abrasive technology

TECHVIEW

AT Everlast® Veined PCD Drill - A Case Study

Drilling test results in carbon/glass fiber composite

ABSTRACT

Abrasive Technology has developed a unique veined PCD drill which offers the Process Engineer improved productivity and significant cost reduction potential. The application of fully sintered PCD (Polycrystalline diamond) veined technology to the drilling of carbon fiber composite material gives excellent results. Current processes use tungsten carbide drills which suffer from very short tool life in this aggressive machining environment. Twist drills manufactured with veined PCD provide a major step forward in tool life while maintaining consistently high tolerance control and surface finish performance. Greater operating parameters are also possible with these tools.

INTRODUCTION

The following case study shows early test results from a drilling improvement program conducted at a leading European aerospace manufacturer. The program objective was to replace tungsten carbide drilling and subsequent reaming with a one shot solution producing an H8 tolerance hole in carbon fiber composite. The life of the tungsten carbide drills and reamers was approximately 40 holes.

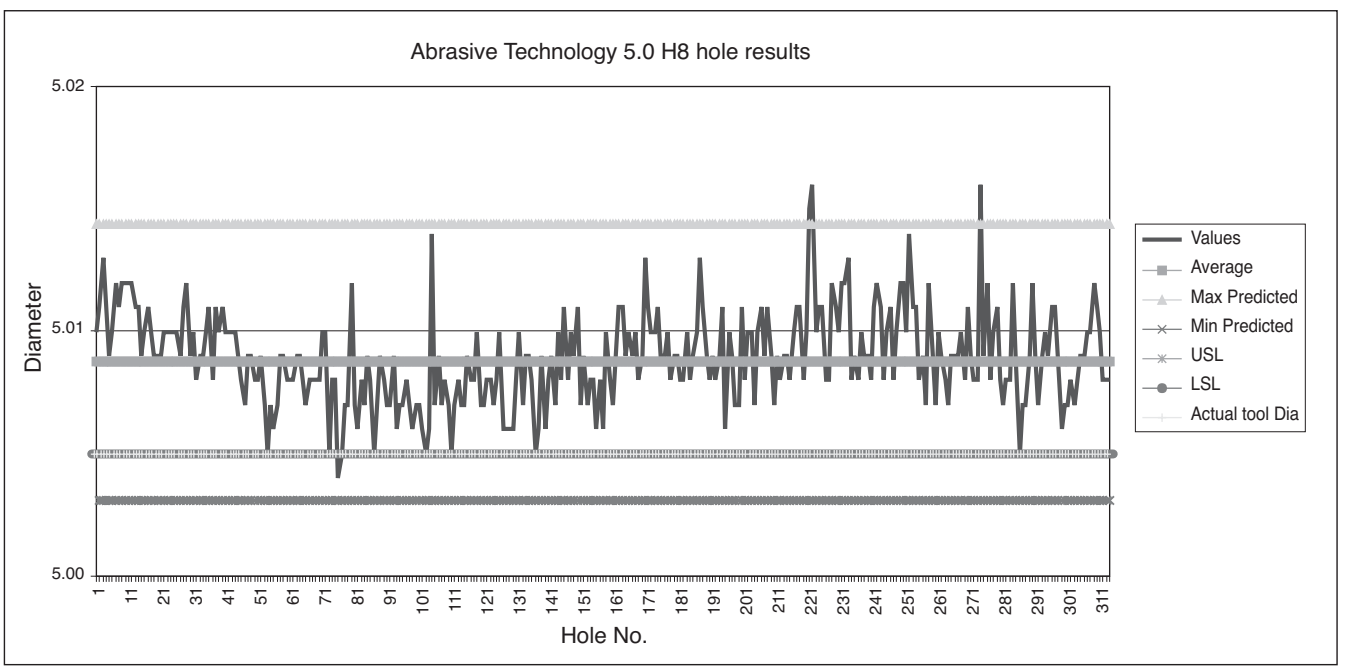
TEST SPECIFICATION

The study was conducted using a patented* Abrasive Technology Everlast® veined PCD twist drill with two spiral, 30 degree flutes, and a standard 120 degree included angle point.

- The carbon/glass fiber composite panel was 4.3mm thick with a woven glass outer layer to reduce de-lamination.
- The tests were carried out on a Matsuura machining center at the following machining parameters:
- Spindle Speed - 12300 rpm. Feed rate - 0.019 mm per rev. Flood coolant was used.

RESULTS

The following data table shows the test results for 315 drilled holes drilled with the AT Everlast® veined PCD drill. The results show little or no evidence of size deviation. The customer's tolerance requirements of H8 were easily reached and both breakout and de-lamination were satisfactory.



