#### **HIGH PRESSURE COOLANT**

## HPC JET SPINDLE



Coolant-driven high pressure / high speed Jet Spindle in comparison to CNC machine spindle for various applications & industries.









## WELCOME TO THE WORLD OF HIGH-SPEED INNOVATION

Established in 2003, Colibri Spindles Ltd. has taken a leading position as a global high-speed spindle solutions provider, with the patented coolant-driven HSM Jet Spindle technology.

The introduction of the enhanced speed and feed capabilities of the unique coolant-driven HSM Jet Spindle helps satisfy ever-growing demands for increased tool life, higher production rates and lower costs for a wide range of manufacturing sectors around the world.

Colibri's R&D team is continuously developing new and upgraded Jet Spindle models, tools and accessories; representing very real technical advancements for a wide variety of applications. Colibri's products and processes are stridently tested and validated.

THE PATENTED HPC HSM JET SPINDLE is a robust, coolant-driven, high speed auxiliary spindle specially engineered to work with high pressure coolant pumps. In addition, the HPC Jet Spindle offers real time, wireless RPM monitoring and display. It's a compact plug & play unit that fits on an ACT or turret with no installation or external power feeds required. Compatible with most machine adaptor models.





#### **TEST SUMMARY – MILLING OPERATION**

Customer tested the unit to improve productivity, tool life and to reduce production cost. Colibri's TJS-HPC (High Pressure) Jet Spindle





Test Date	2017
Country	Czech Republic
Industry	General Industry
Application	Milling
Material Group	1.2842 220HB
Machine	Haas VF-3
Pump Pressure	13kW; 70Bar
Coolant	Emulsion

Test Data	Machine Spindle	HPC Jet Spindle	
Cutting tool (Iscar)	EC-A2 015-025-4C6R.2H50		
Tool Dia. (mm)	1.	.5	
No. of teeth	2	2	
Grade	IC T	702	
Vc (m/min)	38	175	
n (RPM)	8,064	37,136	
Fz (mm)	0.0081		
Overhang (mm)	2	0	
Vf (mm/min)	131 602		
ae (mm)	1.	.5	
ap (mm)	0.1		
l (mm)	127		
Q cm <sup>3</sup> /min	0.02	0.09	
Parts per edge	1.5	27	
Machining time/part (min)	19:26	04:13	
Savings		78.3%	



#### POSITIVE RESULTS: Time savings 78.3% Productivity savings 65%

#### **Overall Productivity %:**

Machine Spindle vs. HPC Jet Spindle





## **TEST SUMMARY MILLING / ENGRAVING OPERATIONS** Customer conducted multiple tests on Inconel part Colibri's TJS-HPC (High Pressure) Jet Spindle





Test Date	2017
Country	Austria
Industry	General Industry
Application	Finishing / engraving
Raw Material	Pre-machined
Material	Inconel
Machine	WFL-M80 Multiturn
Power & Pressure	45kW / 80Bar
Coolant	Emulsion
Adaptor	Camfix 8

#### Tooling & time cost per part

Manufacturer	Machine Spindle	HPC Jet Spindle
Machine Cost per Part (€)	8.18	1.66
Total Machining Cost per Part (€)	11.18	4.66
Cost Reduction per Part (€)	0	6.53
Savings		58.4%

Test Data	Machine Spindle HPC Jet Spindl		
Tool Type	Solid Carbide 60°		
Diameter (mm)	5	5	
No. Flutes	1	-	
Overhang (mm)	19	91	
Cutting Speed (m/min)	113	700	
Spindle Speed (min-1)	5,995 37,136		
Coolant Pressure (bar)	59		
Depth of Cut (mm)	0.4		
Cutting Width ae (mm)	0.4		
Working length (mm)	350		
Feed per Tooth (mm)	0.015		
Table Feed (mm/min)	90 557		
No. of Cuts	1	-	
Parts per Cutter	20		
Surface Quality	Good		
Chip Shape	Fragments		
Wear	Flank Wear		
Metal Removal Rate (cm3/min)	0.01 0.09		
Cutting Time/Part (sec)	233.5 37.7		





#### **GENERAL INDUSTRY**

### TEST SUMMARY FACE MILLING / SLOT MILLING / POCKET MILLING

Customer conducted multiple tests to prove efficiency of the HPC Jet Spindle technology. Colibri's TJS-HPC (High Pressure) Jet Spindle



#### Machining Time: 222% FASTER!

#### **Customer remarks:**

The HPC Jet Spindle demonstrated clear advantages in terms of tool life, speed, surface quality and accuracy.

