INCIPIENTUS™

ULTRASOUND FLOW TECHNOLOGIES AB

“THE MOST ADVANCED ULTRASOUND VELOCITY PROFILING INSTRUMENT IN THE WORLD…”

Non-invasive and high-resolution
ultrasonic measurements in complex fluids

www.incipientus.com

High resolution measurements with a state-of-the-art electronics platform

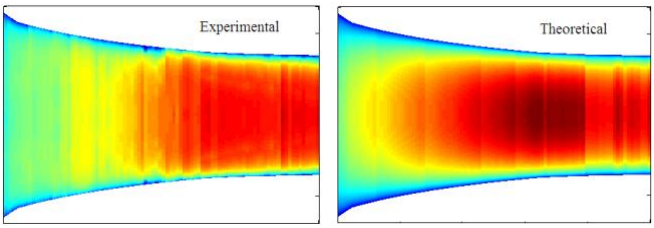
Key Features

- HIGH SPATIAL RESOLUTION — Visualize profiles with over 100 sampling points across a 1 cm measurement distance.
- HIGH TIME RESOLUTION — Measure transient flows with high refresh rates by using onboard FPGA-based data processing.
- SOFTWARE — Complete on-line and off-line package for data processing, visualization and exporting.
- ADVANCED SIGNAL PROCESSING — Signal processing techniques and digital algorithms developed by world experts.
- NON-INVASIVE SENSORS — Complex flow is undisturbed with non-contact sensor installation.
- MULTIPLE DATA OUTPUTS — Extract specific information with access to Raw (RF), Demodulated (IQ) and Processed (FFT) data.
- STATE-OF-THE-ART HARDWARE — Medical ultrasound imaging technology can now be used in fluid mechanics or engineering applications.
- EXPERT USER CONTROL — Incipientus gives you more control over system parameters, enabling sophisticated measurements.

Applications Examples

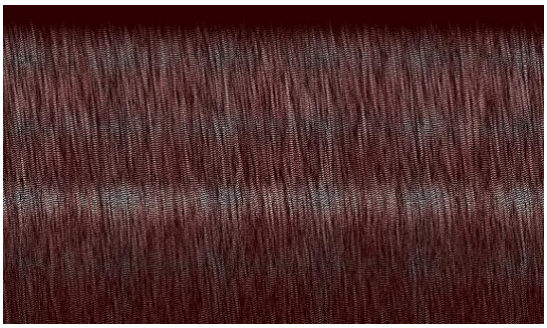
Numerical model validation

Flow simulations or modelling are often useful in design of industrial processes involving flows of complex non-Newtonian fluid suspensions. The UVP system is an important tool for assisting in complex flow problems by validating theoretical predictions with experimental results. With detailed and accurate experimental flow data available, it will be possible to develop more accurate flow models using CFD.



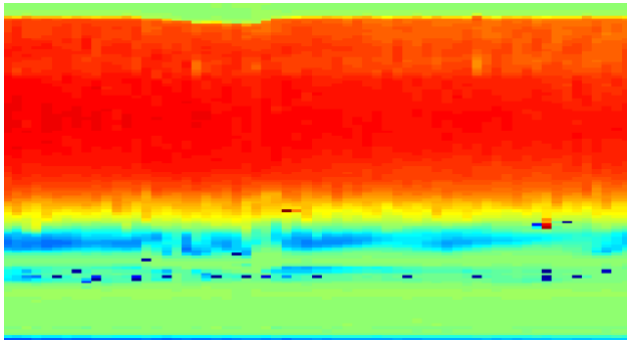
Ultrasound imaging

Important information about the actual fluid and process can be derived by using RF data. Fluid structures, fibre lengths, homogeneity as well as process parameters (e.g. CIP, product changeovers) can be measured using ultrasound imaging. Incipientus™ enhances the measurement data by using image processing techniques. Artefacts due to electromagnetic noise, pipe vibrations and sensor coupling that influence the image quality are removed.



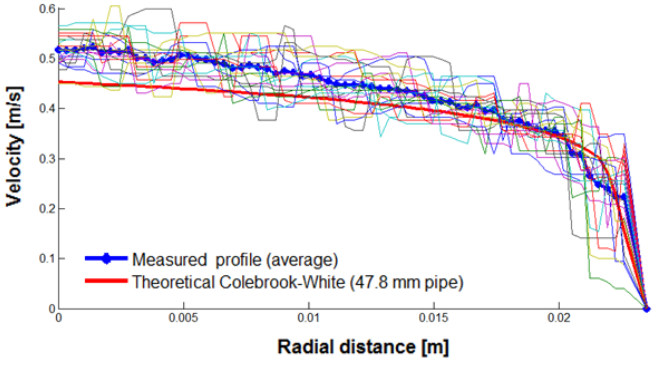
Temporal flow behavior studies

Detailed experiments can be done on spatio-temporal flow conditions using UVP. CFD offers tools to design and predict different dynamic flow situations, but involves a number of assumptions. Important information can be determined from time evolution studies in different applications, for example mixing. To design more efficient processes these flows need to be measured and quantified. CFD is a *modelling* of the reality, but Incipientus™ UVP is a *measurement* of the reality.



