

Welcome



Introduction to hybrid AM

Overview of the OpenHybrid project

David Wimpenny Chief Technologist -NCAM

MTC

Welcome & House keeping



- Fire alarms
- Phones
- Facilities





9:30am - Morning Session

- Introduction to hybrid additive Manufacturing
- Overview of the OpenHybrid project
- Development of processing tools for material deposition, stress relieving and inspection
- 5 axes machine tool and gantry platform development

Refreshment Break

- New software tools for hybrid AM
- Simulation of hybrid AM
- Hybrid AM case studies
- Commercialisation and further developments in hybrid AM

Lunch & Networking



Timetable – Afternoon Session



2:00pm – Afternoon Session

• Showcasing other H2020 Hybrid AM projects



- LASIMM
- 4DHybrid
- HyproCell



• 4:00pm Conference close





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Hybrid Additive Manufacturing



Directed Energy Deposition (DED)











CNC Machining

- Repeatable
- Precise
- Good surface finish
- High productivity
- But waste material



Window Frame – Gti Precision http://gtiprecision.com/category/industryapplications/aerospace-commercial/

Additive Manufacturing

- Less Material Wastage
- Geometrical freedom
- Material options
- Long cycle-time
- Poor surface finish



Courtesy 3TRPD





 \uparrow Productivity (AM) + \uparrow Surface Finish (CNC)

DPENHYBRID



DENHYBRID

1996	Combined Metal Build Up (CMB)	Fraunhofer Institute of Production Technology & Fraunhofer Institute of Laser Technology	3-axis vertical	Fixed to side of spindle
1990's	Laser Aided Manufacturing Process (LAMP)	University of Missouri	5-axis vertical	Fixed to side of spindle
2000	Selective Laser Cladding (SLC) and milling	National Taiwan University of Science and Technology	3-axis vertical	Fixed optics (separate station)



A REVIEW OF HYBRID MANUFACTURING

K. A. Lorenz*+, J.B. Jones§, D. I Wimpenny* and M.R. Jackson+, SSF2015, Texas

Direct Manufacturing of Metal Prototypes and Prototype Tools Prof. Dr.-Ing. Fritz Klocke, Dipl.-Ing. H. Wirtz, Fraunhofer Institute of Production Technology, Aachen, FRG Dipl.-Phys. W. Meiners, Fraunhofer Institute of Laser Technology, Aachen, FRG, SSF Texas 1996



DPENHYBRID

Some of the barriers include.....

- Availability of easy to use software
- Lack of commercial system suppliers
- Benefits of the approach not properly understood
- Need for industrial case studies
- Lack of knowledge in industry



OpenHybrid addresses these and other barriers to adoption





Start date:	1st October 2016	Horizon 2020
Duration: 3 voore		FoF1 – 2016
Duration. 5 years		Novel hybrid approaches for additive and
Total value:	€6.6437m	subtractive manufacturing machines
EU:	€5.133m	Draigate 722017
Switzerland:	€1.643	Project. 725917
Participants:	14	







Several processes in a single machine enabling parts to be made in an unbroken process

&



Hybrid Additive Manufacturing (AM) solution for a wide range of machine platforms and applications for small and large companies





Seamless transition from machining to cladding and inspection













JPENHYBRID

Develop all-in-one hybrid additive/subtractive system based on laser cladding and 5 axes milling....

- 1. Smart cladding tools which provide information on their status/condition
- 2. Extend the capabilities of HMTs cladding heads to include wire feed-stock
- 3. Investigate improved inter gas shielding methods
- 4. Develop and test in-process stress relieving and heat treatment methods
- 5. In process part inspection (accuracy and NDT)
- 6. New easy to use software to control the combined machining and cladding process
- 7. Develop comprehensive suite of process simulation tools
- 8. Integrate the technology on two new platforms (5-axes milling machine and gantry)
- 9. Test the performance of the new hybrid systems
- 10. Undertake demonstration case studies in three key end-use sectors



SPENHYBRID

To help accelerate the industrial adoption of technology developed....

- Develop cost and LCA models to help organisations understand the benefits of hybrid AM
- Produce a range of training courses
- Support the development of relevant standards



Open platform approach which will place Europe in a leading position in hybrid AM;

- <u>Anyone</u> can design new process tool which are compatible with HMTs docking system,
- Easy to use software,
- Modular docking system,
- Compact/low weight/robust processing tools,
- Suitable for wide range of machine tool platforms,
- New machines and retrofitable







Project consortium

TWI Sheffield

WEIR

HMT

TWI Wales

MTC

Picasoft

ESI

ÖPENHYBRID BCT. CRF get it right® TWI mtc GÜDEL YBRID Manufacturing Technology Cent Fraunhofer +GF+ IPT





EWF

BCT

SIEMENS

Gudel

CFR

IPT

GF

Roles



Organisation	Role	Status
GF	Machine tool manufacturer	IND
Güdel	Gantry automation manufacturer	IND
НМТ	Hybrid DED system manufacturer	SME
ВСТ	Adaptive CAM software	SME
Picasoft	CAM software	SME
ESI	Process simulation	IND
TWI (Rotherham)	Powder laser DED processing	RTO
TWI(Wales)	In-process inspection	RTO
Fraunhofer IP	Wire laser DED processing	RTO
МТС	DED system integration & testing, In-process inspection	RTO
Siemens	Power generation equipment	IND
Weir	Mining and mineral processing equipment	IND
CRF	Automotive production	IND
EWF	Dissemination	RTO





Project is very ambitious but builds on significant experience







HSTM 1000











AMUEL

Tool changeable process tools

Patented technology

Award winning



Best multi-functional machine at the EMO show 2013











DENHYBRID

- Increased productivity,
- Wider range of process tools,
- Greater ease of integration from small to large platforms,
- Higher part quality,
- Improved ease of use.







GUDEL – Gantry Platform





GODEL

SPENHYBRID

Hybrid AM systems can be used for;

- New part manufacture
- Feature addition
- Wear / corrosion resistant layers
- Part repair





























Questions?







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Contact:

Dr. David Wimpenny Chief Technologist – Component Manufacturing Technology Group – MTC

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