Project Number: NMP2-SE-2009-229266

Project Acronym: POLYTUBES

Project full name: 'A Process Chain and Equipment for Volume Production of Polymeric Micro-tubular Components for Medical (& non-Medical) Device Applications'

Collaborative projects targeted to SME's

NMP-2008-3.5-1: 'Volume production process chains for high throughput micromanufacturing'

Deliverable reference number and title:

D 7.1: Publishable Executive Summary (M36)

Due date of deliverable: 30-06-2012
Actual submission date: 03-06-2012

Start date of project: **July 1st 2009** Duration: **36 months**

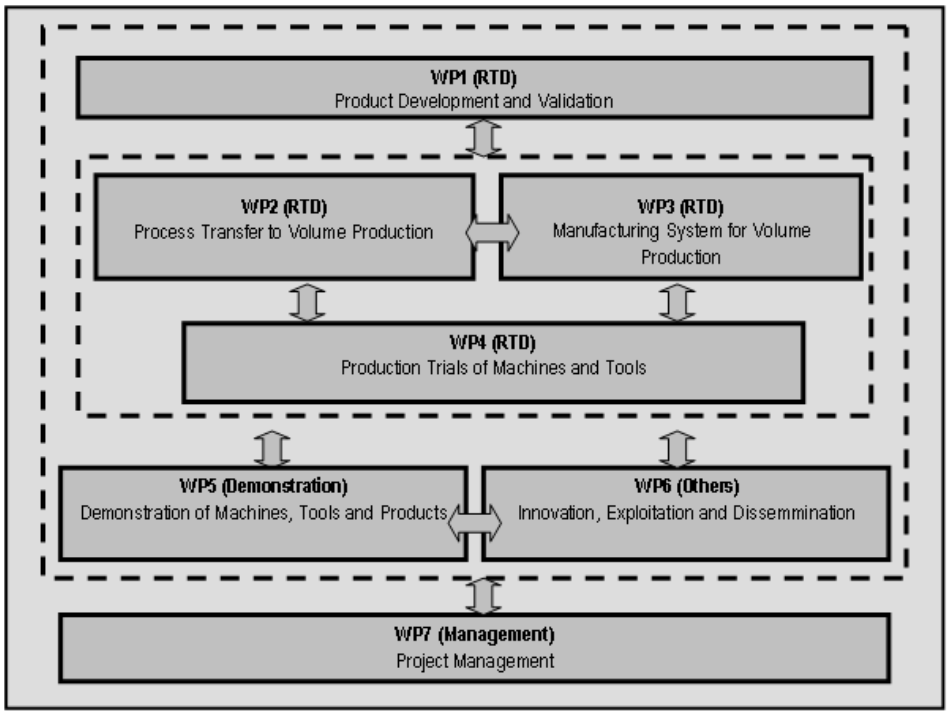
Project coordinator: Dr Erik Perzon
Project coordinator organisation name: Swerea IVF

Project co-funded by the European Commission within the Seventh Framework Programme		
Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Publishable Executive Summary

Project objectives: Uses of innovative polymer microtubular components render opportunities to innovate the product design to meet new social and economical needs. Potential applications include specially shaped functional components for an instrument innovated by the Polytubes consortium for electrophysiological study on human sperms, heat transfer structural and functional parts for micro-heat-exchangers, parts for capillary electrochromatography, etc. Besides efforts to ensure functional realisation of the innovative products which use polymer microtubular components, manufacturing challenges must be met to produce sophisticated microgeometrical features of the components with an efficiency which is economically viable.

The overall objective of the POLYTUBES project is to develop a process chain and corresponding micro-manufacturing platform for the manufacture of polymer-micro-tubes and tubular micro-components for innovative products (medical and non-medical applications). It aims to create new markets for EU SMEs with innovative and economically competitive micro-products and micro-manufacturing equipment to meet the needs for a wide range of emerging applications. The development should also support the SMEs to increase business opportunities with new volume production capabilities in micro-manufacturing. The development could place EU in a pole position in the manufacture and innovative applications of micro-tubular products.



The overall structure of POLYTUBES

List of beneficiaries:

POLYTUBES consortium: is at present comprised of 16 partners from 9 EU countries. 11 of the partners are SMEs. The project is managed by an experienced team with several project managers. Details of the partners profiles and contact, including Co-ordinator's are provided at the project web-site (www.polytubes.net)

Participant No.	Beneficiary name	Beneficiary short name	Country	Main Roles in the project
1*	Swerea IVF AB	IVF	SE	Polymer micro-tubular extrusion; polymer processing, process optimization & customization for product development; project co-ordination and management
2	Asociacion De La Industria Navarra	AIN	ES	Micro-tooling for manufacture of tubular components; Tasks on demonstration of machines, tools and Products
3	DIAD s.r.l.	DIA	IT	Exploitation and dissemination activities; innovation-related activities
4	Pascoe Engineering Limited	PAS	UK	Micro-tooling for manufacture of tubular components
5	Technology Development and Research Limited Liability Company	ANT	GR	E-collaborative platform for design and manufacture for SMEs; Control devices and software, including KBDS software for the monitoring and control of the POLYTUBES production system (Manufacturing Execution System).
6	MASMEC s.r.l.	MAS	IT	Provision of mechantronics solutions to tool motion/force actuation and control, and development of a control system (hardware and software) for an 5-axises of machine/tool system for flexible forming.
7	SYSMELEC S.A.	SYS	CH	Manufacturing system design; manufacturing system implementation (hardware & software)
8	Instituttet for Produktudvikling - IPU	IPU	DK	The micro-rolling system for tube Shaping.
9	MEDI-LINE s.a.	MED	BE	Development and manufacturing of disposable medical devices and other components; Explore the market for the new non-medical products for the project.
10	ANGARIS GmbH	ANG	DE	Micro-system development; development of thin films and devices and expertise to carry out measurements of the Seebeck coefficient, thermal conductivity and the Hall effect on the thin films. Explore the market for the new non-medical products for the project.

