

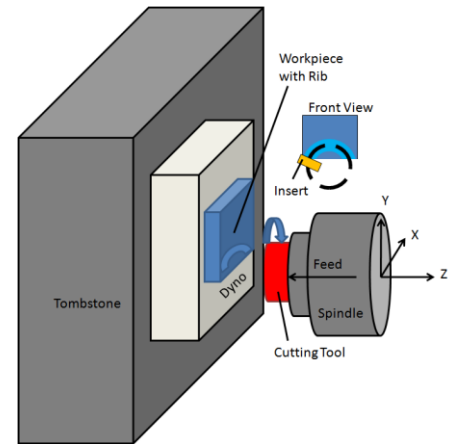
Material Modeling Validation

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. Material models are not only utilized by AdvantEdge FEM, but also within the company's physics-based NC program optimization software, Production Module.

Utilizing state-of-the-art machining equipment, TWS engineers are able to perform metal-cutting experiments for comparison and validation of newly-developed material models. These validation efforts provide customers with added confidence in the data generated using the material models, and also enhance technical expertise.

Standard Validation Approach

TWS engineers collect forces in three orthogonal directions using a 9255B Kistler plate dynamometer. Cuts will be made at two surface speeds, three feed rates, and two rake geometries to complete a twelve condition, full factorial test matrix. Single flute quasi-isotropic plunge milling tests will be conducted on a standing rib, as shown in the schematic at left. This configuration effectively promotes constant chip load machining by allowing for a constant chip load without the effects of a corner radius or chip thinning. This standard validation approach has applicability to both turning and milling configurations.



Single flute quasi-isotropic plunge milling test configuration

Advanced Validation Approach

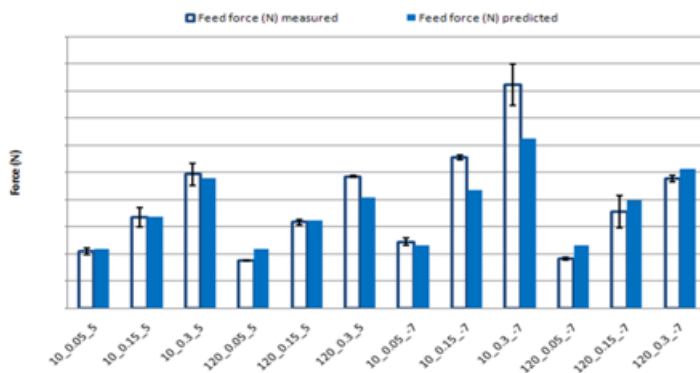
In addition to the standard validation approach, TWS engineers are also able to tailor a test matrix to meet customers' specific validation needs.

Matrix		
Speed (SMM)	Feed (mm/rev)	Rake Angle (mm)
S1	F1	R1
S2	F2	R2
	F3	

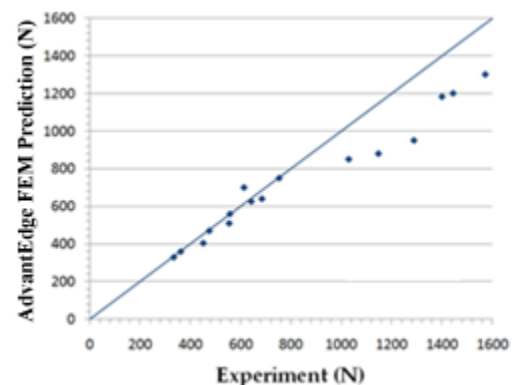
Full factorial test matrix. Speed and feed data will be set via material classification.

Deliverables

Upon completion of all validation activities, comparisons will be made between predicted results from AdvantEdge FEM and Production Module, and experimentally-measured data. Findings will be provided to the customer in multiple formats, including separate force components for discrete conditions and scatter plots depicting trends over a wide range of conditions. Model and test results will also be checked against expectations with respect to changes in cutting conditions such as feed and rake angle.



Sample bar chart depicting feed force through a test matrix.



Sample scatter chart for a test matrix.