have concluded successfully, the material model is delivered to the customer. In addition to the physics-based material model file, TWS will provide a comprehensive summary of the simulation verification performed during the course of model development, including:

- Coefficient generation results
- Normal and frictional pressure trends
- Chip thickness change comparison
- Rake angle change comparison
- Database generation results
- Tangential/Fx/Fc forces
- Radial/feed/Fx forces
- Axial/Fy forces
- Temperature



Duration

Anticipated timeframe for completing material model testing, model development, verification, validation, delivery, and documentation to customer is four to eight weeks.