



APPLICATION NOTE # 322CO/03

River Flow Measurement Using Ultraflux “Time of Flight” Ultrasonic Flowmeter

Location: River Erewash: Attenborough Lakes Nature Reserve: Nottingham: UK
Description: 10 Metre wide river, Depth range 0.5 to 2 metres

Notes:

Various Sewage Works and other sites discharge in the River Erewash which can cause it to become contaminated, it passes through the site of a former aggregate quarry shortly before meeting the River Trent, the quarry area is now a Site of Special Scientific Interest (SSSI).

As part of a scheme that will involve moving the discharge point of the river to ensure the river does not continue to pollute the nature reserve, the site owners contracted Flowline Mfg Ltd to provide a metering station to measure the river flows, the flows were to be measured on an on-going basis.

Flowline supplied a 4 path Ultrasonic System from Ultraflux, the complete supply package included, initial site survey, selection of suitable metering point, installation of system including support columns and cable runs, commissioning of system.

As the site is open to the public and does experience vandalism problems any equipment installed had to be as robust as possible without being too intrusive.

The requirement for “real time” monitoring and continuous recording of flows was satisfied by the use of a GSM modem connected directly to the flowmeter control unit, this allows flows to be read at any time and enables the built-in data logger to be downloaded when required.

The control unit was located approx 60 metres away, in this installation mains power was available however other more remote sites use battery/solar operation.

Photo 1: Site prior to installation of system, looking downstream



Picture 1: “Time of Flight” Operating principal

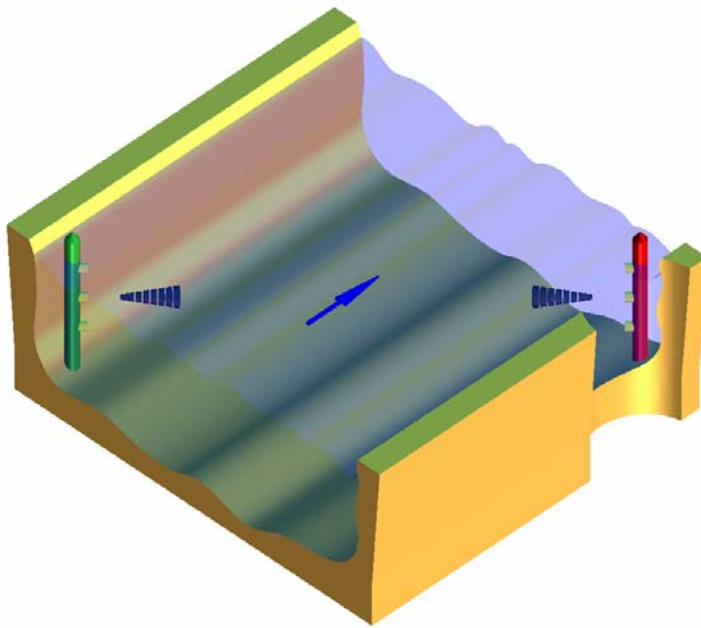


Diagram above depicts the basic operating principle – The use of one or more ultrasonic “paths” located at approx 45 deg to the river axis, measuring velocity at different depths allowing an accurate average velocity to be calculated.

Measurement principle used is “Time of Flight”, ultrasonic sound pulses are alternately sent between probes mounted on opposite sides of the channel/river, the pulses that travel “with” the flow are speeded up, pulses that travel “against” the flow are slowed down, the time that each pulse is transmitted and received is very accurately measured, the greater the time difference between transmission and reception the higher the flow velocity.

Photo 2: Installing the Probe support columns which were piled approx 2.5 meters into river bed



Photo 3: Close-up of installed column/sensor mounting, column flange protects probe from debris



Photo 4: Looking upstream at fully installed system with sensor mountings located on opposite sides of the river, picture taken approx 6 weeks after columns were installed



Photo 5: Control unit located in “Lucy” enclosure, no heating/cooling systems are required.



UF 322 CO and CO-S General Specifications

Flow Measurement

Volumetric flow partially filled round, rectangular and odd shaped conduits using form 2 to 6 velocity chords

Velocity Measurement

Method: Time of Flight ultrasonic

Accuracy: +/- 0.5% of reading

Range: 0.002 m/s to + 5 m/s

Probe Frequency: From 0.5 MHz dependent on application

Level Measurement

4-20 mA input signal from any suitable transmitter: i.e. Ultrasonic, Radar, Pressure

Flow Calculation

Method: Conversion of water level and pipe size to fluid area. Multiplication of fluid area by mean velocity to equal flowrate.

Flow measurement accuracy: +/- 2 - 5% reading typical

* Proper site selection, sensor placement are recommended to achieve accuracy

Sensor/Probe units

Field interchangeable with Control units

Sensor housing: IP 68. Stainless Steel casing

Sensor cables: Twinax type cable, usually armoured, special cables to order.

Max Sensor cable length: 500 m, Sensor mounting hardware: To suit site.

Controller/Display Unit

Field interchangeable with Sensor units

IP 67. Enclosure, Built-in data logger up to 32400 flow readings, control unit programmable with software supplied or via key pad, report generating software supplied FOC.

Display: Flowrate/Total, diagnostics, 3 off Programmable relays, 4-20 mA output for Flowrate.

Certification

CE marked

ATEX available for hazardous areas