



## DRILL BIT BREAKAGE

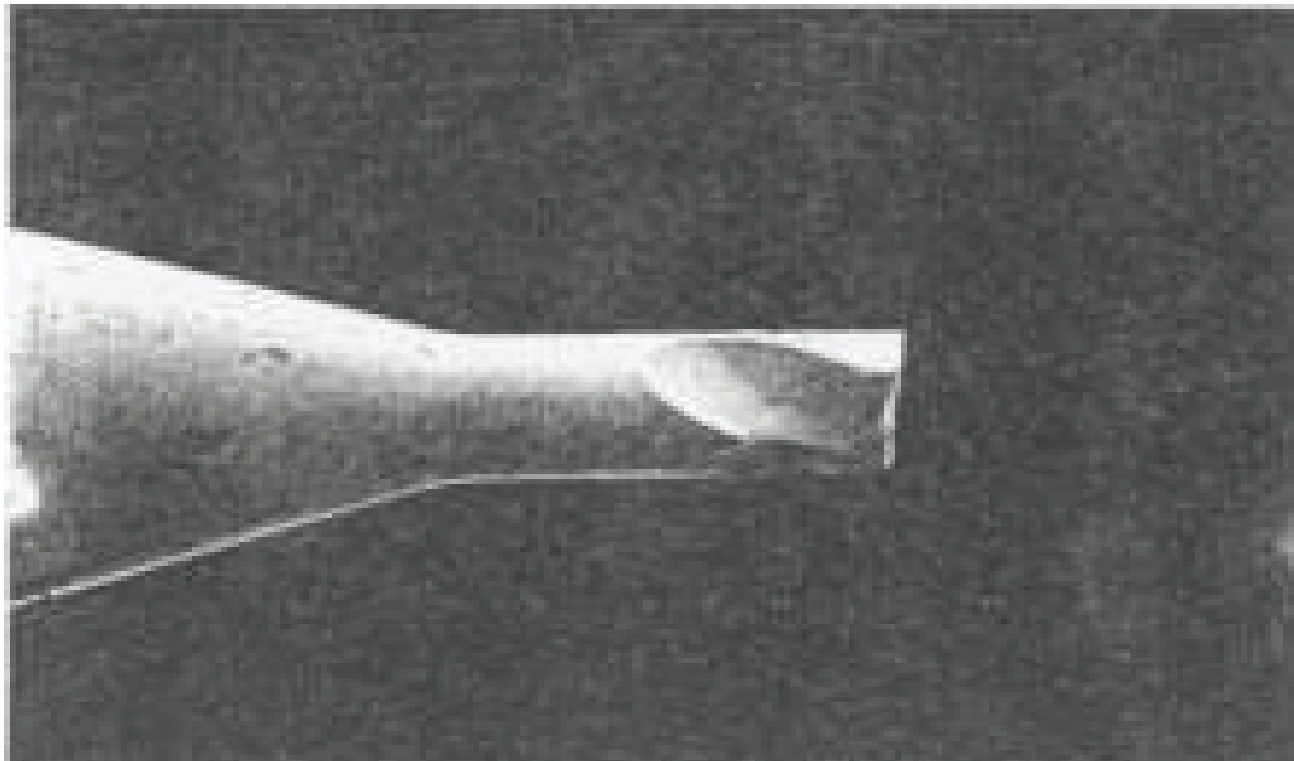
Drill breakage is of two types:

1) Deflected breakage.

