

PSD

www.solidseparation.com

Suppliers of specialist equipment to
separate solids from liquids, worldwide.

STATEMENT OF CAPABILITY 2010



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1.0 Introduction

1.0 INTRODUCTION

1.1 Company Background

PSD has, for more than 20 years, been supplying rental slurry and mud cleaning equipment and bentonite and mud services to the civil engineering and drilling industries. We have worked on hundreds of pipejacking and micro-tunnelling projects through many different types of ground. We also have considerable experience of cleaning mud on directionally drilled crossings since the mid 1980s including the largest diameter crossings in Europe. In addition we have cleaned mud for many diaphragm walling projects with grabs and hydraulic cutters as well as carrying out work for many other applications.

Our management personnel have experience of earth moving, trenching, bored & driven piling, diaphragm walling, rock drilling, coring, large diameter shaft drilling by forward & reverse circulation, tunnelling, pipe-jacking, micro tunnelling, caisson sinking, horizontal directional drilling, off-shore & on-shore oil & gas exploration & production, oilfield waste slurrification & reinjection into deep strata, canal & dock cleaning, soil washing, site investigations, quarrying, minerals recovery and general construction. They have been directly involved with such prestige projects as the Thames Barrier, London Water Ring Main, the Channel Tunnel Rail Link and the Heathrow Express, as well as on smaller projects such as gas pipelines, sewers and bridge foundations.



On 21st April 2009, PSD won the UK's most prestigious award for business achievement, **The Queen's Award for Enterprise**. The Awards recognise outstanding achievement by UK companies and PSD, which also celebrated 25 years of trading last year, is immensely proud of this achievement. The award was won in the category of International Trade, in recognition of PSD's significant growth in overseas business.

1.2 Company Philosophy

We are frequently appointed to work in support of clients on very challenging and critical jobs and our clients place great trust and confidence in our ability to provide the enhanced and cutting edge performance that they require for these important projects. The reliability of our equipment speaks for itself and is regularly measured at more than 99% plant availability.

Our "*can do*" approach enables us to meet the high expectations of our clients and often enables us to apply our wide knowledge base to new and interesting applications. We constantly seek to provide even better products and services so as to further extend our lead over the competition and thereby increase, for our clients, the benefits of employing PSD.

We pride ourselves on providing a highly technical, professional and cost effective service to clients resulting in repeat orders.

In short, we are committed to providing our clients with a high standard of service at an affordable price.

1.3 Design

The majority of PSD's machines are designed in-house and built using high quality materials and components. Our plants are designed to be easy to transport, set up and to operate. The machines are built specifically for the international rental market where reliability is of great importance, yet where operating costs need to be low. The design principles that we employ for our equipment mean that they achieve the optimum performance from the components used and that each machine will provide better performance than similar sized or rated machines available elsewhere on the international rental market.

Our modular designs enable equipment to be operated as stand alone units, in series for a wide range of separation or in parallel for increased capacity. Where a combination of capacity and range of separation is required, machines with different capabilities can be put together almost like Lego to satisfy project specific requirements.

Our policy of environmental awareness and continuous improvement using input from clients, plant operators, designers and equipment manufacturers ensures that our machines are at the forefront of technology and performance and are easy to operate and maintain.

**2.0
Equipment &
Services**

2.0 EQUIPMENT

PSD is the UK's foremost supplier of rental slurry cleaning and solids separation equipment for onshore applications. Our hire fleet includes clayball separators, flat and declined primary shakers, desanders, desilters, mud cleaners, ultra-fine desilters, centrifuges and flocculation plants. We have equipment capable of removing everything from gravels & sands to fine silts and ultimately colloidal particles. By evaluation of a client's site investigation or Particle Size Distribution data or by using our test facilities on samples of strata or slurry, we can identify the methods of treatment and equipment suitable for any particular application.

PSD's extensive range of equipment enables us to select the right items for each job and to offer a cost effective solution to each slurry or mud cleaning requirement. Our larger plants can handle flowrates of 450, 900, 1350 and 1800m³/hr and multiple units can be used in parallel to handle even larger flows if required.

Many of PSD's machines are designed in-house and fabricated in a manufacturing facility adjacent to our plant yard. The modular design of our equipment makes them easy to transport, set up and to operate. The machines are built specifically for the rental market where reliability is of great importance, yet where operating costs need to be low. Our policy of environmental awareness and continuous improvement using input from clients, plant operators, designers and equipment manufacturers ensures that our machines are at the forefront of technology and performance and are easy to operate and maintain.

Each machine that we design employs principles that ensure that the optimum performance is obtained from the components used and that the unit will significantly outperform other similar sized or rated units that might be available on the international rental market.



2.1 Primary Shakers

We have a wide range of primary shakers, designed to remove coarse particles such as roots, stones, pieces of timber and plastic. Each type of machine has different capabilities and throughput capacity dependent upon its characteristics. Variables include screening area, screen aperture and screen material. Screen types include slotted polyurethane, stainless steel wedgewire, woven wire.

2.2 Clayball Separators

Designed for the removal of clayballs and other large particles, the primary aim of the clayball separator is to keep clayballs intact and prevent unnecessary degradation and dispersion. The action of the clayball separator causes minimum shear between the solids and the machine, thereby eliminating smearing of the deck and degradation of the pieces of clay or clayballs. Typically these machines handle flowrates of up to 200m³/hr although higher capacities are available.

2.3 Desanders

Our SS and SOLIDSMaster® desanders range from units with a capacity of 120m³/hr to 450m³/hr with multiple units being capable of handling much higher flows. Various sizes of primary hydrocyclone are used including 5", 10", 20" and 26". Some machines are equipped to operate as desander / desilter units and in all cases the hydrocyclone underflow is dewatered by long life, wear resistant slotted screens of polyurethane or stainless steel.