Test Date	2017
Country	Germany
Industry	General Industry
Application	Milling
Material	Inconel 1.2767 (45NiCrMo16), HRC58
Machine	Hermle C32 U
Coolant Pressure	55 Bar
Coolant type	Emulsion
Adaptor	HSK A- 63

#### Speed:

- In comparison to the machine spindle with a rotational speed of n = 18,000 rpm, the HPC Jet Spindle can sustain a higher feed rate by a factor of 2.22, due to its increased rotational speed n = 40000 min-1.
- The customer set coolant pressure to 55 Bar in the HPC Jet Spindle, in order to reach the desired rotational speed of 40,000 RPMs.

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Test Part: Slot Milling, Plan Milling, Pocket Miling

Pocket Miling: 20x10 mm, 3 Steps, 2.00 mm Depth



Application	Face I	Milling	Slot	Milling	Pc	ocket Milling
Test Data	Machine Spindle	HPC Jet Spindle	Machine Spindle	HPC Jet Spindle	Machine Spindle	HPC Jet Spindle
Tool Type	Mitsubishi Ø1	VFMDD0100 LZ4	Mitsubishi Vf	MDD0100 Ø1Z4	Mitsubisł	ni VFMDD0100 Ø1Z4
Diameter (mm)	1n	nm	1	mm		1mm
No. Flutes		4		4		4
Spindle Speed (RPM)	18,000	40,000	18,000	40,000	18,000	40,000
Cutting Speed (m/min)	57	126	57	126	57	126
Feed per Tooth (mm)	0.0	005	0	.005		0.005
Table Feed (mm/min)	360	800	360	800	360	800
Lateral Delivery	0.	66	[	1.00		0.10
Pecking (mm)	0.	05	(	).50		0.50
Surface quality Ra	0.305	0.22	-	-	-	-



#### **TEST SUMMARY - SHOULDER MILLING OPERATIONS**

Customer conducted multiple tests to prove efficiency of the HPC Jet Spindle technology. Colibri's TJS-HPC (High Pressure) Jet Spindle



Test Data	Machine Spindle	HPC Jet Spindle	
Tool	Solid carbide end mill		
Diameter (mm)	3	3	
No. of Flutes	3	3	
Overhang (mm)	22	20	
Cutting Speed (m/min)	94	188	
Spindle Speed (rpm)	9,974	19,947	
Depth of Cut (mm)	1.5		
Width of Cut (mm)	2		
Machining Length (mm)	848		
Feed per Tooth (mm/t)	0.02		
Table Feed (mm/min)	598 1,197		
Number of Passes	4		
Parts per Cutter	5	0	
Avg. Chip Thickness (mm)	0.02		
Surface Quality	Go	od	
Chip Type	Comma/Helical		
Wear	Flank Wear		
No. of Corners Tested	10		
Needed Surface Quality (Ra/Rz)	0.25		
Metal Removal Rate (cm3/min)	1.8 3.59		
Cutting Time/Part (sec)	233.5	37.7	







#### **TEST SUMMARY - MILLING OPERATIONS**

Customer wanted to test efficiency for machining cast iron parts. Colibri's TJS-HPC (High Pressure) Jet Spindle



#### Tooling & time per part (min)

**POSITIVE RESULTS:** 

Savings: 25.1%

**Total Machining Cost per Part:** 



**25.1%** Savings

Test Date	2017
Country	Austria
Industry	Job shops / mechanical
Application	Ball nose milling
Raw Material	Back plate casting
Material	DIN GGG 40
Machine	DMG - DMC 65 monoBLOCK
Power & Pressure	25kW / 40 Bar
Coolant	Emulsion
Adaptor	DIN69871 40

Test Data	Machine Spindle	HPC Jet Spindle	
Tool	Solid carbide 90°		
Diameter (mm)	5		
No. of Flutes	2	2	
Overhang (mm)	150	180	
Cutting Speed (m/min)	368	490	
Spindle Speed (rpm)	19,523	25,995	
Depth of Cut (mm)	0. 5		
Width of Cut (mm)	0.5		
Machining Length (mm)	120,000		
Feed per Tooth (mm/t)	0.038		
Table Feed (mm/min)	1,499 2,002		
Number of Passes	1		
Parts per Cutter	2		
Avg. Chip Thickness (mm)	0.01		
Chip type	Fragments		
Surface Quality	Good		
Wear	Flank Wear		
Metal Removal Rate (cm3/min)	0.37 0.50		
Cutting Time/Part (sec)	4,802.0 3,597.1		





