



Internal Benchmarks of Quality

What is Quality Benchmarking?

Vanguard Tool Corporation is a leader in the field of precision solid carbide cutting tools in the woodworking industry. All manufactured standard and special cutting tools are characterized by critical tool specifications that ultimately relate to successful functioning: 1) cutting diameter, 2) cutting length, 3) overall length, 4) cutter rotation, 5) primary and secondary clearance angles, and 6) end-cut clearance. One of the realities of manufacturing is that there is very low probability that two objects will be made exactly alike.¹ Therefore, specification tolerances are established to capture limits that distinguish acceptable cutting tools from those that do not conform to standard. For the purposes of quality benchmarking, the concept *nonconformity* describes a departure of a quality characteristic from its intended (e.g. advertised) specification requirement. The concept *cluster* refers to a collection of tools with corresponding specifications manufactured at a specific point in time. The following chart lists the tolerance limits and measuring instrument(s) used to inspect and determine if a finished product conforms to standard.

Criteria to Determine Nonconforming Pieces Per Cluster

Specification θ	Tolerance Limit for θ	Measuring instrument
Cutting diameter	+0.000 – 0.004	Micrometer
End-cut clearance angle		
--End mill	$2^{\circ} \leq \theta \leq 3^{\circ}$	Comparator / 10X magnification
--Plunge	$5^{\circ} \leq \theta \leq 7^{\circ}$	Comparator / 10X magnification
Cutting length	+1/8” – 1/64”	Standard scale
Overall length	+1/8” – 1/64”	Standard scale
Cutter Rotation	N/A	Visual
Primary and Secondary Angles	N/A	Comparator

The major goal of quality benchmarking is to estimate average or expected level of quality *originating* at the level of manufacture and to promote confidence of quality *destination* to customers. *Quality cannot be built into a product through periodic random inspection, but rather through continuous monitoring over a period of time.* At Vanguard Tool Corporation, the accumulation of historical records with respect to measurement specifications have allowed management to satisfy several managerial objectives. In effect, through establishing “average” manufacturing quality and customer satisfaction, it has been possible to improve and monitor quality with the estimated benchmarks.

Proposals for New Quality Standards Established

Lifetime Testing

With the New Year comes the new task of taking quality control measures to another level. While specifications are essential to tool functioning, Vanguard Tool Corporation seeks to use customer feedback to estimate and model *actual tool lifetimes for new and serviced cutting tools*. The major goal of lifetime testing is to give much better approximations to cutting tool quality than specification benchmarks.

Sampling Techniques to Estimate Quality Destination to Customers

Inspecting orders before they are shipped serves as a secondary check to manufacturing, management, and customers that specific product(s) conform to advertised and / or verbal specifications. Due to time and potential need constraints, simple random sampling techniques allow critical specifications to be checked at a given level of confidence. Now, an internal inspection sheet can be created for each order and cluster specification estimates can be calculated to verify quality before being shipped.

¹ Besterfield, Dale H. 1990. Quality Control 3rd edition. New Jersey: Prentice-Hall, Inc.