2.4 Mud Cleaners

Mud cleaners can be used as economical and efficient single units on their own or alternatively used with desilters placed downstream for further fine cleaning of the mud. PSD's range of SUPERCLEAN mud cleaners provide compact, energy efficient cleaning for flows of between 90 and 180 m³/hr include primary screening, hydrocyclone feed pump, hydrocyclones and dewatering screen. The new SUPERCLEAN 350DP handles flows of up to 350m³/hr and incorporate primary screening, desanding hydrocyclones mounted over a dewatering screen, desilting hydrocyclones over fine mesh dewatering screen, hydrocyclone feed pumps and discharge pump. The smaller MC range provides even more compact and energy efficient cleaning for flowrates up to 80m³/hr.

2.5 Desilters

Desilters normally work downstream of a desander, hence the name **Supplementary Unit**. The hydrocyclones separate solids much finer than sand and the hydrocyclone underflow is dewatered by a high performance linear motion shaker fitted with pre-tensioned fine mesh stainless steel screens. Each unit is equipped with a discharge pump for onward transfer of cleaned fluid.

Our SU72DP ultra-fine desilters offer the very finest cleaning of any high volume rental units on the European market. Each machine uses banks of 2" hydrocyclones to separate solids as fine as 10µm at flowrates of up to 100m³/hr. The underflow from the hydrocyclones is dewatered by a high speed linear motion shaker fitted with screens that can be as fine as 300 mesh.

2.6 Centrifuges



We operate one of the widest range of centrifuges of any rental company in Europe. These centrifuges are available worldwide and can remove particles as small as 5µm without chemical treatment, at flowrates of anything up to 120m³/hr. The use of multiple units in parallel can allow even higher flowrates to be processed. Our range includes small capacity HS3000DP and HS3400DP units, medium capacity S3-01-G units, high capacity S4-1-G machines and our S5-1-G centrifuges are thought to be the largest capacity, easily portable rental centrifuges in the world.

2.7 Flocculation Systems

We offer a range of flocculation equipment including solid and liquid mixing systems, dosing pumps, settlement tanks and pH reduction systems. Flocculation is normally used in conjunction with centrifuges or settlement tanks to remove the very fine flocculated solids. We can also help to identify the best products for your application.

2.8 Mixing and Storage

Our hire fleet includes a large selection of robust bentonite mixing and slurry storage equipment. Many of our mixing and storage tanks are built to the same dimensions as type 20' type 1CC freight containers and are Lloyd's Register certified, thereby enabling them to be shipped as seafreight containers.

Thoughtful design means that pumps, jet hoppers and other smaller equipment can be transported within the container sized units.

Our range of venturi jet hoppers allows bentonite, other powders and liquid products to be effectively mixed with water at high volumes. Skid mounted venturi jet hoppers are available in 4" and 6" but pipework adapters can be supplied to suit a customer's requirements. The units may be rented on their own or with purpose built bentonite mixing tanks which include vertical shaft agitators.

Specially designed tanks for the mixing of bentonite, with capacities of up to 30m³, are supplied with Venturi jet hoppers and are fitted with vertical shaft, electric powered agitators.

Supraton and Polygator high shear mixers offer on-line mixing of bentonite with little requirement for the bentonite to yield as is normally required with venturi mixers. These units are often used in conjunction with PSD's big bag handling equipment.

Mixers for both solid and liquid grade polymers are available for rental. Solid grade mixers have variable speed polymer feeders and are designed to be operated on top of an agitated tank. Liquid grade mixing systems are supplied with an integral tank, vertical shaft agitator and variable speed dosing pump.

A range of tanks of up to 30m³ capacity with twin or single vertical shaft agitators are available with valved connections to suit your requirements. The larger tanks are built to type 1CC container dimensions and are certified for shipment as seafreight containers. Straight sided or hopper type storage tanks of up to 35m³ capacity are available with low level valved connections. Circular storage tanks of larger capacities such as 125m³ and 200m³ are available to special order.

2.9 Complete Systems

We are able to offer complete bentonite mixing, fresh bentonite storage, slurry cleaning and waste slurry clean-up systems. These are generally used on larger projects where multiple modules are used together to offer increased capacity or a wide range of cleaning capabilities. Complete systems can be offered to handle any flowrates although typical scenarios would be for 450, 900, 1350, 1800, 2250 and 2700m³/hr.



800m³/hr Slurry Treatment Plant,
Kai Tak, Hong Kong



1800m³/hr Slurry Treatment Plant,
Singapore



1350m³/hr Slurry Treatment Plant,
Kowloon, Hong Kong

2.10 Waste Slurry / Mud Disposal

The disposal of waste slurry / mud has traditionally been by tanker to landfill tips but there are now many locations where there is no suitable tip within reasonable travelling distance and the cost of tipping is in any case rising very quickly. This situation means that it is now often more economical, and nearly always more environmentally acceptable, to treat the waste slurry / mud on site so as to reduce the volume of liquid waste being sent off the site by tanker.

Legislation was introduced in 2001 to implement the European Landfill Directive, which restricts the disposal of fluids to only a few licensed landfill sites in the UK and elsewhere through Europe.

PSD are specialists in the cleaning of waste fluids and we are often able to turn waste mud or slurry into a considerably reduced volume of solids that can be disposed of at landfill and practically clear water that is able to be discharged to the sewer system.

