

**Self-learning control system for freeform milling with high energy fluid jets
(CONFORM-JET)**

<http://www.conformjet.eu/>

Funded under 7th FWP (Seventh Framework Programme)

Research area: NMP-2008-3.2-2 Self-learning production systems

Coordinator

Contact Person: CARTLEDGE Paul

Tel: +44-1159515679

Fax: +44-1159513633

Email: [Contact](#)

Organisation: THE UNIVERSITY OF NOTTINGHAM

University Park., NOTTINGHAM

UNITED KINGDOM

Project description

Innovative control philosophies that enhance the capabilities of niche processing methods are of critical importance for EU manufacturers of high value added products made of advanced engineered materials. High Energy Fluid Jets (HEFJet) processing is a niche technology with outstanding capabilities: cuts any material at negligible cutting forces; generates virtual zero heat; uses the abrasive jet plume as a universal tool.

Nevertheless, freeform machining by High Energy Fluid Jets Milling (HEFJet_Mill) is still at infancy level. This is because no control solution for HEFJet_Mill exists. ConforM-Jet will develop and demonstrate, for the first time, a self-learning control system for HEFJet_Mill to generate freeform parts. This will be done by integrating models of HEFJet_Mill with patterns of multi-sensory signals to control the outcomes of jet plume workpiece interaction, i.e. magnitude and shape of abraded footprint; these are key issues in controlling the generation of freeforms via HEFJet_Mill.

This will be done via the following research steps:

- Develop a novel integrative energy-based model of HEFJet_Mill.
- Develop an innovative energy-based multi-sensing monitoring system for HEFJet_Mill.
- Develop a radically new control system for HEFJet_Mill of freeforms that is equipped with novel abilities:

Self-learning ability: Self-gauging of the energetic models of HEFJet_Mill vs. key energy-based sensory signals. Thus, whenever new working scenario occurs, updated models are employed by the model predictive controller.

Self-adaptive ability: The energy-based sensory signals, trained with the data available in the process database, will be taught to respond to process variations by feeding back the correct combination of process parameters.

– Demonstrate ConforM-Jet control strategy on multi-axis HEFJet_Mill systems to generate aerospace, medical, and optical freeform components made of difficult-to-cut materials (Ni/Ti alloys, optical glass).

Project details

Project Acronym: CONFORM-JET

Project Reference: 229155

Start Date: 2009-11-01

Duration: 48 months

Project Cost: 5.1 million euro

Contract Type: Small or medium-scale focused research project

End Date: 2013-10-31

Project Status: Execution

Project Funding: 3.76 million euro

Participants

| | |
|--------------------------------|----------------|
| ELLA-CS SRO | CZECH REPUBLIC |
| BAE SYSTEMS (OPERATIONS) LTD | UNITED KINGDOM |
| FUNDACION TEKNIKER | SPAIN |
| KUNGLIGA TEKNISKA HOEGSKOLAN | SWEDEN |
| FACHHOCHSCHULE NORDWESTSCHWEIZ | SWITZERLAND |
| WATERJET AG | SWITZERLAND |
| ZEEKO LIMITED | UNITED KINGDOM |
| FINECUT AB | SWEDEN |