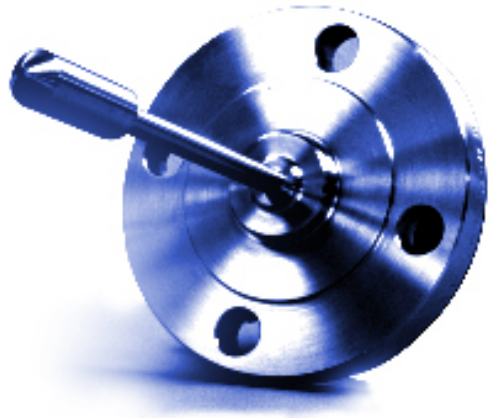
Good Vibrations

high performance

solid state

process viscosity control

Hydramotion, UK



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Company Profile

- Formed in 1988
- Headquarters in Malton - near York, England



- Specialists in viscosity measurement with proprietary patented technology
- Exports to over 60 countries - wherever fluids are handled or processed

Technology Leaders

- Recognised technology leaders in the field of on-line viscosity analysis
- Pioneered new industrial sensor design using mechanical resonance
- Dedicated R&D department of experienced graduate and postgraduate personnel in the fields of electronic, mechanical, and software engineering and physics
- Continuous program of product innovation and refinement
- Modern manufacturing facilities with ISO9000:2000 Quality Management System accreditation
- CAD, CAM and CNC linking design to production



UKAS QUALITY MANAGEMENT
ISO9001 : 2000

CE
approved products

What is viscosity?

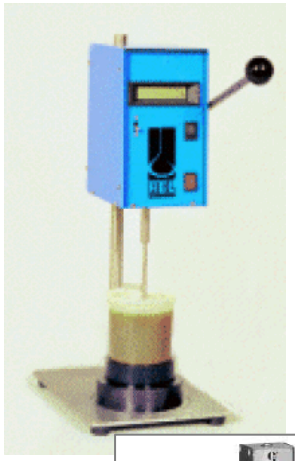
- Viscosity is **resistance to flow**
- Cooler or bigger molecules ⇒ increased viscosity
- Usually measured in **centipoise** (cP) or **millipascal-seconds** (mPa·s)

Typical viscosities

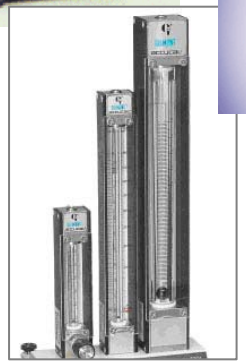
Air	**0.02 cP**
Water	**1 cP**
Bicycle Oil	**10 cP**
Olive Oil	**100 cP**
Glycerine	**1000 cP**
Treacle	**10,000 cP**
Syrup	**100,000 cP**
Bitumen	**1,000,000 cP**



How is viscosity measured?







Traditional techniques:

- **Rotating bob**
- **Falling ball**
- **Glass Capillary**
- **Piston**

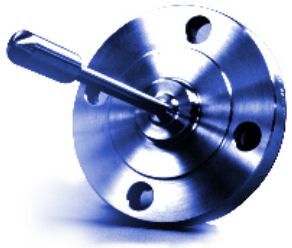
……all measuring the drag caused by fluid viscosity

Usually basic devices with moving or delicate parts,

and maintenance intensive.

These are lab instruments, not suited to on-line process use.