One method of treatment for waste slurry or mud is to flocculate the solids in the fluid and dewater it so as to produce a semi-solid sludge for off-site disposal by tipper truck and a near clear centrate which can be safely disposed of to the public sewer system or to streams, rivers, canals, lakes or to the sea. Flocculation and centrifuging is most economical when there is a continuing requirement for waste fluid disposal during the progress of the job or where there is a large volume of surplus fluid, such as at the end of the work. Small or medium sized centrifuges can typically process 8 to 10m³/hr of flocculated waste fluid, our large S4-1-G centrifuges can handle up to 40m³/hr of these materials and the S5-1-G centrifuges have almost double that capacity.

Another method of eliminating the requirement for disposal by tanker, particularly where waste mud volumes are not large, is mud solidification. This process uses a specialist water absorbent polymer, POLYSWELL, which is mixed with the mud. Some of the water in the mud is chemically bound to the polymer thereby reducing the free water content of the mud and making it 'thicker'. The more polymer that is added the more water becomes bound to it and the mud becomes thicker, drier and stiffer. The final 'solidified' mud can be handled as a solid rather than a liquid and can normally be disposed of to a 'solids' landfill tip.

2.11 Mud Products

PSD have considerable experience in the supply, use, cleaning and disposal of water based muds to the civil engineering and drilling industries. We supply a wide choice of bentonite powders and have specialist mud additives for the control of rheological mud properties for bentonite, polymer and biodegradable mud systems.

Most of our specialist mud products, such as viscosifiers, thinners, fluid loss reducers, friction reducers and pH modifiers are held in stock by us and are available for rapid dispatch for delivery within the UK by next day or standard courier service. We can also make arrangements for air, sea or road transport to locations outside the UK.

There are many different types of bentonite powder including natural Sodium Montmorillonite clay, activated Calcium Montmorillonite clay and chemically or polymer enhanced clays. Bentonite powders are available with yields from 60 to 200 barrels per ton. The selection of the correct bentonite with the appropriate characteristics for the particular job will nearly always result in less problems and higher productivity, *thereby lowering the overall production costs.*

We can advise you on the selection and use of our bentonite and other products for your particular application. We stock a broad range of viscosifiers, from synthetic polymers to natural vegetable based biodegradable products.

CLAYCAP LIQUID is an excellent friction reducer and when added to water it forms an extremely slippery liquid that can be put to a variety of applications such as a lubricating fluid for pipejacking or caisson sinking. CLAYCAP LIQUID also reduces swelling of clays and provides hole unneeling[□]ion and is thus an excellent choice of product.

PSD's FLR POLYMER is a solid grade synthetic polymer, which is primarily used as a **Fluid Loss Reducer** in bentonite based muds. It is particularly effective in plain fresh water muds, polymer extended muds and in weighted muds where substantial reductions in fluid loss may be achieved with small additions of this polymer, typically less than 1.5kg/m³ of mud.

POLYTHIN is a particularly effective mud thinner. One of its major uses is for the thinning (and desanding) of muds in diaphragm walling, prior to concreting. It is also highly useful for thinning heavily contaminated muds in directional drilling and slurry shield tunnelling applications.

PSD have a wide range of flocculants, called POLYFLOC. These include:

- Solid grade flocculants
- Liquid grade flocculants
- Anionic flocculants
- Cationic flocculants
- High charge flocculants
- Low charge flocculants
- High molecular weight flocculants
- Low molecular weight flocculants

In addition we supply primary coagulants and pH reducers.

**3.0
Project
Summaries**

3.0 PROJECTS

3.1 Tunnelling & Pipejacking

Listed below are some of the tunnelling and pipejacking projects that PSD has supplied slurry treatment equipment to:

Location	Client	Details
London, UK	Streeters – Costain	Thames Water Fresh Water Ring Main
London, UK	McAlpine, Wayss & Freytag, Bachy J.V.	London Underground Jubilee Line, River Thames tunnels
Birmingham, UK	Amey Donelon	Dewatering of excavated solids from construction of Erdington Sewer.
Wanchai, Hong Kong	Gammon-Kvaerner Joint Venture	Central & Western Wan Chai 2.2m diameter sewers
Ayr, Scotland	George Leslie-Euro Iseki	2.4m Interceptor Sewer
Dover & Folkestone, UK	Euro Iseki	1.82m Sewer
Horden, UK	Johnston Construction	curved sea outfall tunnel,
Warndon, UK	Johnston Construction	Supply of desander for pipejack
Stockport, UK	Barhale Construction	Supply of desander for pipejack
Witney, UK	M J Clancy	Supply
Dubai, UAE	Euro Iseki	Aluminium plant 2.14m seawater intake
Bilbao, Spain	Euro Iseki	Main city centre sewer
Dover, UK	Murphy	1.45m sewer
Bishopbriggs, Scotland	A.E. Yates	Relief sewer
Kelvin Valley, Scotland	A.E. Yates	Main interceptor sewer
Rainham, UK	Murphy	Supply of desander for pipejack as part of Channel Tunnel Rail Link project (CTRL 361)
Aberdeen, Hong Kong	Complant & Fine Projects / Nishimatsu	Twin 1.8m cable tunnels in hard rock
Dundee, Scotland	Johnston Construction	240m ³ /hr Desanding/desilting for pipejack
Kowloon, Hong Kong	China Harbour Transfield JV	5.15m diameter Kai Tak transfer sewers. 0.2% downtime.
Limerick, Ireland	Coleman Tunnelling	Pipejack
Limerick, Ireland	Herrenknecht International	Desanding for pipejack
Llandudno, Wales	AGD Iseki	Desanding, & waste slurry clean up for pipejack
Dublin, Ireland	AMCO Donelon	Desanding, slurry storage and supply of FLR Polymer for pipejack
North Point, Hong Kong	Leighton-Kumagai Joint Venture	Clean up of run off water from construction of Wan Chai & North Point Sewer
Tunbridge Wells, UK	Johnston Construction	Slurry cleaning for pipejack
Swords, Ireland	Herrenknecht International	Desanding for 750mm pipejack
Falkirk, Scotland	F&B/Herrenknecht International	1.45m dia tunnel. Clayball separator & centrifuge with flocculation
Edinburgh, Scotland	McGarvey Construction	Centrifuge with flocculants to control clay content of the active slurry