The graph above shows the maximum range for the hole size to be 0.011mm and a standard deviation for the hole size at 0.002mm.

"We are extremely impressed with the test results from the Everlast® drill. We have no doubt, looking at the test results, that this drill will produce over 2000 holes to H8 tolerance before requiring resharpening"

Manufacturing Development Engineer - Customer

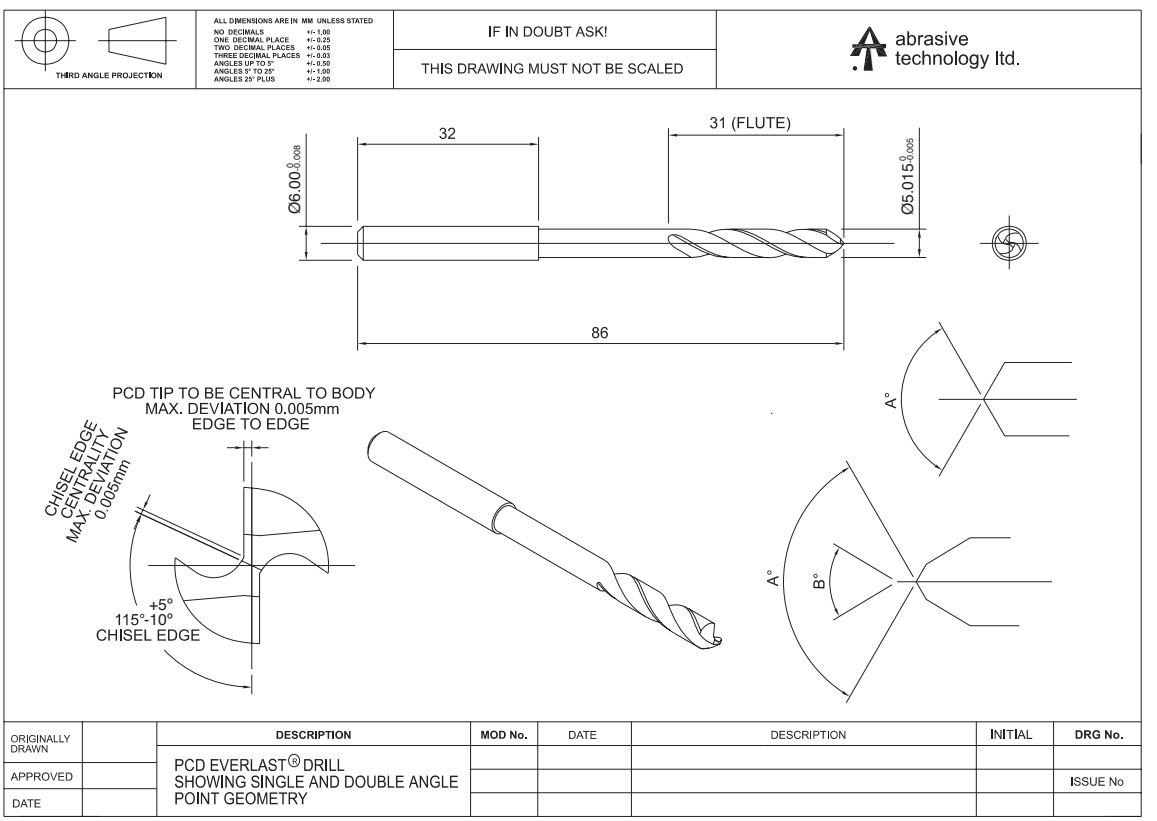
*US Patent No. 5,580,196 European Patent EP0560951

Abrasive Technology 5.0 H8 hole results

Hole diameters (mm)