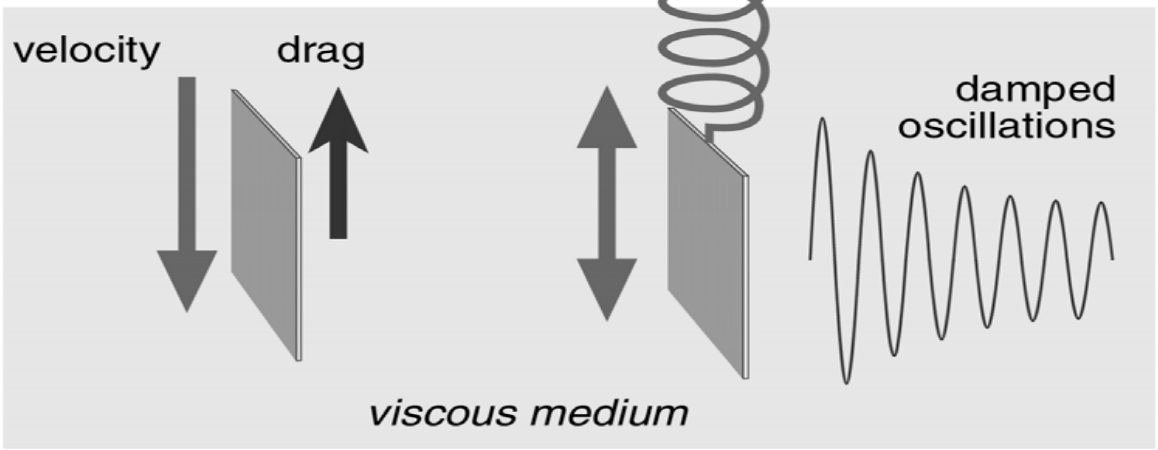
For decades, viscosity measurement was trapped in the lab.



Then came resonant transducers……

DRAG

plate moving with linear velocity



effect is to oppose motion with drag force

MEASURE DRAG FORCE

RESONANT

plate oscillating on a spring

effect is to dampen oscillations

MEASURE ENERGY LOSS

Energy loss from resonant sensor is measured using specially developed hardware and software and is immune to the process conditions which cause problems with drag method

Result is **accurate real time viscosity** and **high plant and process immunity**

Resonant Viscometers

Hydramotion didn’t invent the resonant viscometer -

But we perfected it.

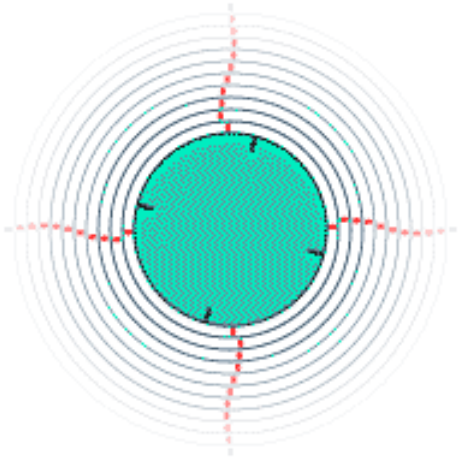
- The technique to measure viscosity by measuring the damping on a vibrating element in a liquid has been around since the 1950’s.
- Early designs of such vibrating or resonant devices, although well-intentioned in principle, were flawed and troublesome.
- Fifteen years ago Hydramotion pioneered new patented resonant sensor designs resulting in the ‘XL7‘ - the worlds first true on-line viscometer that can work in any fluid and any conditions on any process plant



How it works



torsional motion generates shear waves ...



... and shear waves dissipate energy depending on viscosity



Measuring Viscosity in the Process

- **Robustness**
- **Low maintenance**
- **High repeatability**
- **Not affected by process conditions - temperature, pressure, and flow**
- **Not affected by installation – sensor location, plant vibration**
- **Low cost of ownership**
- **Simple installation no special requirements**
- **High reliability – a plant critical process element**

Maintenance free

“You shouldn’t have to keep pulling up the tree to look at the roots”



- Solid state, all welded stainless steel design with no moving parts means maintenance free
- **Imagine this**, a process viscometer measuring bitumen at 600 deg F. So hot you could light a newspaper off the transducer flange. Working continuously on-line in a noisy plant for years, never been removed since installation day. Measuring with such a high sensitivity that it could detect the change in viscosity of a glass of water as it warms up in a room.

There are XL7s which have worked continuously, 24/7, for over 10 years without removal from the line, even for casual inspection.

Measuring viscosity now



The situation is now reversed. Viscometers were once delicate lab devices that lasted no time in the field. The new generation of process viscosity sensors has become one of the smartest and toughest analysers on the plant, that can outperform the viscometer in the lab.