Location	Client	Details
Athens, Greece	AGD Iseki	Desanding for pipejack in dense sands as part of preparation for 04 Olympics.
Swords, Ireland	AGD Iseki	Controlling slurry density for pipejack in clays with use of centrifuge and flocculation system
Limerick, Ireland	AMEC / PJ Hegarty JV	Desanding and desilting equipment in support of 2 No. 1800mm diameter Herrenknecht pipejacking machines. Full waste slurry clean up using centrifuge and flocculants
Bewl, UK	F & B Tunnelling	Clayball separator to act as primary cleaning unit on a pipejack project.
Brussels, Belgium	SMET Tunnelling	Desanding for 1450mm diameter pipejack.
Hamburg, Germany	SMET Tunnelling	Desanding/desilting on a 2900mm diameter pipejack in the centre of Hamburg.
Leicester, UK	AGD Iseki	Desander for pipejack.
C855 Circle Line, Singapore	Who Hup, Shanghai Tunnel Engineering, Alpine Mayreder	Major four stage slurry treatment plant to support 2 No. 6.6m diameter slurry TBMs with a combined flow rate of 1800m ³ /hr.
Durban, Republic of South Africa	Hochtief Construction / Concor (Durban Harbour Tunnel Contractors)	Bentonite mixing, slurry cleaning and waste slurry clean up for 520m long, 5.1m diameter services tunnel in marine sediments beneath Durban Harbour entrance.
Lille, France	CSM Bessac	Provision of desander for use with AVN1000 excavating 117m drive at 1295mm OD through sandy clays.
Kowloon, Hong Kong	Leighton-Balfour Beatty-Kumagai-John Holland (Link 200 JV)	Bentonite mixing, slurry cleaning and waste slurry clean up for 8m diameter railway tunnel for Kowloon Canton Railway Corporation.
Sables d'Olonne, France	CSM Bessac	Provision of 310m ³ /hr desander for 600m of 1850 OD pipejack in very fine sand and abrasive rock.
Dunedin, New Zealand	McConnell Dowell Constructors	Provision of desander and centrifuge to support AVN1800T on 2150mm diameter pipejack.
South London, UK	Herrenknecht International	Desanding for 1200mm dia pipejack.
Isle of Grain, Kent, UK	F & B Limited	Provision of centrifuge and flocculation system for waste slurry clean up for pipejack.
County Dublin, Ireland	Dolmac Limited	Desander to support Herrenknecht pipejacking machine.
Prague, Czech Republic	AGD (Iseki)	Mud cleaner for pipejack
Ramsgate, UK	AGD (Iseki) / Perco	Centrifuge & floc system for pipejack
Newcastle under Lyme, UK	AGD (Iseki) / Perco	Desander, centrifuge & flocculation system for pipejack
Mullingar, Ireland	AGD (Iseki) / Dolmac	S4 Centrifuge & flocculation system for pipejack
Croes Atti, Flint, UK	AGD (Iseki) / VJ Donegan	Centrifuge & floc system for pipejack
Barcelona, Spain	AGD (Iseki)	SM400 desander, S4 centrifuge & flocculation system for pipejack

3.2 Major Civil Engineering

PSD are often involved in major civil engineering projects, including bentonite pilling, diaphragm walling, canal cleaning, reservoir dredging, soil washing. Some of those that we have been involved with recently are listed below:

Location	Client	Details
Blackpool, UK	Bachy Soletanche	Fine cleaning and waste mud clean-up by flocculation for diaphragm walling – North West Water storm water tanks
London, UK	Stent Foundations	London Underground Jubilee Line, Bermondsey Station
London, UK	Tarmac Bachy	Canary Wharf station diaphragm walling
Kent, UK	Tarmac H.B.M. J.V.	Medway Tunnel
Birmingham, UK	Douglas Technical Services	Dredging of the Aston canal.
Copenhagen, Denmark	COMET (Bachy)	Copenhagen Metro
Germany	Spie Spezialtiefbau	Fine cleaning of diaphragm walling slurries by centrifuge
London, UK	VHE	Woolwich Arsenal, soil washing
Newmarket, UK	Delta Civil Engineering	Removal of solids from wash water used to clean the 20km Blackdyke to Kennett water transfer tunnel
Bourg la Reine, France	Spie Fondations	Fine cleaning of diaphragm walling slurries by centrifuge
Microsoft Office Word 2003.Ink Jersey, Channel Islands	Shanks Waste Services	Washing of 1000 tonnes of clay-rich hydrocarbon contaminated land at a former gas works
La Celle St. Cloud, France	Spie Fondations	Fine cleaning of diaphragm walling slurries by centrifuge
Hackney, UK	Cementation Bachy JV	Fine cleaning by centrifuge for diaphragm walling on Channel Tunnel Rail Link – Contract 220
London, UK	Costain Skanska Bachy Joint Venture	Desilting for diaphragm walling on Channel Tunnel Rail Link – Contract 240
London. UK	AMEC Piling	High capacity desanding for A13 Piling works
Birmingham, UK	Stent Foundations Expanded Piling AMEC Piling	Various contracts for desanding of bentonite piles for construction of Birmingham Northern Relief Road
London, UK	Cementation Foundations Skanska Limited	Channel Tunnel Rail Link – desilting for diaphragm wall – Contract 230
London, UK	Keller Ground Engineering	Cleaning of bentonite for Channel Tunnel Rail Link Contract 310 piling
Dublin, Ireland	Nishimatsu Construction	Clean up of run off water from construction of Dublin Port Tunnel
East Sussex, UK	J T Mackley Constuction	Dewatering of dredgings from Weir Wood Reservoir
Arnhem, Holland	HBG Construction	Desanding and desilting of 50 No. 1.5m dia. Piles excavated in very fine sand
North Point, Hong Kong	Leighton-Kumagai Joint Venture	Clean up of run off water from construction of Wan Chai & North Point Sewer

