

PROVAEN - PROcess VIsualisation and ANalysis ENdoscopic System

Consortium Partners

Keymed (Medical Equipment) Ltd: Pera: Leicester University: Dantec Dynamics: Laser Zentrum Hannover e.V.: Litron Lasers Ltd: DTU: Intertek MSG

Project Goal

PROVAEN "will develop a new innovative characterisation tool, capable of operating in harsh and inaccessible environments, thus enabling effective process and product development, precise optimisation of material properties production control and fault diagnosis. This will be achieved through the development of the component technologies to enable the application of a number of advanced laser-based particle measuring techniques via specialised endoscopic probes, interfacing with a simple-to-use, portable system, enabling routine and fast application inside actual process equipment"

Quantified and Measurable Technological Objectives:

- Particle detection – detection and imaging down to < 100nm achieved through use of intense, highly structure pulsed laser illumination and high aperture objective lens system.
- Particle size measurement – the limiting Rayleigh resolution of <1 µm will be achieved by means of a high numerical aperture, diffraction limited optical system (NA> TBA) enabling detailed size & shape information on particles of 5µm or greater.
- Particle velocity – Individual and statistical ensemble analysis information on particles travelling up to 330 m/s.
- Operating environment – Endoscope system technology will be developed enabling operation in hostile environments without active cooling or auxiliary protection, specifically:
 - temperature: -40°C to 300°C
 - pressure: 1 – 100 bar
- Laser output – Develop new pulsed laser technology, coupling and delivery techniques to achieve an output from the endoscope of >50mJ in a pulse of optimised duration in the range 5 – 15ns.
- Endoscope energy transmission efficiency and quality – overall efficiency of laser pulse transmission >70%
- Laser sheet thickness - < 1mm with an optical field of view ranging from 2 mm² through to 200 mm².

Market Scope

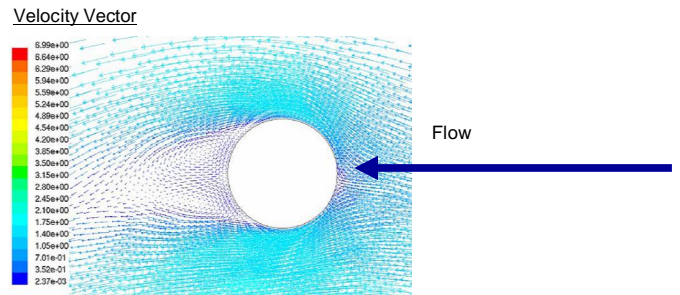
PROCESS AREAS	INDUSTRY SECTORS
Mixing systems	Speciality chemicals
Particulate engineering	Pharmaceuticals
Spray drying systems	Food
Aerodynamics	Aerospace
Hydrodynamics	Automotive
Gas & multiphase flows	Marine
Fluid flows	Civil
Powder flows	Environmental
Sprays	Power Generation
Fuel injectors	Medical devices
Combustion nozzles	Bulk powder products

Status of Development

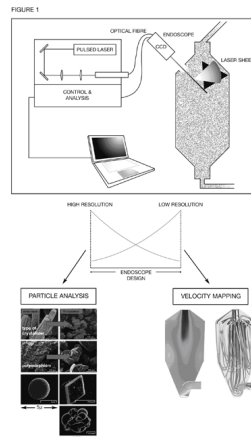
- All partner activities are taking place in parallel.
- Prototype, using existing technology, has been shown to work well but is not easily portable.
- Laser, laser coupling and delivery system development is nearly complete.
- Test rigs have been set up and optimisation of probe shape (to minimise flow disruption) is well underway (see images on left of poster).
- Some industrial processes of interest have been identified but more welcomed as a real test bed for the final instrument.
- Project is on track for delivering the final probe in 12 months time
- Dissemination of the capabilities of the probe are vital to the project and to dissemination of the technology

Optimisation of Probe Size & Shape to minimise flow disruption

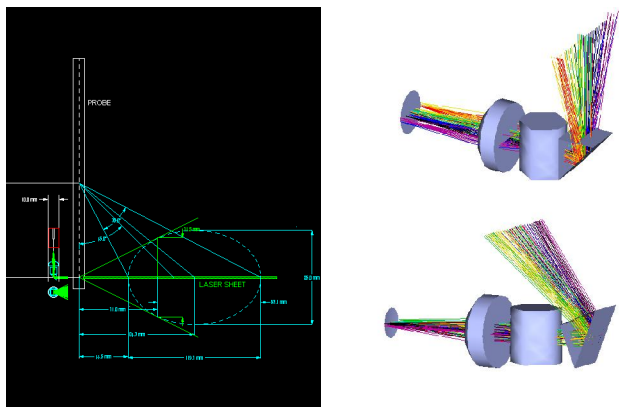
(Dr Aroussi – Leicester University)



Proposed Use in Industrial Processes



Probe Design – Current Prototype (KeyMed)



Author: Dr Bill Meredith, Intertek MSG

For more information on testing the final probe contact bill.meredith@intertek.com or TEL: (0)1642-435704

And visit www.provaen.com