Hydramotion has, over a ten-year programme, developed a range of viscometers to suit virtually all applications for viscosity measurement in any environment.

Users are able to rely on the Hydramotion viscometer as a key control element in their process leading to full process automation with major quality and productivity benefits.

Hydramotion
viscosity

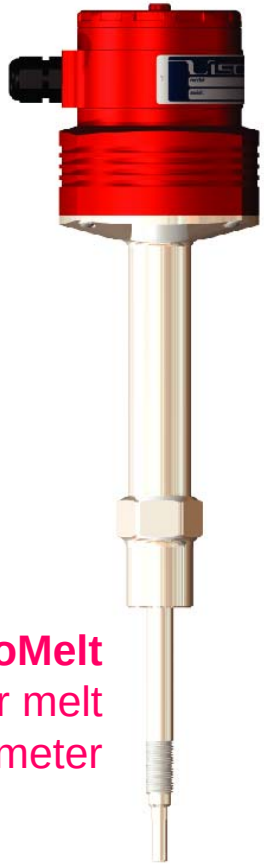
a viscosity analyser for all occasions



XL7 general purpose process viscometer



ViscoJet standalone viscometer



ViscoMelt polymer melt viscometer



GoVisc automation viscometer



ReactaVisc reaction vessel viscometer

All available in any size, process fitting or material and certified for EEx Hazardous Area use

Hydramotion
viscosity

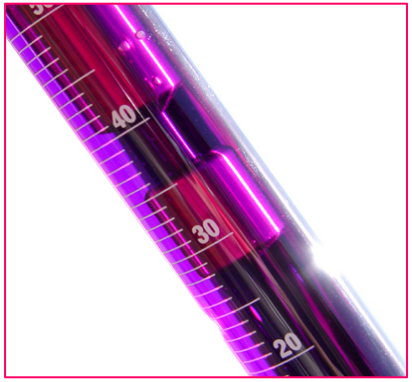
in the lab and field.....







Viscolite
portable
viscometer





XL7 **process viscometer**

- any fluid
- any process
- any location
- simple installation
- virtually maintenance free
- digital and analogue outputs
- high accuracy and sensitivity
- resilient to process conditions



XL7 in all sizes

Standard:
up to 150°C

HT2:
up to 450°C







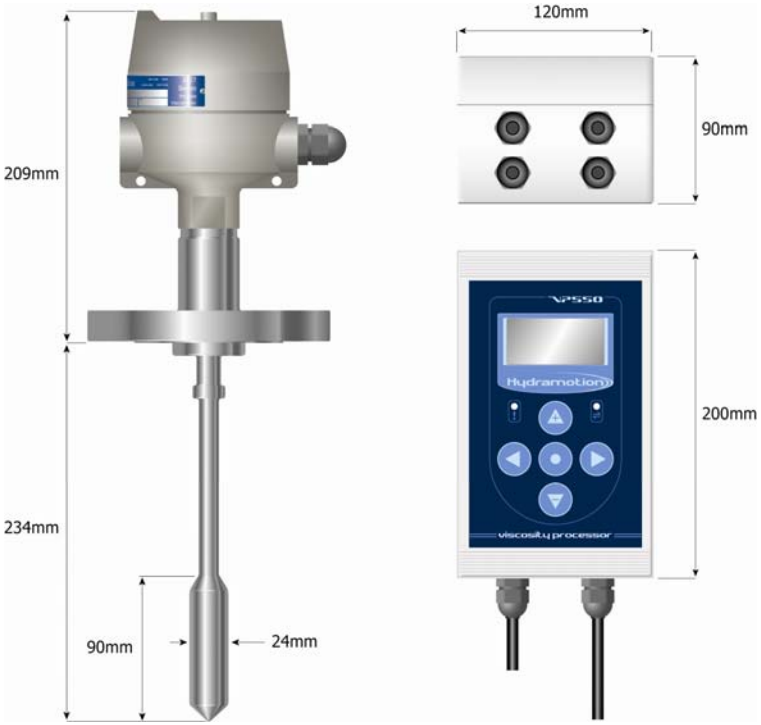






XL7 specification

range	**0 – 1,000,000,000 cP**
accuracy	**±1% of reading**
repeatability	**±0.3% of reading**
temperature (max)	**–40 – +450 ˚C (HT2 model)**
pressure	**to process connection**
materials	**all 316 stainless steel; other materials on request**
construction	**all-welded crevice-free wetted parts**
environmental rating	**IP67**