Location	Client	Details
London, UK	Keller Ground Engineering	Clean up of waste bentonite for Channel Tunnel Rail Link Contract 310.
Paris, France	Soletanche/Bilfinger/Spie JV	Removal of chalk fines from active mud for hydrofraise operation.
Barrow, UK	Van Oord ACZ	Desanding of pumped seawater used to pressure test pipeline.
Monte Carlo, Monaco	SAM	Removal of fines from mud and waste mud clean-up.
Corby, UK	Corus Steel	Dewatering of sludge from holding lagoons.
Biscarrosse, France	Soletanche Bachy	Removal of fine particles from mud and waste mud clean-up using a centrifuge and flocculants.
Dartford, UK	AMEC	Clean-up of chalk contaminated shaft construction water using a centrifuge, flocculants and pH adjustment
Marseille, France	Soletanche Bachy	Cleaning of mud for a small diameter piling operation. Compact, high performance unit used.
Le Havre, France	Soletanche Bachy	Desilting of mud used for hydrofraise operation and waste mud clean-up using a centrifuge and flocculants
Great Yarmouth, UK	Bachy Soletanche	Desanding and desilting of diaphragm wall panels for deep shaft.
Corby, UK	Corus Steel	Annual dewatering of zinc sludge from holding lagoons.
Allington, UK	Bachy Soletanche	Fine cleaning of mud for hydrofraise operation and waste mud clean-up using a centrifuge and flocculants. Deep excavation for underground waste transfer station.
Crotone, Italy	DEC Dredging International	Major soil washing project to remove contaminants from beach sand.
Marseille, France	Soletanche Bachy	Fine cleaning of bentonite mud used on hydrofraise diaphragm walling project.
Reading, UK	Clear Water D.C	Three stage separation equipment for the clean up of over 8000m ³ of difficult sludge from digester tanks.
Martinique, Caribbean	Soletanche Bachy	Fine cleaning of bentonite mud used on prestigious diaphragm walling project
London Heathrow, UK	British Airports Authority	Long term rental of flocculation system and belt press for the fine cleaning of site road sweepings
Albi, France	Soletanche Bachy	Compact, high performance mud cleaner for small diameter piling operation.
Paris, France	Spie Fondations	Supply of supplementary desilting equipment to work downstream of client's own desander on diaphragm walling project.
Ganguise, France	Soletanche Bachy	Provision of supplementary desilter and centrifuge to work downstream of client's own desander on diaphragm walling project.
Marseille, France	Spie Fondations	Supply of desilting equipment to work downstream of client's own desander on

Location	Client	Details
		diaphragm walling project.
Terminal 5, Heathrow, UK	Bachy Soletanche	Compact high performance desander and desilter to clean bentonite mud on deep diaphragm walling project.
Rennes, France	Soletanche Bachy	Supplementary desilter working to remove sand and coarse silt downstream of client's desander.
Chertsey, UK	Southern Water / Clearwater D.C.	Removal of rag and grit deposits from a sludge digester tank.
Dalkeith, Scotland	CRM	Provided high quality flocculation plant and centrifuge for waste water clean up trial.
Piccadilly Extension for Terminal 5, Heathrow	BAA and Laing O'Rourke	Clean up of waste bentonite mud from an airside diaphragm walling project.
Marseille, La Parrette and Lille, France	Soletanche Bachy	3 No. Supplementary desilters working to remove sand and coarse silt particles downstream of client's desander.
Blancarde Marseille, France	Spie Fondations	Supply of desilting equipment to work downstream of client's own desander on diaphragm walling project.
T5 Heathrow, UK	BAA and Laing O'Rourke	Provision of flocculation plant and centrifuge for carrying out the removal of fines from fluid used in a aggregate washing facility.
Versailles, France	Soletanche Bachy	2 No. Supplementary desilters working to remove sand and coarse silt particles downstream of client's desander.
Marseille, France	Soletanche Bachy	Provision of supplementary desilter for diaphragm walling project.
Kirkcaldy, Scotland	Future Environmental Services	Provision of Primary screen, desander & desilter with operator for use with high pressure jetting of blocked sewer pipes
Mansfield, UK	Drilcorp Limited	Desanding equipment for 432m deep borehole drilled under bentonite
Issy les Moulineaux, France	Soletanche Bachy	Supplementary desilter working to remove sand and coarse silt particles downstream of client's desander.
M27 Motorway, Hampshire, UK	Clearwater D.C. & Highways Agency	Provision of primary screening & desilting equipment for dredging of motorway drainage balancing ponds.
Woolwich, UK	AMEC	Clean-up of chalk contaminated shaft construction water using a centrifuge, flocculants and pH adjustment for DLR Woolwich Arsenal Extension
Marina Bay, Singapore	Bachy Soletanche Singapore	Primary screen, SM450PSDP & SU10DP desilter to support diaphragm walling operation using grab and hydrofraise.
Cork, Republic of Ireland	Euro Dismantling Services Limited	Provision of primary screen, centrifuge and flocculation system for screening of sludge digester during decommissioning of chemical plant.
Lyon, France	Spie Fondations	Supplementary desilter working to remove sand and coarse silt particles downstream of client's desander.

