Extrude Hone press release

December 10, 2018

RENISHAW AND EXTRUDE HONE ADDRESS INTERNAL FINISHING ON 3D-PRINTED PARTS DESIGNED BY MOOG Inc.

RENISHAW, MOOG, EXTRUDE HONE, COOLPULSE AFM (Abrasive Flow Machining), Additive Manufacturing, Manifold

Extrude Hone processes ensure complete removal of partially-sintered material on internal surfaces of a complex titanium manifold.

Extrude Hone has been a leader in finishing since the 1960's, working closely with the aerospace, automotive, medical and energy generation supply chains to improve mechanical properties of parts for increased component life and to improve fluid dynamic properties of parts for improved fuel efficiency, all whilst offering productivity gains in manufacturing. Recognized as the industry's 'problem-solver',

Extrude Hone has more recently been approached by companies facing challenges in internal and external surface finishing for Additively Manufactured components.

For most, Renishaw need no introduction. Recognized as one of the leading companies in the additive manufacturing sphere, not only for their machinery but also for their application engineering and ability to prescribe complete additive solutions to customers, it is no surprise that some of the world's leading OEMs across various industries place their trust in Renishaw. For more information about Renishaw's additive solutions, see:
http://www.renishaw.com/en/additive-manufacturing-systems--15239

In order to provide a complete solution, finishing must be considered but can be a hard nut to crack due to the relatively rough surfaces and complex geometries produced by Additive Manufacturing techniques.

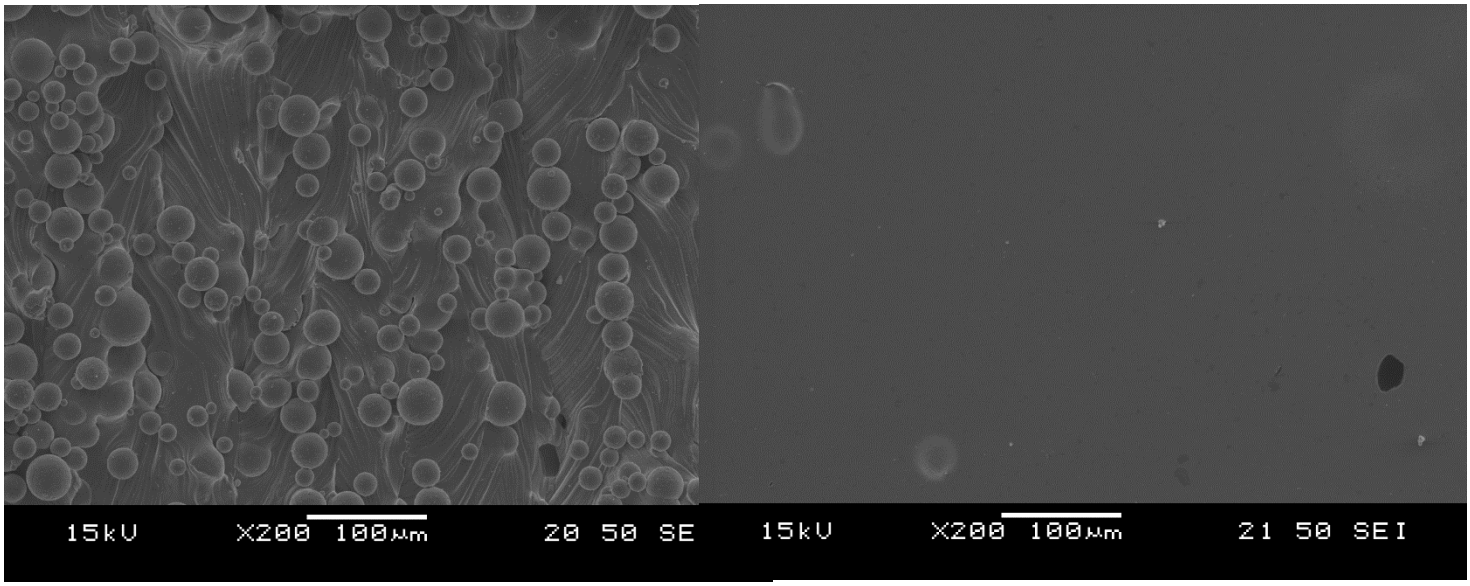
Renishaw tasked Extrude Hone with the complete removal of partially-sintered and unsintered material on the internal surfaces of a titanium demonstrator part (designed by MOOG) representative of an aerospace manifold which was built using Renishaw's industry-leading quad laser technology. Being manufactured additively, the manifold had organic features including convoluted passages with no line-of-sight and diameter changes along bores making this application a very tall order for most finishing processes.