Complex flows – transitional, turbulent flow

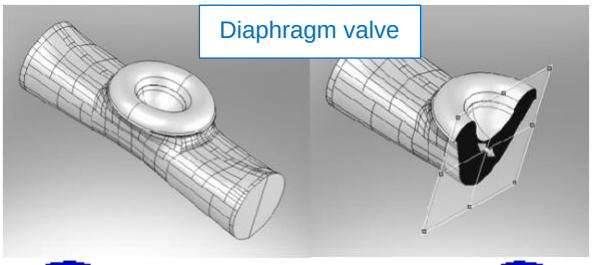
Transitional and turbulent flow especially in non-Newtonian fluids are still outstanding problems in fluid dynamics. Not enough experimental data is available in pipes or complex geometries to validate theoretical predictions and Reynolds numbers. The lack of experimental data can be reduced by using UVP to measure detailed velocity profiles at different flow rates in various fluids.

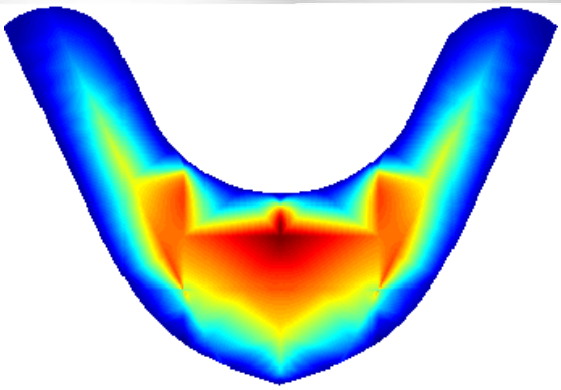


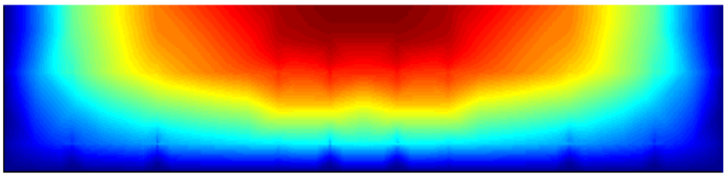
Applications Examples

Flow mapping in complex geometries

Flow through complex geometries such as abrupt contractions and enlargements, open channels as well as valves are important problems in fluid dynamics, because they are integral components in pipeline systems. Understanding the energy loss mechanisms in complex geometries is therefore a prerequisite to good engineering design of pipeline systems. There are very few experimental results available for viscous fluids in complex geometries. Most of the complex flows which are encountered in industry can only be studied without disturbing the flow to be measured. UVP is a capable tool to study such flows.

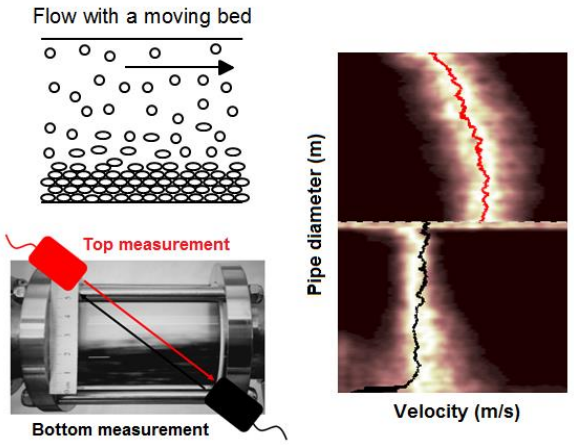


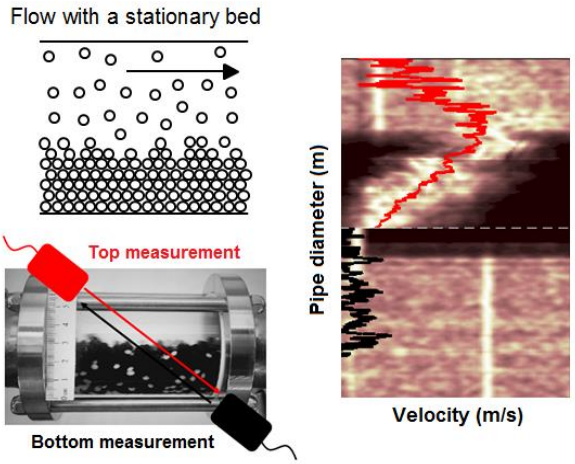




Complex flows – multiphase flow

In the process industries it is often required to pump fluids through a pipeline network from storage facilities to various processing units. Monitoring and understanding the flow behavior of a complex multiphase fluid in the production or pipeline is therefore essential. UVP can be used to detect different flow regimes and the solids-liquid interface in multiphase flow. Experimental data can aid engineers to gain a better understanding of these complex flows and to develop more accurate predictions.