11	BPE International Dr Hornig GmbH	BPE	DE	Development and evaluation of micro-fluidic devices for highly integrated micro-modules. Explore the market for the new non-medical products for the project
12**	Fraunhofer-Gesellschaft zur Förderung der Angewandten Forschung e.v.	FRA-ILT & FRA IPA	DE	Development of new laser beam sources and components; Process transfer strategy (maturity model); Manufacturing System Design (Integrating Business and Process Chain).
14***	The University of Birmingham	BIM	UK	Electrophysiological studies in mature human sperms.
15	Fachhochschule Köln	ASC	DE	Forming processes and the industrial applications (micro-tube-radial-expansion of tubes and sheet materials, conventional sheet and tube forming).
16	University of Strathclyde	STR	UK	Product design; Manufacturing processes design; Forming tool design; Forming-machinery development; Manufacturing system development.
17	Imperial College of Science, Technology and Medicine	ICL	UK	Materials forming, process design, and multi-scale modelling activities.
18***	Ionotech Ltd.	ION	UK	Electrophysiological studies in mature human sperms.

* Coordinator

** Participant 12 represents two Fraunhofer institutes, ILT and IPA. These institutes are merged as a single legal unit.

*** At month 13 of the project time, BIM left the consortium and was replaced by ION. ION also took over all tasks originally planned for BIM.

The work performed:
Over the 36 month period that the project has been running, the work has focused on:

- Product designs for mass production of polymer micro-tubes and tubular micro-components
- Design, manufacture and evaluation of the first and second functional prototypes
- Manufacturing systems and platform design for volume production of polymer micro-tubes and tubular micro-components
- Process transfer strategy (Maturity Model)
- Process optimization/customization for product development
- Micro-Tooling for Manufacture of Tubular Components
- Polymer micro-tubes manufacturing system
- Polymer micro-tube shaping machine system
- Polymer micro-tube rolling machine system
- Polymer micro-tube expansion/inflation machine
- Laser sizing, trimming, drilling systems system
- Online product inspection system
- Integration of the machine systems on a common platform
- Web-based Collaboration platform, project web-site, development of specification for e-tool for manufacturing information capture and assessment
- Monitoring of technology development and market, dissemination of the project information.

Demonstrators:
Three functional demonstrators were realized:

- Demonstrator No 1: Patch Clamp Device for capture of human sperm cells to be used in In-Vitro Fertilization and cell studies.
- Demonstrator No 2: Micro-tubular Heat Exchanger
- Demonstrator No 3: Micro-tubular capillary for electrochromatography

Exploitable results:
A total of 22 exploitable results were identified in which foreground was developed:

#	Exploitable results	Main partners involved	Comments
	METHODS, PROCESSES, DESIGNS, SPECIFICATIONS, STUDIES ETC		
1	Design of the manufacturing-platform BASIS for micro-manufacturing	**SYS**, IPA	Design
2	Process for polymer-micro-tube production	**IVF**	Process
3	Process station for polymer tube micro-embossing process and the machine	**STR**	Process and prototype machine
4	Process station for polymer tube hydroforming and the machine	**ASC**	Process and prototype machine
5	Process station for laser drilling of polymeric micro-tubes and the machine	**ILT**	Process and prototype machine
6	Anti-adhesion thin coatings for micro-forming tools	**AIN**	Coating processes

7	Process station for cross-rolling of the polymeric mico-tubes and the machine	**IPU**	Process and prototype machine
8	Methodology of Design for Manufacture of the polymer-micro-tubular products.	**STR**, IPA, ASC and IPU	Methodology
	INSTRUMENTS, DEVICES, MATERIALS, SOFTWARE, SYSTEMS ETC		
9	The POLYTUBES Process Maturity Model	**IPA**	software
10	Polymer-micro-tubular products for medical applications	**ION**	Product prototype
11	Polymer-micro-tubular products for micro-fluidic applications	**ASC**	Product prototype
12	Polymer-micro-tubular products for electrophoresis applications	**IPA**	Product prototype
13	Micro-tool fabrication for micro-materials processing	**PAS**	Process and tools
14	Micro-mechanics modelling tool	**ICL**	Software and method
15	The hybrid system (hardware) for the laser-sizing/trimming/ drilling	**ILT**	Prototype subsystem
16	The control system for the advanced micro-manufacturing	**SYS**, IPA	Prototype subsystem
17	The handling system I: for tubular micro-manufacturing	**SYS** & IPA	Prototype subsystem
17-bis	The handling system II: for laser positioning	**MAS**, ILT, SYS	Prototype subsystem
18	The completed (prototype) PolyTubes Manufacturing System	**SYS**, IPA,	The complete system
19	Knowledge-based product design for manufacturing tool (KBDS software) for SMEs	**ANT**,	Software on-line
	DEMONSTRATORS, TRAINING ETC		
20	Industrial training and guidelines	**DIA**, AIN,	For industrial training
21	Educational Materials for University teaching	**STR**, ICL, ASC, IPU	Important for future uptake and use by new engineers and architects
22	Low-Cost Inner- handling module for laser process	**IPA**	Prototype subsystem

Project logo:

Contacts:
Contacts of all partners listed above are available at the project web-site (www.polytubes.net) in Partners profiles. For general enquire on exploitation and collaboration please contact:

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