Using a combination of its Abrasive Flow (AFM) and COOLPULSE technologies, Extrude Hone was able to remove all partially sintered material and improve the roughness of all internal surfaces, COOLPULSE being used for in the main bores with steps in diameter and AFM being used for the convoluted passages.

Here are the results:

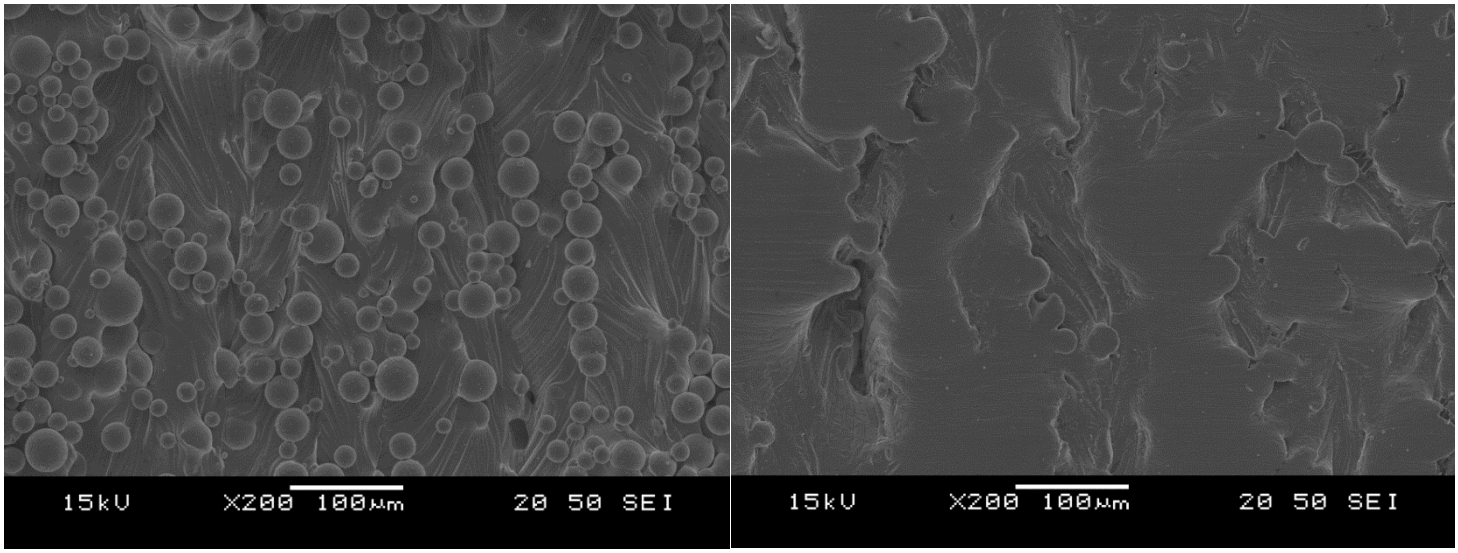
Primary Objective: Remove all partially sintered and unsintered material

COOLPULSE:



Control Surface - SEM x200 Magnification **COOLPULSE Surface - SEM x200 Magnification**

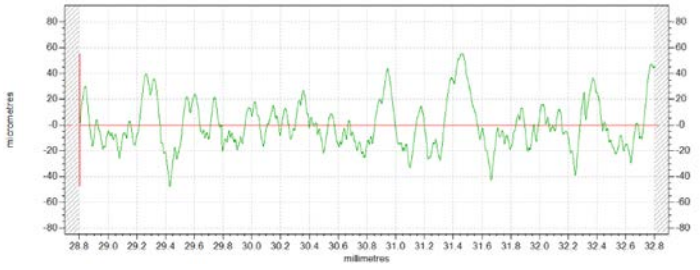
Abrasive Flow Machining (AFM):