#### **TEST SUMMARY - FINISHING OPERATIONS**

Customer wanted to test efficiency for finishing operations for aerospace parts. Colibri's TJS-HPC (High Pressure) Jet Spindle



## Total Machining Time per Part (min) Machine Spindle HPC Jet Spindle Image: Spindle for the spind

#### POSITIVE RESULTS: Productivity increase: 71.2%

Test Date	2017
Country	Austria
Industry	Aerospace
Application	Finishing
Raw Material	Pre-machined
Material	DIN S355 JR
Machine	Hermle C 40 U
Power & Pressure	25kW / 60 Bar
Coolant	Emulsion
Adaptor	HSKA63

Test Data	Machine Spindle HPC Jet Spind		
Tool	Solid carbide 90°		
Diameter (mm)	5		
No. of Flutes	1		
Overhang (mm)	18	0	
Cutting Speed (m/min)	188	707	
Spindle Speed (rpm)	9,974	37,508	
Depth of Cut (mm)	0.35		
Width of Cut (mm)	0.35		
Machining Length (mm)	9,700		
Feed per Tooth (mm/t)	0.05		
Table Feed (mm/min)	499 1,875		
Number of Passes	1		
Parts per Cutter	50		
Avg. Chip Thickness (mm)	0.02		
Surface Quality	Good		
Wear	Flank Wear		
No. of Corners Tested	10		
Needed Surface Quality (Ra/Rz)	0.10 0.50		
Metal Removal Rate (cm3/min)	0.06 0.23		
Cutting Time/Part (sec)	1,167.1 310.3		











MEDICAL

#### **TEST SUMMARY SLOTTING OPERATION**

The customer needed to save time machining a precision dental implant placement tool.





Test Date	2017
Country	Israel
Industry	Medical Device
Application	Slotting
Material Group	Aluminum 7075 15-20HRC

Operation				
Test Data	Machine Spindle	HPC Jet Spindle		
Cutting Tool Ø (mm)	End-Mill 2.5			
Overhang	3	0		
Run-out (µm)	5	3		
No. of teeth - Z	3	}		
Depth of cut - ap (mm)		13		
Cutting width - ae (mm)	2.5			
Spindle RPM - n (in material)	10,000	30,000		
Cutting Speed - Vc (M/min)	1,230	3,690		
Feed per tooth - fz (mm/tooth)	0.041			
Feed / Revolution - fn (mm/rev)	0.123			
Feed - F (mm/min)	500	2,500		
Parts (pcs)	60	0		
Operation	Rou	ıgh		
Surface Finish	Go	od		



Results	Machine Spindle	HPC Jet Spindle
Cutting Time (sec)	180	60
Time savings (%)		66%





**GENERAL INDUSTRY** 

#### **TEST SUMMARY – DRILLING OPERATION**

Customer tested the unit to improve productivity and tool life finishing over 6,000 holes. Colibri's TJS-HPC (High Pressure) Jet Spindle



Test Date	2016
Country	Netherlands
Industry	General Industry
Application	Drilling
Material Group	1.2842 220 HB
Machine	SHW Unispeed 7
Machine Spindle Speed	8,000 RPMs
Coolant Pressure	30 Bar
Material	RVS 316 (tube)
Application	Drilling holes
Coolant	Houghton Adrana A2859

Test Data	HPC Jet Spindle	
Cutting Tool	SCD-010-004-030 AP4 IC908	
Spindle Adaptor	DIN 69871 50	
Tool holder Shank	ER-32	
Collet Type	ER-11 2-3	
Tool overhang (mm)	16	
Run-out (µm)	0.005	
Tool cutting diameter - D (mm)	1.0	
Depth of cut - ap (mm)	0.6	
Spindle RPM - n	24,000	
Cutting Speed - Vc (M/min)	75	
Feed per tooth - fz (mm/tooth)	0.008	
Feed / Revolution - fn (mm/rev)	180	
Operation - Semi / Finish	Finish	

Results	
Tool life (No of holes)	6,504
Cutting Time (per hole)	1.5 Sec
Surface Finish	Good
Total time	166 min (12 tubes / 542 holes each)





Colibri Spindles Itd. Lavon Industrial Park, 2011800, Israel Tel +972 4 9089100 Fax +972 4 9589061 marketing@colibrispindles.com www.colibrispindles.com



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