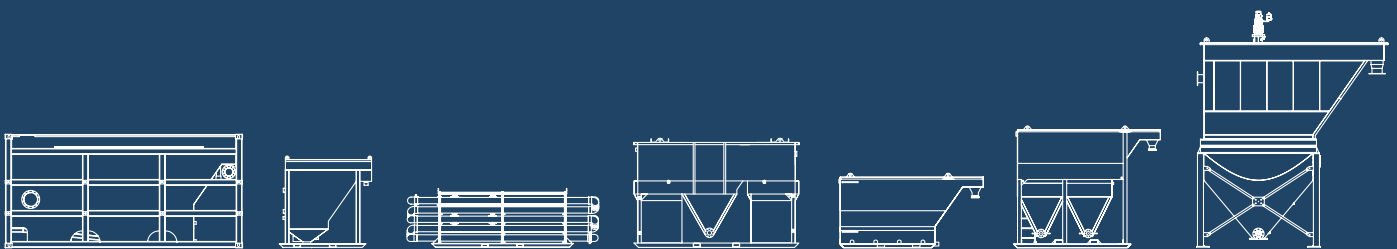




Solutions for Suspended Solids Removal



Hire, Sales & Technical Support

Registered Office: Siltbuster Limited, Williams Building, Kingswood Gate, Monmouth, Monmouthshire, NP25 4EE. Registered in England & Wales No.4737424



Who are Siltbuster?

At Siltbuster we pride ourselves on not being just a plant hire company but a solutions provider. Our reputation has grown over the past 10 years based on customer focused product development and ongoing technical support.

Water treatment isn't always as simple as it should be, that's why as part of our services we offer:

- Site visits to scope best solutions
- In-house laboratory testing of samples
- On-site commissioning and installation
- Telephone and on-site technical support
- Regional employees ensuring timely response to enquiries

We have the largest hire fleet of water treatment equipment in the UK operating both nationwide and internationally, enabling us to mobilise the equipment you need for when you need it.

Our equipment is used on projects ranging from small residential developments to some of the largest civil infrastructure schemes recently undertaken including: Heathrow T5, CrossRail, Hinkley Point C, the Forth Road Bridge, Copenhagen Metro and even the odd special project such as mud runs and the raising of the Costa Concordia!

We have established a nationwide series of educational training courses led by our team of water treatment experts, providing practical advice on how to plan works to minimise water contamination. To date over 5,000 people have benefitted.

Why Treat Suspended Solids?

What is the Problem?

Often overlooked as one of the world's most common and abundant pollutants, silty water (a term given to waters laden with suspended solids) can cause significant harm to aquatic environments.

Silt pollution is highly visible, travels a long way and is easily traced back to the source.

Surface waters and groundwaters have legal protection and it is a criminal offence to pollute them.

Silt pollution is a common reason for construction companies being taken to court, where they can face significant fines.

Environmental Harm

Although perceived to be naturally occurring and thus 'what does it matter', suspended solids in water have the ability to:

- Suffocate fish by blocking gills
- Strip out dissolved oxygen killing aquatic life
- Prevent sunlight penetrating the water, reducing the ability of plants to photosynthesise
- Settle out on the river bed, killing bottom dwelling organisms
- Blinding off gravel beds and damaging spawning grounds
- Combine with other contaminants such as oils and chemicals, causing greater pollution

Sources of Silt Contamination

When considering silt pollution there are five main sources:

- Surface water run-off from exposed soils
- Dewatering and pumping excavations
- Washing of plant and equipment
- River crossings
- Disturbance of river bed or bank (in channel works)



Options for Disposal

Off-site disposal via tankering is the most costly option and is only viable for small volumes of water.

Disposal to foul sewer is often considered on inner city construction sites. Permitted by the local utility provider under a temporary trade effluent licence, disposal of excess waters to sewer will be charged per cubic metre of water discharged and restrictions to the composition of the water, daily volume and instantaneous flow rate will apply. Typical discharge criteria are max total suspended solids (TSS) 500-1000 mg/L and pH 5-10.