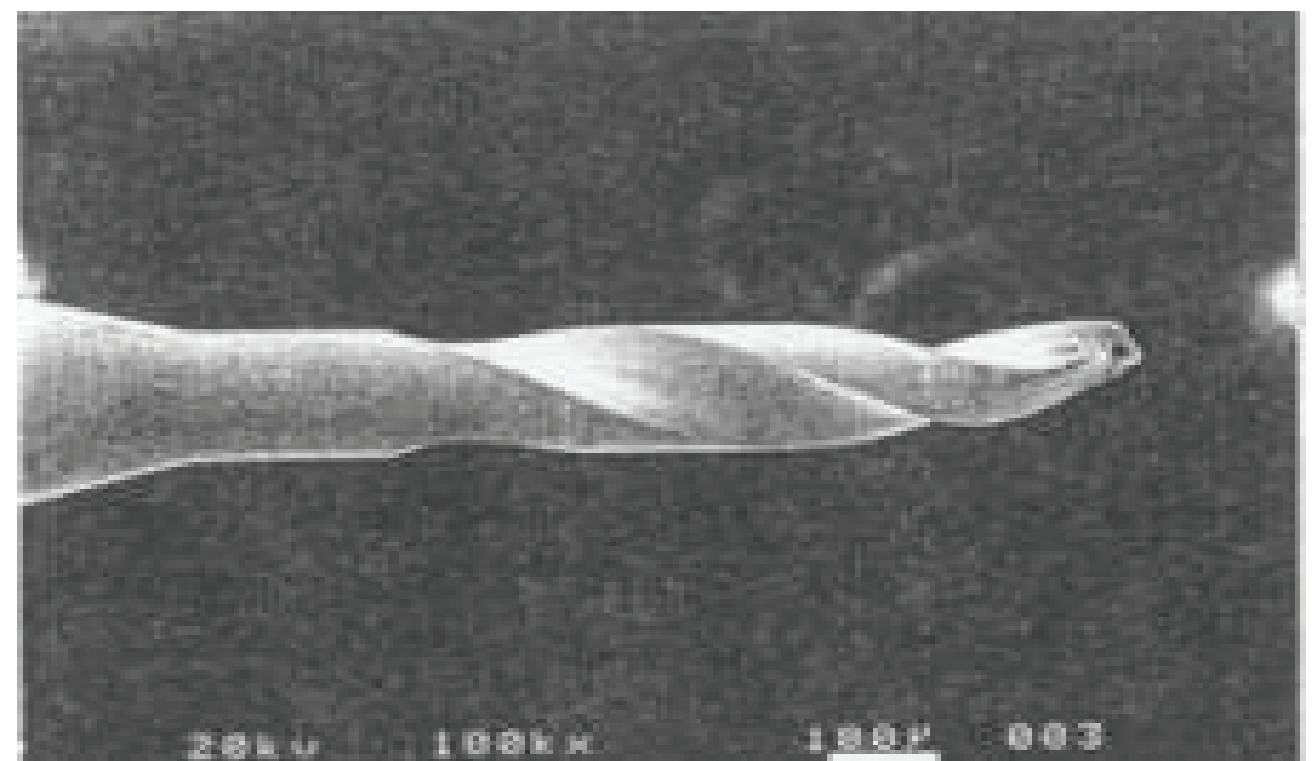
Radial force tends to break the drill at the end of flute.

2) Twisted breakage

Large torque tends to break the drill at the middle of flute.



**Deflected Breakage**



**Twisted Breakage**

FAILURE CAUSE	SYMPTOMS	REMEDIES
Long flute length and body length	As flute length and body length increases more prone to breakages will be in the tool	Use suitable flute length and body length
Weak drill bit strength due to thinner web	Large drill bit deflection causes drill bit to break at the end of the flute.	To increase strength change web thickness and web taper. Use variable web type drill for better hole accuracy and registration.
Un suitable raw material grade	Low TRS (Transverse rupture strength) causes drill breakage more easily through cutting resistance.	Use wear resistant WC tungsten carbide material.
Small flute volume	Increased twisted moment causes breakage in the middle of flute.	Increase chip pocket volume, change web thickness, web taper and flute land value.
Low chip load	Low chip load worsens hole registration accuracy, resulting in breakage problems.	Apply suitable chip-load. (Please refer Ind-sphinx drilling parameters)
High chip load	Hole registration accuracy affected by swarf clogging and chip-off drill bit result in breakage.	Apply suitable chip-load. (Please refer Ind-Sphinx drilling parameters)
Low spindle speed	Increased frictional heat causes drill breakage.	Apply suitable spindle speed. (Please refer Ind-sphinx drilling parameters)

FAILURE CAUSE	SYMPTOMS	REMEDIES
High spindle speed	Drill bit is broken by cutting load with increased cutting resistance.	Apply suitable spindle speed. (Please refer Ind-sphinx drilling parameters)
Unbalanced drill point geometries.	Hole registration accuracy reduced with asymmetrical drill bits.	Check drill point geometry.
Dust and scratches on front side of entry.	Unevenness of entry material causes deflection and breakage.	Control the handling of entry board. Check bushes for defects.
Panel stack height too high	Hole registration accuracy affected through swarf clogging, causing bit breakage.	Apply suitable PCB stack heights to achieve quality target.
Poor drill chuck (Dust in spindle, spindle chuck wearing, scratching,etc.)	Increased dynamic deflection by poor chucking causes breakage.	Preventive maintenance of collet chuck should be done at regular interval of time.
Total indicated Run out (TIR)	Large dynamic deflection causes breakage.	Control spindle run-out. Recommended value < 10 micron. (<5 micron is better for < 0.30mm drill bits.)
Penetration too deep into the back-up board.	Back up board generate large particles of swarf particle adhere to drill causes breakage.	Apply suitable penetration depth.
Unsuitable peck drilling	The increment of steps doesn't match PWB stack height which causes swarf clogging and breakage.	Recalculate peck drilling step increments and parameters.
Uneven contact of bush with entry board.	Uneven bush contact, a damaged bush or poor surface causes breakage.	Check whether the pressure foot is parallel to m/c table.
Uneven and scratched surface on the PWB	Uneven ness and scratches on the front side of the entry board can cause the drill to break.	Check PWB Quality.