Carbide Related Technologies, Inc.
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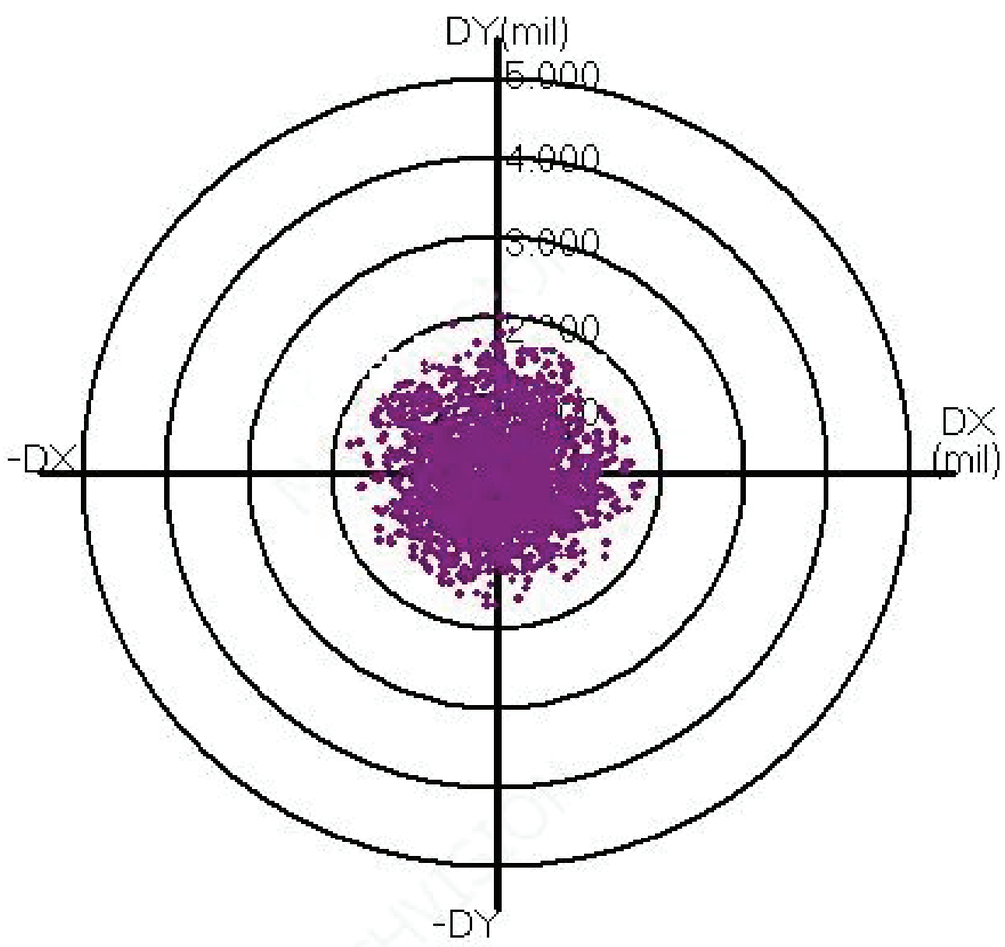
Common drilling problems can be corrected by eliminating the factors that reduce hole quality.