Disposal to ground or controlled water is often the best practical option for most construction sites. Regulated by the Environment Agency (EA), Scottish Environment Protection Agency (SEPA), Natural Resources Wales (NRW) or Northern Ireland Environment Agency (NIEA) and having the highest risk, water treatment selection is imperative with this disposal route. The cheapest option might not always be the best solution long term! Typical discharge criteria is often max TSS 30-60 mg/L and pH 6-9.

In both permitting situations, the water will typically need to be treated to ensure the discharge criteria are met.

Rapidly Settling Solids

Settling rates

Total suspended solids (TSS) is the term given to describe the total concentration of suspended particulate matter in a column of water.

Suspended solids are typically subdivided into two main groups known as rapidly settling solids (settleable solids) and slow settling solids. Rapidly settling solid is the term given to particulate matter which has a settling velocity of at least 3 m/hr and slow settling solid is the term given to particulate matter which has a settling velocity of less than 0.25 m/hr.

Understanding the distinction between slow settling solids and rapidly settling solids is critical when determining the best practical water treatment solution for your site. Rapidly settling solids will settle by gravity separation alone, in which case a Siltbuster lamella clarifier is the most efficient treatment option.



Gravel



Sand



Silt



Clay

Near Surface Geology

The near surface geology at the site is critical, as the geological composition of the surface soils will have a bearing on the settling characteristics of the infeed waters to be treated.

The table below provides a breakdown of geological classification and the associated settling velocities.

Sediment	Particle Size	Settling Rate
Gravel	>2 mm	>1000 m/hr
Sand	63-2000 µm	200 m/hr
Silt	2-63 µm	11 m/hr
Clay	<2 µm	0.013 m/hr

As you can see, gravels, sands and silts are all classified as rapidly settling, whereas clays are slow settling. Waters containing clay particles will therefore require additional treatment prior to the lamella clarifier stage.

Slow Settling Solids

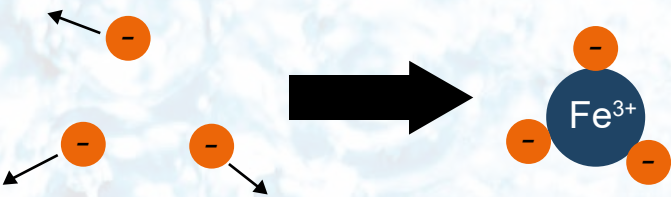
Chemical Pre-treatment

Waters containing very fine particles, particularly clays, with slow settling velocities will not settle out under gravity alone even in a lamella clarifier at normal flow rates. In these cases chemical dosing is used to aggregate the slow settling particles, increasing the particle settling rate so they can be removed by gravity separation techniques.

A typical process involves the sequential adding and mixing of chemicals to the water. First a coagulant is added and mixed, followed by a flocculant.

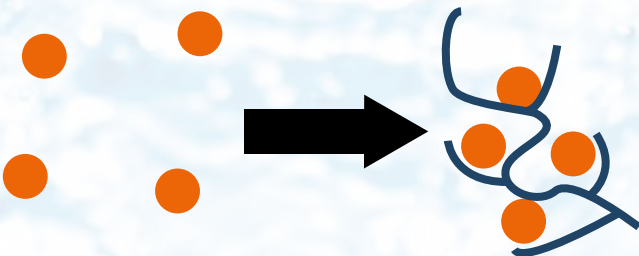
How Do Coagulants Work?

Fine particles in suspension often have negative electrical surface charges. These prevent aggregation due to repulsive forces between them, hence the particles remain in suspension. Coagulation is a chemical process that involves the neutralisation of these charges. A coagulant is typically a positively charged metal ion, the choice of which depends on the receiving water. When added, the destabilised particles are able to start coming together forming micro floc. Common metal based coagulants are ferric chloride and where permitted, poly aluminium chloride.



How Do Flocculants Work?

To further increase the settling rate a flocculant can be used which work through physical processes alone. In most cases a long string organic compound with charged negative sites is used which bind the micro floc together into rapidly settling aggregates known as flocs.



Settlement of clay particles from time 0-60 mins



Clay flocs rapidly formed after chemical dosing

Lamella Clarifiers

Gravity Settlement for Suspended Solids



The Unit

Siltbuster is the UK's leading provider of mobile settlement units, specifically lamella clarifiers. Each unit in the extensive range is designed to remove suspended solids and settleable matter from suspension.

