

# Pi<sup>π</sup> Technical Note 154

## TurbSense<sup>®</sup> Mounting Options

### Introduction

The TurbSense<sup>®</sup> probe is capable of measuring turbidity from 0.01 NTU to 1000 NTU but in order for it to do this successfully, it needs to be mounted in the appropriate flow cell for the sample it is likely to be measuring. Measuring turbidity in clean water has three main issues to overcome; zero drift, stray light, and bubbles. Due to the patented design of the TurbSense<sup>®</sup>, zero drift isn't a problem at all (whereas it is for all other turbidity meters); please see the 'Overcoming 'Noise' and Establishing a 'Zero'' technical note for a detailed explanation of how the zero drift problem for turbidity sensors has been overcome by TurbSense<sup>®</sup>. For a fuller discussion on how Pi handles bubbles whilst measuring turbidity please see the 'Bubbles in Turbidity' technical note.

### Flow Cell Installation at Atmospheric Pressure

For samples where bubbles aren't expected to be a problem, the TurbSense<sup>®</sup> is mounted in a black (stray light absorbing PVC) plastic flow cell. The design of the cell minimises volume (to increase response times) whilst ensuring there is no stray light. The flow cell is not under pressure and overflows, typically to drain, with a flow rate of 0.5 L/min to 1.0 L/min. As with all TurbSense<sup>®</sup> flow cells, both the sensor and the flow cell itself can be fitted with AutoClean systems (generally not necessary on filter effluent applications or when the turbidity is rarely above 1 NTU). The flow cell is mounted on a backboard and is deliberately mounted at an angle, so that any bubbles that do pass into the flow cell with the sample are encouraged to slide off the sensor and burst harmlessly away from the sensor face.



*TurbSense<sup>®</sup> Flow Cell*

### Pressure Flow Cell Installation

For samples where nucleating bubbles are expected to be a potential problem (e.g. when a sample is going from high pressure to low pressure, or the temperature of the sample is increasing), the TurbSense<sup>®</sup> Pressure Flow Cell (left) has a dole valve on the outlet. This restricts flow to 0.5 L/min and therefore creates a back pressure within the flow cell (maximum 4 Bar). This in turn prevents nucleating bubbles forming. This adaptation to the standard flow cell can also be used if the sample needs to be returned to the process.



*TurbSense<sup>®</sup> Pressure Flow Cell*

### Automatically Cleaning Flow Cells

All TurbSense<sup>®</sup> sensors are built with the capacity for automatic cleaning in mind and the same is true for their flow cells. For samples where there is likely to be an accumulation of sediment in the flow cell over time, the flow cell can be fitted with automated valves (controlled by the analyser the sensor is connected to) that can isolate the sample, dump the water in the flow cell and spray the inside of the flow cell with water to flush out any sediment. All this is possible with no operator intervention.



*TurbSense<sup>®</sup> Pressure Flow Cell with AutoClean*

## Non-nucleating Bubbles

Some samples carry entrained air (bubbles) with them and in these rare cases, it is necessary to remove the bubbles prior to them entering the flow cells. The most efficient and cost-effective method of doing this is to pass the water over a series of weirs. This design encourages the entrained bubbles to rise to the top of the sample as it flows over the top of a weir and bursts. Pi has developed a low volume system for this that can go prior to the non-pressured flow cell. The de-bubbler can come with or without autocleaning.



*TurbSense® Flow Cell with AutoClean and De-bubbler*