Drill hole row number	Drill hole col. no.	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000	19.000	20.000	21.000
	1.000	5.005	5.005	5.005	5.003	5.003	4.999	5.002	5.002	5.002	5.003	5.002	5.005	5.004	5.001	5.002	5.006	5.003	5.003	5.006	5.004	5.002
	2.000	5.006	5.006	5.003	5.002	5.003	5.000	5.002	5.004	5.003	5.000	5.004	5.004	5.003	5.005	5.004	5.003	5.006	5.004	5.004	5.000	5.002
	3.000	5.008	5.005	5.004	5.004	5.004	5.002	5.004	5.002	5.003	5.001	5.002	5.005	5.003	5.004	5.003	5.003	5.007	5.002	5.003	5.002	5.003
	4.000	5.006	5.004	5.004	5.004	5.004	5.002	5.001	5.003	5.002	5.004	5.003	5.003	5.005	5.002	5.004	5.007	5.006	5.007	5.003	5.002	5.002
	5.000	5.004	5.004	5.005	5.003	5.003	5.007	5.002	5.002	5.003	5.001	5.003	5.004	5.003	5.002	5.004	5.006	5.003	5.004	5.011	5.004	5.003
	6.000	5.005	5.004	5.006	5.003	5.002	5.002	5.002	5.000	5.005	5.003	5.001	5.008	5.004	5.006	5.008	5.005	5.005	5.002	5.004	5.007	5.004
	7.000	5.007	5.005	5.003	5.004	5.003	5.001	5.003	5.002	5.001	5.004	5.003	5.006	5.005	5.003	5.005	5.007	5.006	5.005	5.007	5.004	5.004
	8.000	5.006	5.005	5.006	5.002	5.003	5.003	5.002	5.003	5.001	5.002	5.001	5.005	5.008	5.005	5.006	5.007	5.003	5.004	5.003	5.002	5.005
	9.000	5.007	5.005	5.005	5.000	5.003	5.002	5.001	5.002	5.001	5.005	5.005	5.005	5.006	5.005	5.006	5.006	5.005	5.003	5.005	5.004	5.005
	10.000	5.007	5.006	5.006	5.002	5.003	5.004	5.002	5.002	5.001	5.003	5.003	5.006	5.004	5.002	5.003	5.003	5.007	5.002	5.006	5.005	5.007
	11.000	5.007	5.005	5.005	5.001	5.005	5.003	5.002	5.004	5.003	5.006	5.002	5.004	5.003	5.005	5.005	5.004	5.007	5.004	5.003	5.004	5.006
	12.000	5.007	5.004	5.006	5.002	5.005	5.000	5.001	5.003	5.005	5.003	5.004	5.004	5.004	5.006	5.010	5.003	5.005	5.004	5.002	5.006	5.006
	13.000	5.006	5.006	5.005	5.004	5.000	5.002	5.000	5.003	5.002	5.005	5.006	5.005	5.003	5.004	5.011	5.005	5.009	5.004	5.003	5.006	5.003
	14.000	5.006	5.007	5.005	5.004	5.003	5.004	5.001	5.005	5.004	5.004	5.006	5.003	5.004	5.006	5.005	5.004	5.006	5.005	5.003	5.004	5.003
	15.000	5.004	5.004	5.004	5.003	5.003	5.003	5.009	5.002	5.004	5.006	5.004	6.004	5.006	5.004	5.006	5.004	5.006	5.003	5.007	5.001	5.003

DATE OF TRIAL	VARIOUS	TOOL HOLDER	SPEED INCREASER	AVERAGE HOLE SIZE	5.004mm
TYPE OF MATERIAL	CFC	TOOL DESCRIPTION	2 FLUTE PCD VEINED DRILL	STANDARD DEVIATION	0.002mm
PANEL REFERENCE	Abrasive Tech 001 & 002	PANEL THICKNESS	4.3mm	MAX PREDICTED	5.009mm
SPEEDS R.P.M.	12,300	COOLANT	ECOCOOL SLF (FLOOD)	MIN PREDICTED	4.998mm
FEEDS mm/REV	0.019	HOLE USL	5.018	PROCESS SPREAD	0.011mm
ACTUAL TOOL DIA	5.005mm	HOLE LSL	5.000	SPEC WIDTH	0.018mm
		RANGE	0.011mm		



For more information on how Abrasive Technology can improve your drilling, contact:
Abrasive Technology Ltd. - European Headquarters. London, UK. Tel: 44.20.7471.0200 • Fax: 44.20.7471.0202
www.abrasive-tech.com

World headquarters - Lewis Center, Ohio USA

abrasive technology

WORLD HEADQUARTERS
Abrasive Technology, Inc.
8400 Green Meadows Dr.
P.O. Box 545
Lewis Center, Ohio 43035 USA
Ph: 1.740.548.4100
Fax: 1.740.548.7617

EUROPEAN HEADQUARTERS
Abrasive Technology Ltd.
Roxby Place, Fulham
London
SW6 1RT United Kingdom
Ph: 44.20.7471.0200
Fax: 44.20.7471.0202

ASIAN HEADQUARTERS
Abrasive Technology Asia Pacific Pte Ltd
Blk 1093 Lower Delta Rd. 05-11/13
Tiong Bahru Industrial Estate
Singapore 169204
Ph: 65.6270.6878
Fax: 65.6270.6877

NIOM CERTIFIED QUALITY ISO 9001:2000 MOST GLOBAL LOCATIONS

www.abrasive-tech.com