Location	Client	Details
Paris, France	Soletanche Bachy	Provision of supplementary desilters for major diaphragm walling project.
Barrow, UK	Bachy Soletanche	Compact high performance desander and desilter to clean bentonite mud on diaphragm walling project.
Brussels, Belgium	Jan de Nul NV	Provision of desilter, flocculation system and Lamella Plate Concentrator for trials with removal of furnace slag from pipeline ballast water.
St. George's Wharf, London, UK	Bachy Soletanche	Compact high performance desander and desilter to clean bentonite mud on large diameter (1800mm) deep piling project.
Riverside South, London, UK	Bachy Soletanche	Compact high performance desander and desilter to clean bentonite mud on diaphragm walling project.
North Quay Shaft, London, UK	Bachy Soletanche	Compact high performance desander and desilter to clean bentonite mud from shaft construction by diaphragm walling.
Former Maze Prison, Northern Ireland	Remedx	Screening equipment & lamella plate separator with centrifuge for soilwashing application
M74 "missing link" Glasgow	Morgan Est Piling	Mud cleaning and mixing equipment to support bentonite piling through clay, sand, gravel and mudstone
Tyne Tunnel 2	Bachy Soletanche	Desanders and desilters to clean bentonite for excavation of diaphragm walled tunnel portals by grabs through Glacial Till and laminated clay to rock head and SU300DP desilter to support Hydrofraise through the sandstone / siltstone / mudstone.
The Shard	Stent Foundations	Desander and desilter to clean bentonite mud for the construction of 50 No. 900mm diameter secant piles to 55m depth, 20 No. 1500mm diameter and 60 No. 1800m diameter load bearing piles through Terrace Deposits, London Clay and Thanet sands for the UK's tallest building

3.3 Horizontal Directional Drilling

Just some of the many HDD projects that PSD has supplied mud cleaning equipment to are listed below:

Location	Client	Details
Furzey Island, UK	Land & Marine	BP undersea conductor pipeline
Groningen, NL	Horizontal Drilling International S.A.	3 No. crossings 30" ream 360m-970m
River Tejo, Portugal	Hydro Soil Services N.V.	1 No. crossing 20" pipe 34" ream x 700m
Pont St.Esprit, France	Horizontal Drilling International S.A.	2 No. crossings 22" x 240m
Grembergen, Belgium	Hydro Soil Services N.V.	1 No. crossing 20"x280m
Aries, France	Horizontal Drilling International S.A.	1 No. crossing 32" pipe 48" ream x 810m
Zeebrugge, NL	Hydro Soil Services N.V.	1 No. crossing 40" pipe 54" ream x 487m
Mol, Belgium	SMET G.W.T. N.V/S.A	
Frodsham, UK	Horizontal Drilling International S.A.	2 No. crossings 24" pipe x 500m
Dudzele, Belgium	Hydro Soil Services N.V.	1 No. crossing 56" ream 48" pipe x 660m
Gainsborough, UK	Horizontal Drilling International S.A	1 No. crossing 24" pipe 36" ream x 446m
Berlare, Belgium	Hydro Soil Services N.V.	1 No. crossing 40" pipe x 460m
Velsen, NL	Horizontal Drilling International S.A.	1 No. crossing 32" pipe x 1000m
Doel, Belgium	SMET G.W.T. N.V/S.A	
Narzole, Italy	Hydro Soil Services N.V.	2 No. crossings 20" pipe 1 No. crossing 16" pipe
Cardiff, UK	Allen Watson Limited	
Cardiff, UK	Avoidatrench Limited	
Peterborough, UK	Horizontal Drilling International S.A.	1 No. crossing 42" pipe 56" ream 500m in rock
Wester Schelde, NL	Hydro Soil Services N.V.	
River Ribble, Preston, UK	Smit Land & Marine Engineering Limited	1 No. crossing 42" pipe 60"ream x 640m
Hartel Kanaal, NL	Horizontal Drilling International S.A.	1 No. crossing 40" pipe x 800m
Yeovil, UK	Avoidatrench Limited	
Folkestone, UK	Stockton Pipelines Limited	1 No. crossing in Chalk
Rio Tejo, Portugal	Smit Land & Marine Engineering Ltd.	1 No. crossing 28"ream x 450m
Le Pin, Paris, France	Horizontal Drilling International S.A	1 No. crossing 36" pipe 54" ream
Ijmeer, NL	Horizontal Drilling International S.A	1 No. crossing 22" pipe x 1400m
Amsterdam, NL	Horizontal Drilling International S.A	4 No. crossings 28" pipe
Northampton, UK	Hydro Soil Services N.V.	1 No. crossing 12" pipe 18"ream x 1500m
Damme, Belgium	Verbraeken Construction N.V	1 No. crossing 22" ream
Southend, UK	LMR Drilling UK Limited	1 No. crossing 20"ream x 470m