Control Surface - SEM x200 Magnification **AFM Surface - SEM x200 Magnification**

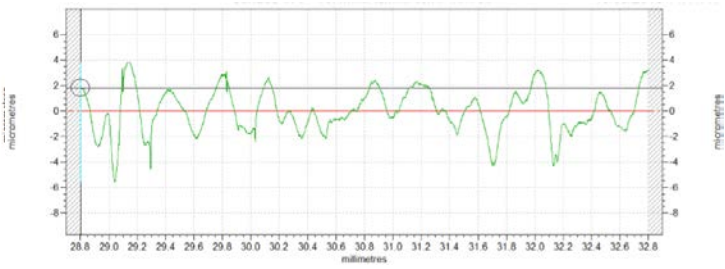
Secondary objective: Improve surface roughness

Results:



Ra	14.8442	µm	Rq	18.6181	µm
Rsk	0.6139		Rku	3.1671	
Rp	42.5169	µm	Rv	36.8230	µm
RLo	4.8119	mm	Rt	103.1705	µm
Rlq	166.79	µm	Rdq	35.05	°
Rda	30.69	°	Rz	79.3399	µm
RS	83.40	µm	RSm	294.50	µm
Rln	4.0000	mm	Rc	53.7758	µm

Control Surface



Ra	1.3495	µm	Rq	1.6838	µm
Rsk	-0.2066		Rku	3.0015	
Rp	3.1043	µm	Rv	3.7386	µm
RLo	4.0074	mm	Rt	9.3930	µm
Rlq	164.58	µm	Rdq	3.68	°
Rda	2.22	°	Rz	6.8430	µm
RS	173.27	µm	RSm	455.23	µm
Rln	4.0000	mm	Rc	5.6011	µm

After EH processes

Statement from Renishaw's Alex Freeman (Senior Development Engineer - Special Projects):

"We approached Extrude Hone due to their reputation in the field of internal surface finishing. After processing the demonstrator with Abrasive Flow and COOLPULSE, we were unable to detect any partially sintered material on the internal surfaces of the manifold. We also noted improvements in the surface roughness, of particular interest were the small internal non-line-of-sight channels. We consider the results of the trial to be very promising and will be suggesting Extrude Hone's AFM and COOLPULSE processes to customers with similar design requirements to this demonstrator. The internal surfaces are the most advanced we've seen to date."

Extrude Hone finishing solutions are suitable for aluminum, stainless steel, Inconel, and titanium and can address a broad range of geometries meaning that most 3D-printed components can be finished by an Extrude Hone technology or combination of technologies.

Demonstrating its commitment to additive technology, Extrude Hone recently set up a brand-new business unit called ‘Extrude Hone Additive’ and is aiming to establish itself as the ‘go-to’ partner for additive finishing as the industry grows and matures.

For more information on Extrude Hone’s additive solutions:

About Extrude Hone.

Extrude Hone® serves customers in many market segments, including automotive, aerospace, heavy industry, medical, and general engineering. From engineering to fully automated solutions, Extrude Hone supports its customers with edge blending, shaping and fine-flow tuning surfacing solutions through its engineered processes and state-of-the-art finishing technologies, delivering ultimate added value, and improving productivity and quality.

Extrude Hone offers customers access to AFM (Abrasive Flow Machining), ECM (Electrochemical Machining), ECM Dynamic, PECM (Precise Electrochemical Machining), COOLPULSE, and TEM (Thermal Energy Method) via our Technical Centers and Center of Excellence, ensuring our presence during all of the most critical feasibility tests and demonstrations – from the early design phases by producing small batches of components for prototyping through testing and supporting the ramping stage in our contract shops prior to the final delivery of state-of-the-art equipment. Our company offers first-class service around the world.

Contact us: help@extrudehone.com