XL7 **installation**

- any size of pipe or tank
- any orientation
- “fit and forget”
- clean-in-place
- immune to plant noise



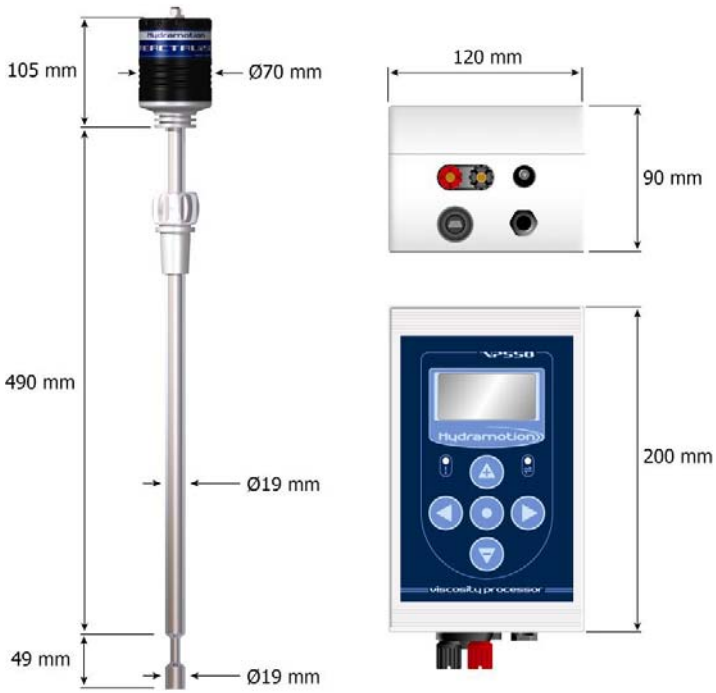
ReactaVisc **reaction vessel viscometer**

- fits any vessel
- high sensitivity
- compact design
- lightweight
- crevice-free sensor
- integrated temperature probe
- digital and analogue outputs



ReactaVisc **specification**

range	**0 – 500,000 cP**
accuracy	**±1% of reading**
repeatability	**±0.3% of reading**
temperature (max)	**–40 – +150 ˚C**
fitting	**gland adapter**
materials	***wetted parts:* 316 stainless steel** ***enclosure:* acetal (Delrin®)**
construction	**all-welded crevice-free wetted parts**
environmental rating	**IP65**



Viscolite® VL700 **portable viscometer**

- fast
- accurate
- robust
- truly portable
- immerse – read – wipe
- temperature correction



Viscolite® VL700 **specification**

range	**0 – 10,000 cP**
repeatability	**better than 1%**
temperature (max)	**–40 – +150˚C**
minimum sample	***standard VL700-S:*** **50 ml** ***small-sample VL700-T15:*** **10 ml**
materials	***wetted parts:*** **316 stainless steel** ***enclosure:*** **acetal (Delrin®)**
power supply	**4 x AA alkaline cells**
environmental rating	**IP65**



Hydramotion – a summary

- Standard and bespoke solutions for all industrial viscosity applications
- Extensive specialist knowledge base in real time fluid physical analysis
- Wide ranging process and application experience covering all industry sectors and geographical territories
- Modern manufacturing facilities and highly accredited QA systems
- Dedicated highly skilled and creative R&D team
- Progressive innovation program to further develop new sensors for wider on-line fluid analysis applications
- Track record as successful partners in shared challenges for valued clients



…THANK YOU