Effective gravity based solid/liquid separation requires the largest possible settlement area and optimum hydraulic flow. Siltbuster lamella clarifiers utilise lamella plate technology to maintain ideal settlement conditions within each unit, thereby ensuring maximum particle settlement and minimum unit footprint.

Siltbuster mobile clarifiers are robust, skid-mounted, compact and modular making them simple to transport, install and operate.

They are ideal for sites with limited access, restricted spaces and temporary projects. Hopper bottomed units can be fitted (on request) with an automatic sludge removal system making their operation virtually maintenance-free.

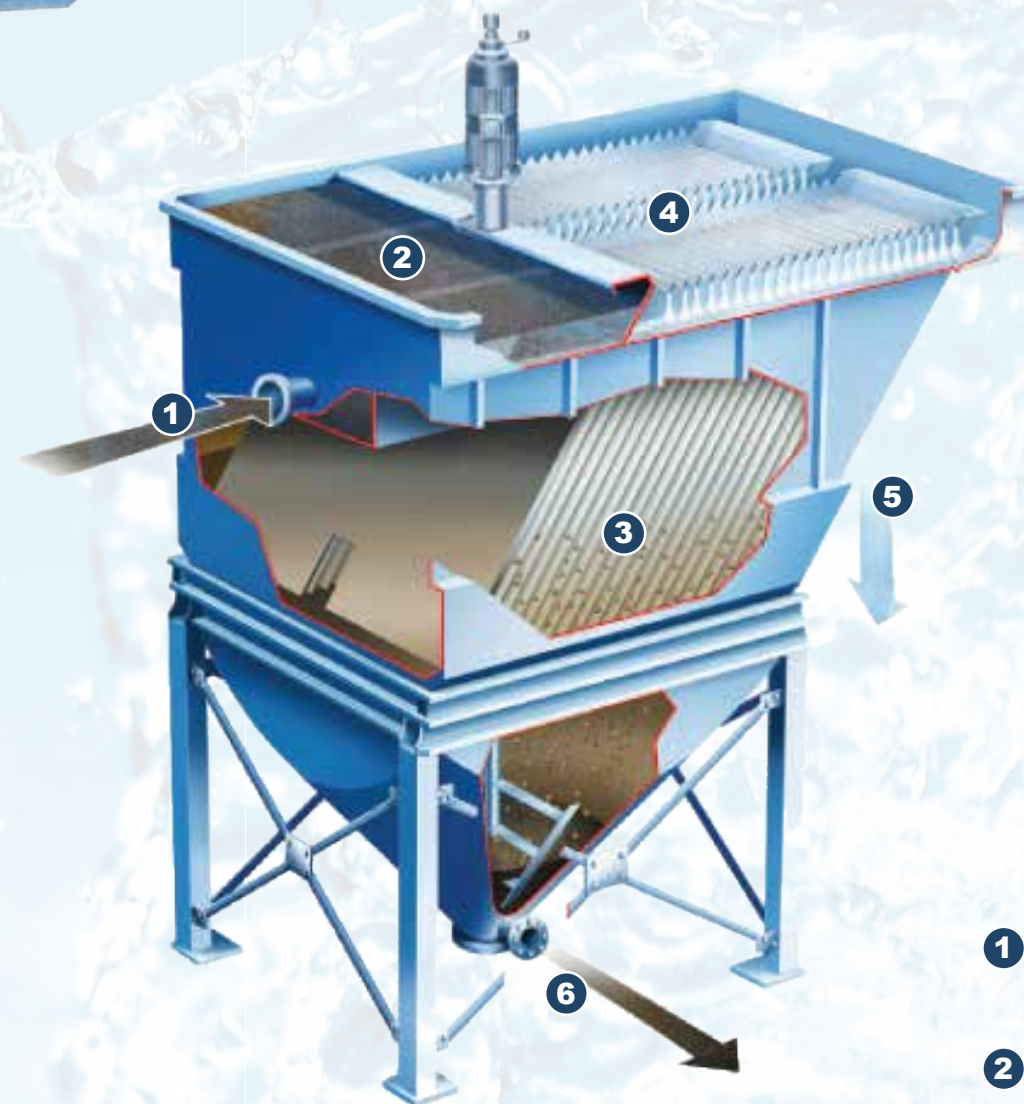
The range of lamella clarifiers can be supplied as single or multiple units in parallel. They can also be supplied as a complete, tailored, packaged treatment solution, including ancillary equipment such as lids, covers, walkways, flow meters, chemical dosing, sludge pumps, sludge storage etc.