Location	Client	Details
Orleans, France	HDI S.A	1 No. crossing 10" pipe 280m in rock
Hajduszoboszlo, Hungary	Hydro Soil Services NV	4 No. crossings 32" pipe 42" ream x 300m
Meteren, NL	Horizontal Drilling International S.A	3 No. crossings 8" pipe x 350m
Teeside, UK	Stockton Pipelines Limited	1 No. crossing x 1000m
River Tamar, Plymouth, UK	LMR Drilling UK Limited	1 No. crossing 22" pipe x 1400m-Longest Polyethylene pipe to be installed by HDD at the time.
Manosque, France	Horizontal Drilling Int S.A	
Venice, Italy	Hydro Soil Services NV	2 No. crossings 8" pipe x 250m & 900m
Tewkesbury, UK	LMR Drilling UK Limited	1 No. crossing 48"x960m
Schiedam, NL	Horizontal Drilling International S.A	1 No. crossing 40" pipe x 1150m
Yerseke, NL	Hydro Soil Services NV	3 No. crossings ream up to 42" x 1460m
Avranches, France	Verbraeken Const N.V	
Marseilles, France	Verbraeken Const N.V	
Various, France Various, Belgium	Verbraeken Const N.V	Various crossings – mud lined to central processing plant
Rotterdam, NL	A.Hak Nederland b.v	
Courcelles, Belgium	Verbraeken Const N.V	400m
Tunis, Tunisia	Horizontal Drilling International S.A	
Wijchen, NL	A.Hak Nederland b.v	
Paris, France	Horizontal Drilling International S.A	2 No. crossings 32" ream 650m
Newbury, UK	Stockton Pipelines Limited	3 No. crossings 36" pipe
Bedford, UK	Stockton Pipelines Limited	
Abergavenny, UK	NACAP Nederland b.v	1 No. crossing 24" pipe x 450m
Kazakhstan	Horizontal Drilling International S.A	Various crossings
Yatton, UK	LMR Drilling UK Limited	
Carmarthen, UK	NACAP Nederland b.v	1 No. crossing 24" pipe
Gien, France	Verbraeken Const NV	922 m crossing
Middlesbrough, UK	Dredging & Construction	
Blackburn, UK	Stockton Pipelines Limited	
Gent, Belgium	Hydro Soil Services NV	
Isle of Man	LMR Drilling UK Limited	
Bideford, UK	LMR Drilling UK Limited	
Cambridgeshire, UK	LMR Drilling UK Limited	1 No. crossing 48" steel pipe
Killingholme, UK	Stockton Pipelines	
Clarecastle, Ireland	LMR Drilling UK Limited	550m crossing 40" hole
Bristol, UK	Stockton Pipelines Limited	1600m crossing in mudstone & sandstone
Limerick, Ireland	LMR Drilling UK Limited	
Baku, Azerbaijan	Stockton Pipelines Limited	BTC pipeline project -7 No. crossings up to 42" & 1000m in length
Dilsen, Belgium	Verbraeken Const NV	3 No crossings up to 40" & 1000m
Herstal, Belgium	Hydro Soil Services NV	1 No 24" crossing in Schist rock, sand and gravel
Torbay, UK	LMR Drilling UK Limited	1 No crossing at 40" & 360m in clay
Northwich, UK	LMR Drilling UK Limited	Mud cleaning for 480 m long 32"

Location	Client	Details
		diameter HDD crossing in stiff clay and weak mudstone.
Lewes, UK	The Directional Drilling Company Limited	Mud cleaning equipment and centrifuge with flocculation.
Padova, Italy	Horizontal Drilling International S.A	Mud mixing, desanding and desilting equipment for 36" pipe crossing of River Brenta.
Limavady, Northern Ireland	Longbore Limited	Mud cleaning for two 27" crossings, of 530m and 330m length through sands, gravels and schist.
Joure, Netherlands	A.Hak Nederland b.v	Mud cleaning for a series of HDD crossings in fine grained sands and silts.
Valenciennes, France	Horizontal Drilling International S.A	Mud mixing, desanding and desilting equipment.
Herne Bay, UK	The Directional Drilling Company Limited	Mud cleaning equipment for outfall.
Rotterdam, Holland	A.Hak Nederland b.v	High quality desanding and desilting equipment for multiple crossings
Ross on Wye, UK	The Directional Drilling Company Limited	Mud cleaning equipment.
Lewes, UK	PERCO Engineering Services Limited	Mud cleaning equipment and centrifuge with flocculation for 350m long crossing in sensitive town centre location.
Great Barford, UK	Anglian Water and Laing O'Rourke	Clean up of over 1800m ³ of waste bentonite mud from a major HDD twin crossing.
Lourdes, France	Horizontal Drilling International S.A	Desanding equipment.
Ebbw Vale, UK	Stockton Drilling Limited	Mud mixing and cleaning equipment for crossing in mudstone
Alfonsina, Italy	Horizontal Drilling International S.A	Desanding equipment.
Kings Lynn, UK	LMR Drilling UK Limited	Desanding and desilting equipment for multiple crossings through Kimmeridge clay.
Leicester and Huddersfield, UK	ARM Pipetek	Mud cleaning equipment for several small diameter crossings
Bacton, UK	Stockton Drilling Limited	Mud cleaning equipment and desilter for 500m long 52" directionally drilled crossing in sandy clays and putty chalk.
Bornem, Belgium	Hydro Soil Services NV	Mud cleaning for two 42" crossings, of 495m and 745m length through fine sands.
Manchester, UK	AMS No-Dig	Mud cleaning for two 300m long 600mm diameter HDD crossings of River Irwell in coal measures.
Gravesend, UK	LMR Drilling UK Limited	Desander, desilter & 2 centrifuges for HDD crossing.
Bewdley, UK	ARM Pipetek	Mud cleaning equipment for several 1200mm diameter crossings
Dawlish, UK	A.E. Yates Trenchless Solutions	Clean up of over 400m ³ of waste bentonite mud from a major HDD crossing.
Southampton, UK	Visser & Smit Hanab	Provision of supplementary desilter to work downstream of client's own

