

October
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PEPT-Flow Newsletter

Project Consortium

SMEs

CESAP	http://www.cesap.com
COLOREX	http://www.colorex.nl
EXTRICOM	http://www.extricom.de
EXTRUDER EXPERTS	http://www.extruder-experts.com
GENESIS	http://www.genesisps.co.uk
MAPEA	http://www.mapea.com
POLIMER TEKNIK	http://www.polimerteknik.com
RCT	http://www.rctsr.com
ROSSETER	http://www.e-nanoscience.com
SCC	http://www.sccconsultants.com
TREFFERT	http://www.treffert.org

Research Organisations

EINDHOVEN UNIVERSITY OF TECHNOLOGY	http://www.mate.tue.nl
FRAUNHOFER-ICT	http://www.ict.fraunhofer.de
SMITHERS RAPRA	http://www.rapra.net
UNIVERSITY OF BIRMINGHAM	http://www.bham.ac.uk

Associations

ASSOCOMPLAST	http://www.assocomplast.org
CCIAA	http://www.mi.camcom.it
BPF	http://www.bpf.co.uk
GKV	http://www.gkv.de
PAGEV	http://www.pagev.org.tr

For more information on the PEPT-Flow project, please visit our website:

<http://www.peptflow.com>

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About the project...

The PEPT-Flow project aims to apply the flow analysis technique of positron emission particle tracking (PEPT) for investigation of polymer flow and mixing behaviour within industrial twin-screw processes, determining the influence of machine design, process operation and polymer system.

The results generated will be used to establish knowledge-based machine design criteria and operation guidelines, and to further develop both new and existing commercial simulation and modeling software.

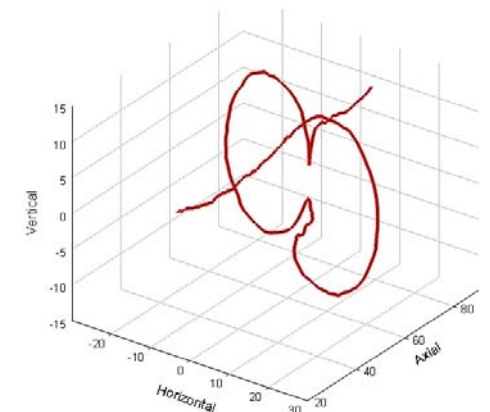
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Interpretation of PEPT data

In this newsletter we will investigate how the PEPT data can be used to characterize individual and combinations of screw elements.

- The PEPT-Flow project has progressed rapidly and a large amount of PEPT data has been generated on the experimental twin-screw extruder at the University of Birmingham.
- The technique generates an (X, Y, Z) positional coordinate against time every few milliseconds and this data is an important tool in the characterisation of individual and combinations of screw elements.

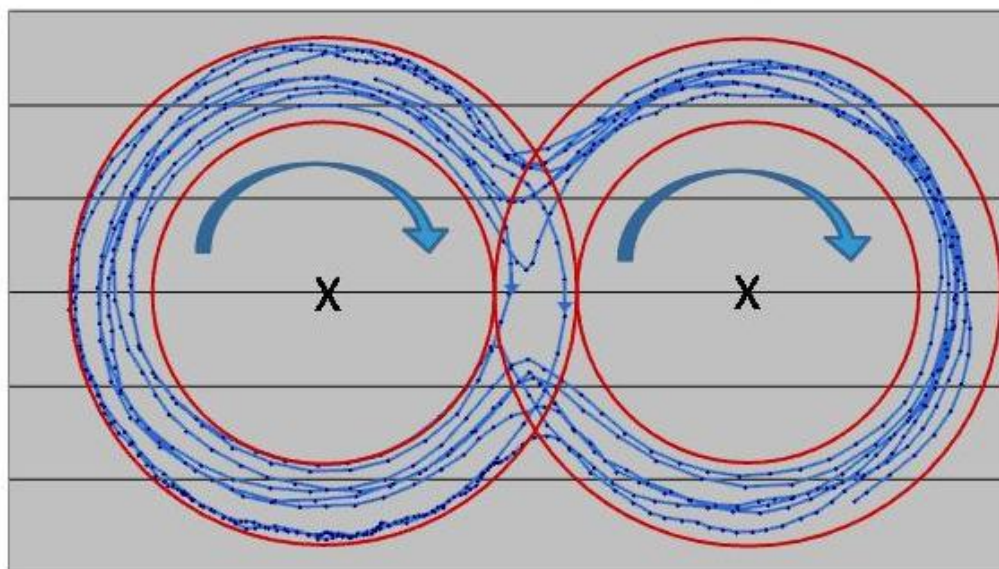


Flow through a conveying element.



PEPT Particle Trace

Cross Section of 27mm Extruder Viewed From Die End



The diagram shown above is the result of one run of the PEPT particle through three sets of kneading paddles set at 30°, 60°, and 90°. By superimposing the actual diameter of the barrel and the root diameter of the screw over the points observed we can see the accuracy of the technique. We can observe various things just from the particle trace.

- The left hand screw has eight complete paths whereas there are only six around the right hand screw.
- The two paths that go between the screws are both complete circuits of the left hand screw.
- There is also a collection of points at the bottom of the left hand screw implying that material tends to spend longer in this region than in any other region.

These observations confirm earlier work by other researchers that the left hand screw takes more power than the right hand screw, as viewed above.

This data has been collected from just one run. For every configuration there are typically between 20 and 30 runs. One of the challenges has been to handle all this information. Each run has to be analysed and divided into the individual 1D elements such as the 60° kneading block. For each individual screw element, it is possible to calculate comparable numbers such as residence time, trajectory lengths and velocities. The 20 to 30 sets of results for individual elements can then be combined to give average results for each type of element. The information from this hopefully gives a true representation of what happens in any particular type of screw element and the effect of nearby elements.

The averaged data may show that the graph given above is either typical of that screw configuration or untypical. It is the calculated average values and distribution around the average that will show the difference between one screw profile and another.

Upcoming PEPT-Flow Events

- **23rd October 2009**

PEPT-Flow Seminar featuring talks related to the work of the project from members of the consortium:

- Innovative polymer flow visualisation
- PEPT-Flow results and how to use them in practical compounding
- Simulation and optimisation of mixing in intermeshing co-rotating twin-screw extruders.

Location: Foreign Trade Centre, Istanbul, Turkey

- **27th November 2009**

Co-rotating Twin Screw Extruder: State of the Art and New Horizons: A PEPT-Flow Workshop

A workshop covering various aspects of the project, including talks on:

- Dispersive mixing in co-rotating twin screw extruders
- Mixing of polymeric liquids in co-rotating twin screw extruders
- Novel commercial software to predict the flow behaviour in co-rotating twin screw extruders.

Location: CESAP, Bergamo, Italy

- **9th December 2009**

Advances in Twin Screw Understanding: A Free PEPT-Flow Seminar

An overview of the PEPT-Flow project with talks on '*Twin Screw Extruders*', '*Initial PEPT results*', '*Simulation Software*' and '*Case Studies*'.

Location: Holiday Inn Frankfurt City-South, Frankfurt, Germany

The workshop will feature presentations by the project partners on the results of the project and how these can be used to benefit industry.

To view the Programme and download a Registration Form for these events, please visit: www.peptflow.com