How it Works

The diagram on the right shows the inlet flow through a feed channel to the base of the plates. The flow is then distributed with each flow diagonally upwards in parallel to the lamella plates. The particles settle on the plates and are retained in the sludge storage area of the unit with treated water discharging by gravity. Care should be taken to ensure the treated water doesn't scour the ground at the point of exit. The sludge hopper can be emptied via drain ports & valves by a range of methods, e.g. vacuum tanker or by manual or mechanical means.

Did you know...

Siltbuster's Lamella Clarifiers are up to 20 times more efficient than conventional settlement tanks and lagoons resulting in less space required on site!



KEY ADVANTAGES

- + Readily transportable, fast and simple to deploy, easy to operate
- + More efficient than conventional settlement tanks
- + Easy to clean lamella plates, no blockages, no backwashing required

TYPICAL APPLICATIONS

- + Surface water runoff
- + Groundwater treatment
- + Excavation dewatering
- + Drilling and mining

- | | |
|--|--|
| 1 WATER PUMPED INTO CLARIFIER | 4 SOLIDS TRAVEL DOWN PLATES AS WATER MOVES UPWARDS |
| 2 STILLING CHAMBER DIRECTS FLOW DOWNWARDS | 5 OUTLET DESIGN MAINTAINS FLOW EVEN IF UNIT NOT LEVEL |
| 3 FLOW DISTRIBUTED BETWEEN PLATES | 6 SLUDGE STORED IN HOPPER |



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Range of Siltbuster Lamella Clarifiers



FB50

Flat-bottomed, skid-mounted lamella clarifier. A favourite in the construction industry. Typical applications include general construction site, ground water, open excavations, trenching.

Operating Range:	1-50 m ³ /hr
Height:	1.90 m
Length:	4.03 m
Width:	1.45 m
Dry Weight:	2.5 tonne
Inlet Size:	4" F Bauer
Outlet Size:	6" F Bauer



HB10

Very transportable settlement unit, providing effective settlement area of 10m². Typical applications include pilot plants, batch processes, space restricted sites and borehole analysis.

Operating Range:	1-10 m ³ /hr
Height:	2.14 m
Length:	2.01 m
Width:	0.98 m
Dry Weight:	0.6 tonne
Inlet Size:	2" F Bauer
Outlet Size:	3" M Bauer



HB20

The Siltbuster HB20 Settlement Unit provides an effective settlement area of 20m², and is a transportable settlement trap providing effective separation of suspended particulates from water

Operating Range:	1-20 m ³ /hr
Height:	2.49 m
Length:	2.38 m
Width:	1.48 m
Dry Weight:	1 tonne
Inlet Size:	4" F Bauer
Outlet Size:	4" M Bauer



HB40

The Siltbuster HB40 Settlement Unit provides an effective settlement area of 40m². It has a single hopper and fits in an ISO container.

Operating Range:	1-40 m ³ /hr
Height:	2.61 m
Length:	3.10 m
Width:	2.14 m
Dry Weight:	2.2 tonne
Inlet Size:	4" F Bauer
Outlet Size:	6" F Bauer



HB50

The Siltbuster HB50 Settlement Unit provides an effective settlement area of 50 m². Typical applications include cofferdams, ground water, trenching, open excavations

Operating Range:	1-50 m ³ /hr
Height:	3.10 m
Length:	3.85 m
Width:	1.70 m
Dry Weight:	2.4 tonne
Inlet Size:	4" F Bauer
Outlet Size:	6" F Bauer



HB50E

Designed for the export market, the HB50E provides an effective settlement area of 50 m² within a shorter frame size.