Location	Client	Details
		equipment.
Isle of Grain, Kent, UK	Stockton Drilling Limited	Provision of SUPERCLEAN mud cleaner.
Bedford, UK	AMS No-Dig	Mud cleaner for HDD crossing
Bristol, UK	LMR Drilling UK	Provision of centrifuge and flocculation system for clean up of heavily contaminated waste mud
Llandeilo, UK	Nacap Land & Marine JV	Provision of personnel and rigside mud cleaning equipment for directionally drilled crossings
Westrum, Belgium	Dekabo BV	Desander and desilter for multiple directionally drilled pipeline crossings
Yealmpton, UK	LMR Drilling UK	Provision of desander, desilter, centrifuge and flocculation system.
Ross on Wye, UK	LMR Drilling UK	Provision of centrifuge and flocculation system for waste mud clean up.
Norden, Germany	Bohlen & Doyen GmbH	Desander and desilter for directionally drilled pipeline crossing
Tholen, Netherlands	NACAP Nederland b.v.	Provision of SM450PSDP high capacity desander for 60" reamed HDD crossing in fine sands.
Lepe, UK	LMR Drilling UK	Provision of desander, desilter, centrifuge & flocculation system for trial drill across the Solent from mainland to Isle of Wight.

**4.0
Support
Services**

4.0 Support Services

4.1 Site & Office Based Support

PSD can provide technical support from experienced personnel, both on site and from the head office. We are normally able to offer clients the services of full-time, site based plant operators or personnel for commissioning of equipment and training of the client's own personnel. Many of our operators are electricians or fitters who undergo continuous in-house training in the operation of our equipment. External training is also provided in other aspects such as safety, slinging and first aid.

Equipment is supplied with comprehensive, English text operation & Maintenance Manuals and technical support can be given via the telephone. Regular maintenance visits are available for clients who require them.

4.2 Testing Facilities

We can help to identify the best products and equipment for your application. We have facilities to test a client's sample of mud / slurry or solids to identify the flocculants, coagulants and pH reducers that are required for flocculation. We can then predict chemical usage and throughput capacity of a flocculation system and centrifuge so that clients can evaluate the savings that such a system would provide for them on a particular project.

Particle size distribution testing is also available through PSD which helps with the selection of equipment particularly for dredging works.

4.3 Key Management Personnel

COLIN PIGOTT BSc (Eng) CEng FICE

After studying Civil Engineering at Aberdeen University, Colin worked for Pigott Foundations, the family company and in 1984 formed PSD. Colin is well known and respected within the civil engineering and drilling industries, having spent over 30 years in the management of piling and groundworks projects. He designed and built the TITAN reverse circulation rig, which could drill blind shafts of up to 4m diameter to depths of over 300m. He also developed and supervised the innovative rock roller bit techniques that were used to excavate the central piers of the Thames Barrier, thereby saving many months on the construction time for that project. Colin is very much a hands on Chief Executive and takes an active part in all aspects of the running of the company.

ADAM BEEBY

PSD's Business Development Director, Adam Beeby is responsible for developing business opportunities and client relationships as PSD expands further into the worldwide rental marketplace. Adam has gained considerable technical and management experience from his previous work both in the UK and overseas in site investigation and geotechnical instrumentation. Since 1997, Adam has been an active member of the main management committee of the British Drilling Association, involved specifically with finance, marketing and safety issues. Throughout Adam's career he has been committed to delivering the highest standard of service whilst maintaining a strong focus on safety and technical matters, issues that are at the core of PSD's activities.

MICHAEL ROWLINSON BSc (Hons) ICIQB

As Operations Manager, Michael Rowlinson's responsibilities include equipment design and specification, logistics and compliance and in conjunction with Adam Beeby, contract management. Michael has more than 11 years experience of solids / liquids separation technology and prior to that he gained useful experience in general civil engineering and construction including such projects as the tunnelling works for the Heathrow Express Rail Link.

MATT MORAN

PSD's Plant Supervisor, Matt Moran has wide experience of setting up, commissioning and running PSD's equipment, including major installations for large diameter tunnels as well as smaller plant for diaphragm walling, piling, HDD and other applications. Matt is an Electrician by trade and joined the company as a trainee plant operator.

4.4 Design

PSD design most machines in-house in a modular form to be easy to transport, set up and to operate. Units can be used as stand alone machines or in combinations to give wider performance and throughput capabilities.

The machines are built specifically for the rental market where reliability is of great importance, yet where operating costs need to be low. The design principles that we employ for our equipment mean that they achieve the optimum performance from the components used and that each machine will provide better performance than similar sized or rated machines available elsewhere on the European rental market.

Our policy of environmental awareness and continuous improvement using input from clients, plant operators, designers and equipment manufacturers ensures that our machines are at the forefront of technology and performance and are easy to operate and maintain.

As an example, the creation by PSD of a new class of high volume SOLIDSMaster[®] desander, coupled with the use of very efficient 'SU' desilters, has revolutionised solids separation equipment, making on-line cleaning a reality and reducing or eliminating the need for large volume mud storage pits.

Another major advance that we have made in recent years is the use of a computerised 3D design package for our new machinery and equipment upgrades. Every component is modelled and accurately positioned in 3D space so that a virtual reality model is created. When this is complete two dimensional drawings are produced and used for the fabrication of the equipment. The precision of the 3D design coupled with accurate fabrication enabled the 152DP and S3-01-G centrifuges to be constructed so that the centrifuge modules could be stored inside its tank with only millimetres to spare.

5.0 Appendices

5.0 Appendices

This section includes several examples of a typical layout for a large capacity plant and equipment technical data sheets. Please visit our website www.solidseparation.com to download our latest press releases and technical data sheets on our other equipment. Project specific and typical plant layout images and drawings are available from PSD on request.