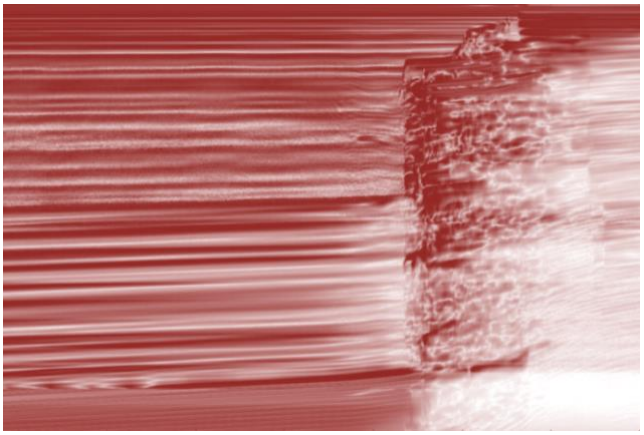




Do more with Incipientus™ UVP

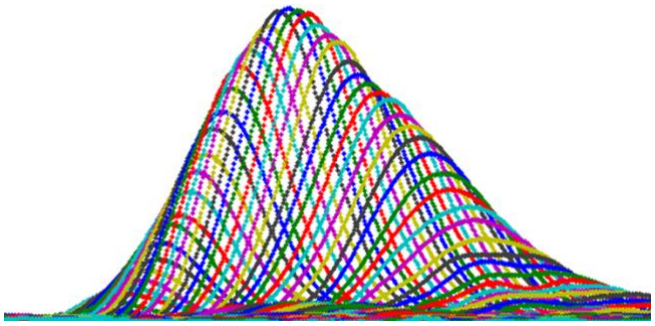
- RAW DATA (RF)

With access to raw (RF) data the expert user can unlock the true potential of the Incipientus™ UVP. You can also apply your own signal processing techniques and for example design your own custom clutter filters. This option is especially useful for special engineering applications and post data analysis.



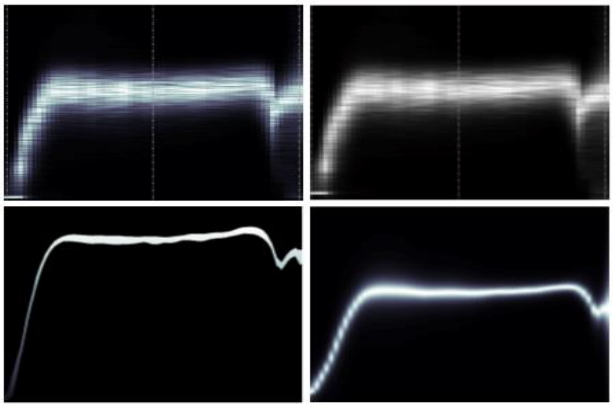
- DEMODULATED DATA (IQ)

Demodulated data allows you to directly apply your own velocity estimation algorithms as well as plot Doppler spectra. IQ data is of special interest in research applications or studies as this is a convenient and fast way to analyze the complex baseband ultrasound echo signals. For example, the ultrasound sensor and sample volume dimensions can be characterized by analyzing IQ data.



- PROCESSED DATA (FFT & PROFS)

Processing on hardware level saves time and this is important in for example fast transient flows. The UVP can output PROFS (velocity profiles) calculated on the hardware platform which is even faster than using an industrial PC. Use processed FFT data captured during fast flows or processes to gain further insights and extract more information.



Technical Specifications

Description	Specifications	Comments
General		
Working temperature	-10°C – 50 °C	Storage -20~70 °C
Working humidity	20 – 80% RH non-condensing	
Dimensions	90 x 295 x 285 mm	
Weight	3.82 kg	
Protection class	IP20	
Measurement		
Velocity Measurement Range	0.1 – 5 m/s	Frequency & PRF dependent
Time of flight measurements		Automatic switching
Data output modes	RF, IQ, FFT & Profiles (WA, NP)	
Switch between single ended & balanced transducers		Switch via zero resistor
Signal Processing	Real-time velocity estimation	On board processing
Ultrasound Electronics		
Number of Tx/Rx channels	2	Non-simultaneous
Number of analog outputs	2	After amplification
Emission voltage	30 – 80 V_{p-p}	Application dependent
Frequency range Tx/Rx	1 MHz~7 MHz	Option 1
Frequency range Tx/Rx	0.5 MHz~4 MHz	Option 2
Cycles per Pulse	1~40	DDS
AWG Tx memory	4096 word, 14 bit digital to analog conversion	
Buffer memory	64 Mb	
Rx amplification	7 – 55 dB	Linear in dB or Time Gain Compensation (TGC)
Clock frequency	100 MHz	
Power section synchronization		
Acquisition window start gate output		
PRF output connection		
General Electronics		
2 x Tx/Rx channels	50 ohm	BNC connector
2 x RFout channels	50 ohm	BNC connector
Trigger (PRF) channel	50 ohm	BNC connector
Digital gate channel	50 ohm	BNC connector
Remote Control Interface	Ethernet 100 base-T	RJ-45 connector
AC Input voltage range	95~260 VAC / 50~60	
Power consumption	≤ 10 Watts	
Cable length	< 3 m	Can be extended

Contact Details

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