Operating Range:	1-50 m ³ /hr
Height:	2.61 m
Length:	3.26 m
Width:	2.03 m
Dry Weight:	2.7 tonne
Inlet Size:	4" F Bauer
Outlet Size:	6" M Bauer



HB50M

The Siltbuster HB50M Settlement Unit provides an effective settlement area of 50m², and has an increased sludge hopper volume and slope to give improved sludge thickening and storage volume.

Operating Range:	1-50 m ³ /hr
Height:	3.15 m
Length:	3.69 m
Width:	2.46 m
Dry Weight:	3.5 tonne
Inlet Size:	4" F Bauer
Outlet Size:	6" M Bauer



Flow Proportional Chemical Dosing

Flow Proportional Dosing

By controlling the dosing of chemicals in proportion to the flow rate of the water, Siltbuster systems ensure that excess reagents are not added, saving money and ensuring better quality water as an output. Over-dosing of chemicals can affect the pH of the water causing problems to the environment and making the resulting treated water out of consent.

The administered reagents will be bound to the suspended solids and will be retained in the clarifier.

Process Using a Mix Tank

The incoming water passes through a magnetic flow meter in to a Mix Tank. The magnetic flowmeter records the total volume of water treated and allows the flow proportional dosing of water treatment chemicals based on manually entered control parameters.

The reaction tank is split into either two or three compartments via internal baffle walls. Each compartment is fitted with a top mounted variable speed mixer designed to mix the dosing chemicals.

Following chemical pre-treatment, the once fine particulates have now become larger, more rapidly settling particles. The treated solids can then be removed with a Siltbuster Lamella Clarifier.



The incoming flowrate is measured in real time through the use of a digital magnetic flowmeter and relays the information to on-board chemical dosing equipment.



Proportional to the incoming flowrate, dosing pumps ensure the correct amount of chemicals are automatically introduced. Removing the risks associated with under/over manual dosing.



The chemicals are injected into a Mix Tank which provides contact time and mixing energy required to fully disperse and intermix the coagulant and flocculant.



The chemically conditioned material then passes through an inclined lamella where the solids causing the waters to become dirty and discoloured are captured.

Chemical Dosing Systems

Mix Tanks

Siltbuster's range of Mix Tanks vary from 1 m³ to 30 m³. The larger unit is based on an ISO 20 container for ease of transport.

Optional integral variable speed mixers (1 per stage) ensure the rapid and controlled mixing of any treatment chemicals with the waste water as well as ensuring any suspended particles remain in solution.

Typical applications for these mixing tanks are:

- Final water quality monitoring
- Reaction tanks
- pH correction
- Aeration (metals removal)
- Sludge storage
- Buffer tanks

Mixing tanks can be supplied as a standalone unit or as part of a complete water treatment package.

The mix tank also facilitates the introduction of gases such as air or carbon dioxide via spargers, for applications where pH adjustment is required or where aeration is needed to optimise metal removal.

Did you know...

The variable speed of the mixer driver allows the fine tuning of the mixing energy. This gives the best control over floc formation.

MT8

The Siltbuster MT8 is an 8 m³ mix tank for small and medium size projects.



MT30

The Siltbuster MT30 is a 30 m³ mix tank based on an ISO 20 container and is ideal for large scale water treatment systems.



Pipe Flocculators

Siltbuster Pipe Flocculators provide a secure and consistent method of effectively mixing treatment chemicals with waste water. The use of in-line static mixers eliminates the need for powered mixers minimising power requirements.

As standard our Pipe Flocculators come complete with 4 dosing ports allowing the multi-stage dosing (sequential addition) of a range of treatment chemicals

The range of Pipe Flocculators available can handle flow rates of up to 150 cubic metres an hour depending on which unit is chosen.

- No power requirements
- No moving parts
- Rapid and uniform mixing
- No reverse mixing



Stands

By elevating the mixing tank on a stable and secure steel stand the subsequent treatment stage(s) can be gravity fed. This means a pump is not needed for this transfer, saving cost and energy.



Chemical Dosing Skid

The Siltbuster free standing chemical dosing skid comprises a splash proof enclosure (housing) for the storage of dosing pumps and ancillary equipment. It is used for controlled chemical dosing.