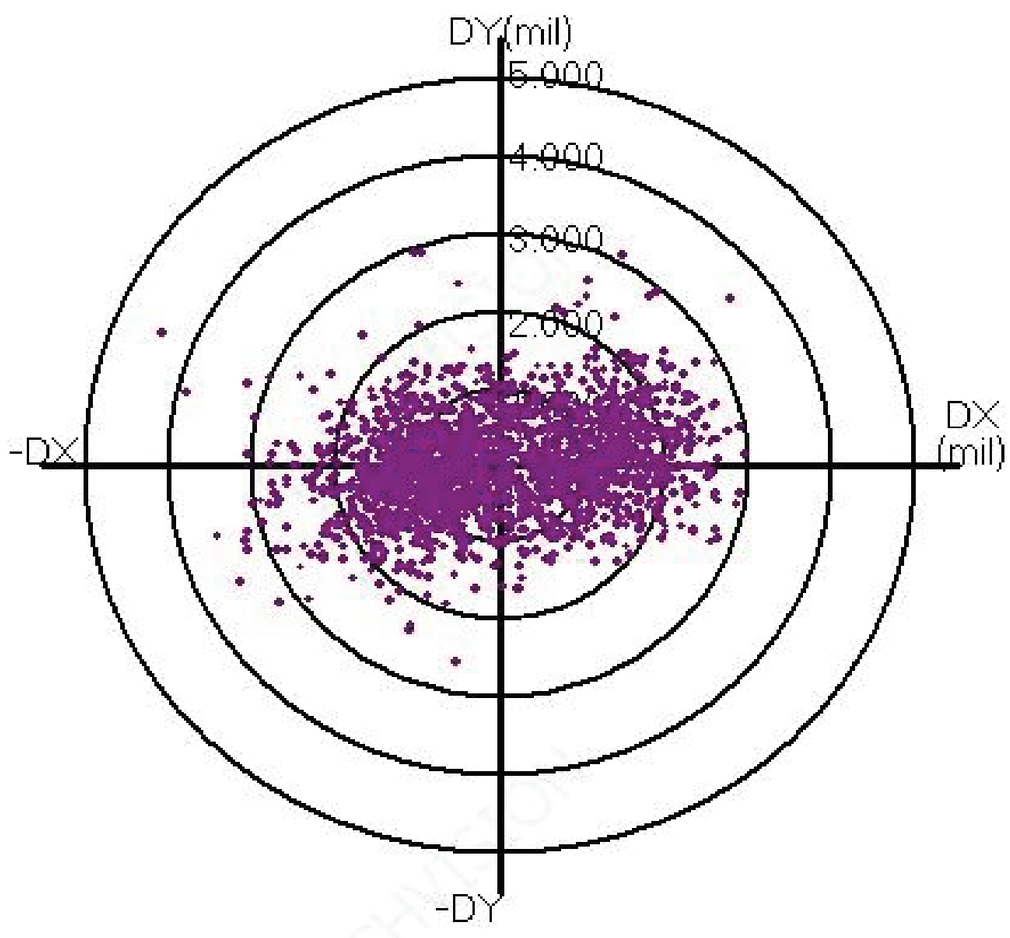
HOLE REGISTRATION ACCURACY

Hole registration accuracy is measured by an AOI machine.

As shown below, hole positional accuracy is affected by some causes, therefore by countermeasure these defects we can get better accuracy results.



GOOD



BAD

FAILURE CAUSE	SYMPTOMS	REMEDIES
Long flute length and plunge length	When flute length and plunge length are unnecessarily long, hole registration accuracy reduced.	Set optimum flute length and plunge length.
Unsuitable drill point geometry (Helix angle and Point angle etc.)	Unsuitable drill bit geometries for different for different PCB applications and equipment conditions affects accuracy.	Select suitable geometries for respective drilling conditions and applications.
Number of hits too high.	It results in poor accuracy and promotes wearing.	Apply suitable hit counts.
Low spindle speed	Swarf will stick with drill point results in poor accuracy.	Always apply suitable spindle speed.
High spindle speed	Load on drill bit increases results in poor accuracy.	Always apply suitable spindle speed.
High chip load	Accuracy got affected by damaged drill bits and poor chip evacuation.	Apply suitable chip load Please refer drilling parameters
Low chip load	It promotes excessive wearing results in bad accuracy.	Apply suitable chip load Please refer drilling parameters

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FAILURE CAUSE	SYMPTOMS	REMEDIES
Less flute volume.	Flute pocket got clogged with chips. Chips go between the entry and PCB laminate board which worsens accuracy notably.	Enlarge flute volume by changing flute land value, web thickness and web taper.
Unsuitable TC material.	It damages drill bits cutting edges which promotes poor accuracy.	Use high hardness and wear resistant grades of TC.
Unsuitable drill point geometries.(Taper flare, FWD, FLD, hook and barrel etc.)	Hole positional accuracy got worsened by the presence of pointing defects.	Drill point geometry should be free from pointing defects.
Too many repoints.	It results in diameter wear which promotes bad positional accuracy.	Apply suitable repoint numbers.
Drilling machine's condition	A worn ball screw or linear bearing from constant use worsens accuracy	Maintain the precision of drilling machine by routine services of machine.
Unsuitable vacuum conditions.	Low vacuum affects chip evacuation results in chip clogging where as high vacuum lifts the entry board allows to locate chips in between entry material and PCB results in not proper centering of drill bit.	Set suitable vacuum force. It should be in between 100-150 milli bar.
TIR (Total indicated run-out)	Large dynamic deflection results in poor positional accuracy.	Control spindle run out by proper repair and maintenance. It should not be more than 10 microns.
Unsuitable foot pressure	Low foot pressure results in improper clamping of bush to the entry board causing poor accuracy.	Apply suitable foot pressure. i.e. 1.5 bar to 2.5 bar.
Uneven contact of bush with entry board.	It damages bush or results in poor surface condition causes poor accuracy.	Pressure foot should be parallel to machine table.

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FAILURE CAUSE	SYMPTOMS	REMEDIES
Unsuitable entry board.	Low performance entry board on PCB with high hole quality may not obtain the accuracy as desired.	Use high quality entry board with controlled thickness and desired favorable properties for good results.
Dust and scratches on the entry board.	Drill bit is deflected by uneven ness of entry material results in poor accuracy.	Control the handling of entry board.
Unsuitable back-up board.	Very hard board causes excessive wear and damage drill bit, which worsens position accuracy.	Select suitable hardness grade for back-up board.
Unsuitable stack preparation	Loosely stack entry board and PCB's causes poor accuracy.	Check stud pins and tapering of the PCB stacking to prevent gap between entry and PCB stack.
Uneven and scratched surface on the PCB	Drill bit may be deflected by the unevenness and scratching on the PCB's surface, worsen positional accuracy.	Check PCB quality. Check un-evenness with image processor or AOI machine for measuring hole registration accuracy.
Panel stack height too high	Drill deflection is directly proportional to stack height, which affects accuracy results.	Select suitable stack height to achieve desired accuracy outputs.
High number and thickness of PCB copper layers.	Due to increase in numbers and thickness of copper, cutting resistance increases which causes wear and affects accuracy.	Decrease hit count and stack height to get better accuracy outputs.
Hard cutting PCB material.	The increase of cutting resistance causes wear and chipping of cutting edges, worsens accuracy results.	Decrease hit count and stack height to get better accuracy outputs.