Containerised Chemical Dosing

Secure, self contained dosing and inline mixing



Overview

The Siltbuster Containerised Chemical Dosing system provides a secure means of locating a dosing system and treatment chemicals within a 20 ft ISO container.

The Containerised Settlement Treatment system comes complete with all necessary equipment to allow the flow proportional/ pH proportional dosing of the treatment chemicals and their mixing with the water to be treated.

The container can be configured with a range of options including:

- Bunded chemical storage
- Flow-proportional dosing systems
- Reaction/aging tanks and pipeflocculators
- Control panels and data logging
- Insulation, lighting and heating
- Automatic monitoring of feed and discharge water (Clarity)

How Containerised Chemical Dosing works

- Water containing slow settling solids, is pumped into the Siltbuster water treatment system.
- The flowrate is monitored and a signal is relayed to the chemical dosing pump.
- The chemical dose is automatically adjusted to ensure it can react to changes to the water flowrate.
- Following chemical treatment, the water then passes through a Siltbuster lamella clarifier, capturing solids allowing the treated water to be safely discharged.
- Should the pH level of the water be either acidic or alkaline, the system has the ability to include an optional neutralisation stage.



KEY ADVANTAGES

- + Secure (vandal-resistant) and safe housing of chemicals
- + Double bunded chemical storage provides enhanced environmental protection
- + All-weather housing, with integral heating for frost protection

TYPICAL APPLICATIONS

- + Water with presence of slow settling solids
- + Long duration construction schemes
- + Discharge to surface watercourse

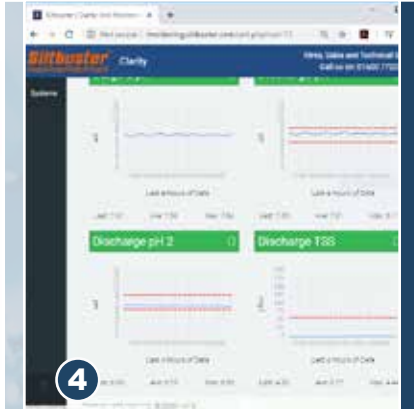
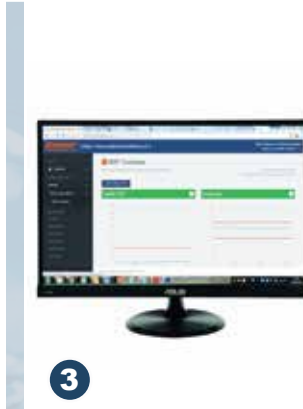


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|-------------------------------------|------------------------------------|
| 1 BUNDED CHEMICAL STORAGE | 4 CONTROL PANELS |
| 2 FLOW-PROPORTIONAL DOSING | 5 LIGHTING AND HEATING |
| 3 REACTION TANK OR PIPE FLOCCULATOR | 6 MONITORING OF FEED AND DISCHARGE |



Clarity

Real-time Online Monitoring and Reporting



Overview

The regulators often request the recording of data as proof of conformance to the discharge criteria.

To remove ambiguity and enable commercial resilience, real-time water quality monitoring supports best practice and delivers a robust data set.

Moving away from traditional, qualitative spot checks, Clarity by Siltbuster now provides continuous quantitative measurements forming a crucial audit trail.

Product Detail

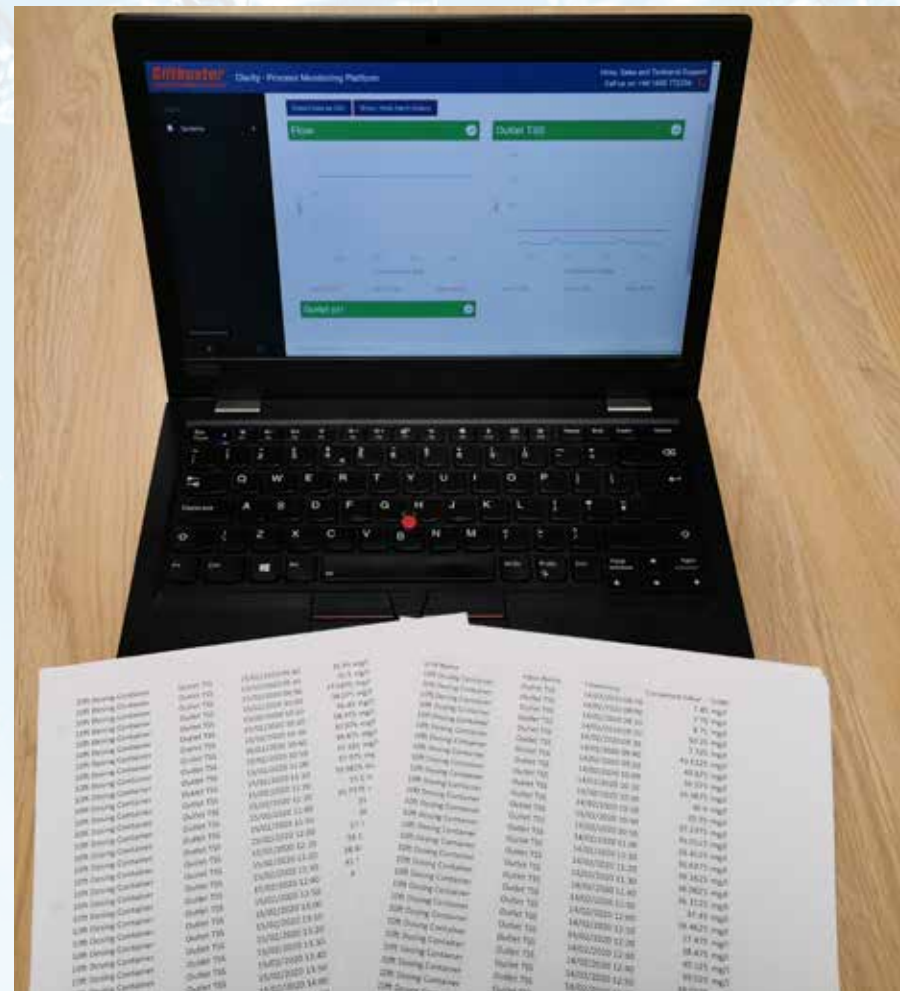
Any number of key parameters can be logged and monitored (for both inlet and/or outlet waters), be that Total Suspended Solids, pH, Flow rate, Dissolved Oxygen, Conductivity, Temperature to name a few.

Accessible via both a web and mobile app interface, Clarity enables Environmental Advisors to maintain a high level overview of multiple sites compliance (via a red, amber, green flagging system) whilst still having access to exact performance data where required.

Historical records can be extracted via the search functionality and the data can be exported as a .csv file, providing robust evidence of permit compliance.

Clarity offers alarm notifications by text message (SMS) or email, should water reach pre-defined limits. Depending on feed pump choice, the system can even shut down the pump automatically to prevent a breach.

Site managers and operatives can continue with their daily tasks without the need for constant supervision.



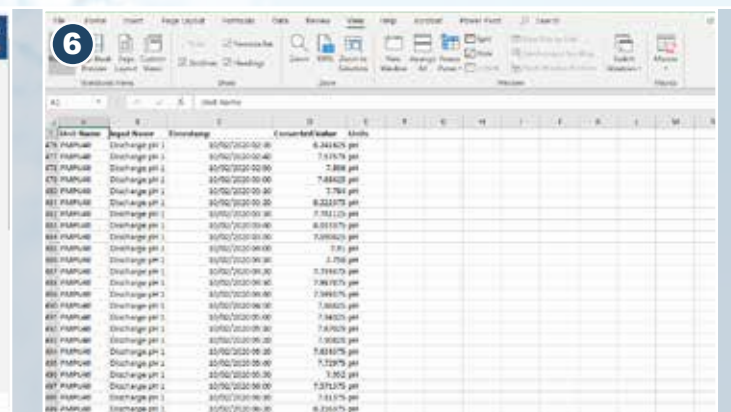
KEY ADVANTAGES

- + Data logging for proof of compliance
- + SMS and email process alarms
- + Available for hires and sales and can be retro-fitted

TYPICAL PARAMETERS

- + Total Suspended Solids (TSS)
- + Acidity (pH)
- + Dissolved oxygen
- + Flow rate, conductivity and more....

- 1 CONFIGURE PROBES
- 2 DOWNLOAD APP FROM GOOGLE PLAY
- 3 WEB INTERFACE
- 4 SET ALARMS AND NOTIFICATIONS
- 5 TRAFFIC LIGHT COLOUR CODING
- 6 DATA LOGGING



Gravity Settlement Case Studies

Road improvement project, Heathrow Airport Galldris Construction / Balfour Beatty

A main southern perimeter road running adjacent to London's busy Heathrow Airport required repairs and upgrading. Various excavations were needed to be carried out in roads and within the central reservations. As work was taking place close to a canal, the high water table quickly resulted in filling with solids in the water.

As water was entering at multiple locations, a number of pumps were required to frequently dewater the area. Initially, 1 FB50 settlement unit was deployed to address a single section. As the unit provided significant results, 3 more were installed to ensure the waters being discharged were of a suitable quality.

In addition, Siltbuster have been tasked in a number of both Airside and Landside projects at Heathrow Airport, including the construction of Terminal 5.



Decommission of Battersea Power Station Skanska, Carillion & Blu-3



A large area of hard standing was being used as a holding area for stockpiles of potentially contaminated soil excavated from the Battersea Power Station site. The volume of water runoff from the stockpiles was significant during periods of heavy rain causing local flooding of site roads and potentially silting up surface and foul drainage.

Siltbuster provided a HB50 settlement unit to provide up to 50m³/hr of treatment capacity preventing site flooding and discharging only treated water to foul sewer under Consent to Discharge regulated by Thames Water.

Groundwater in London Skanska

Excavation work in the city centre began to fill with ground and surface water. As work needed to continue in poor weather conditions, Siltbuster were tasked to quickly dewater the area into the mains sewer, whilst remaining compliant with the site's discharge consent.

The restricted space required a compact solution. Siltbuster provided its HB20 unit to meet the needs of the project and successfully carry out the work.

In addition, the Siltbuster HB20 was fitted with an impeller flowmeter enabling the site to record the volume of water discharged, as required in their discharge permit.



Chemical Dosing Case Studies

Dam grouting project, Exmoor National Park Bachy Soletanche

Siltbuster supplied two water treatment plants to help prevent any environmental impact as a result of a major dam maintenance project in Exmoor National Park, Somerset.

At the base of the dam a 150 m³/hr treatment system captured leaking water from under the dam and removed sand particles from suspension, resulting in neutralization of the alkaline pH.

A second, larger 500 m³/hr Siltbuster treatment plant was located further downstream to treat the groundwater from a series of natural springs in the valley below.

Siltbuster installed both plants and they were operational in just 12 weeks, where they remained for the duration of the project.



A465 Heads of the Valleys, South Wales Carillion PLC

During one of the wettest winters on record, Siltbuster were required to install their systems to treat a large volume of surface water as a result of multiple excavations on one of Wales' largest construction sites.

Due to the size of the construction site, a number mobile Siltbuster systems were required to treat the water generated to ensure the working area remained dry.

In addition, flocc blocks were introduced with the Siltbuster settlement units where glacial deposition had left behind pockets of clay.



Metro Cityring, Copenhagen Holscher Wasserbau

In Copenhagen's city centre, work on the expansion of the metro system are underway, spanning 15 km in length with 17 upgraded stations when complete which will improve commuting times. The natural high water table and predominantly limestone geology, has caused a number of issues during construction.

Siltbuster were tasked with treating slow settling groundwater laden with very slow settling Calcium Carbonate. A number of Siltbuster chemical dosing systems with digital dosing systems, were quickly transported and installed on site to accurately treat the water with the use of coagulant's and flocculant's. The digital dosing systems were operated in conjunction with SCADA so that all data could be remotely monitored and controlled.





Hire, Sales & Technical Support

Tel: +44(0)1600 772256

Visit: www.siltbuster.com

Email: enquire@siltbuster.com



Siltbuster Ltd, Williams Building, Kingswood Gate, Monmouth, Monmouthshire, NP25 4EE

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