

# INSIGHT

## OUT WITH OLD, IN WITH NEW, OR JUST NEW!

### KEE SOLUTIONS AT THE TOUCH OF A KEYPAD

**T**HE KEE GROUP HAS ALWAYS BEEN A LEADER in wastewater treatment systems and the services associated with them. Even before the environment became such a major issue, KEE invested in digital document storage, which enabled them to reduce the amount of paperwork generated. Customers now also have the choice of communicating by e-mail and paying invoices electronically.



These developments provide both customer and KEE with efficient communication methods which reduce the need for paperwork and postage delays. KEE has been operating service management systems since the early 1990s. While these systems provide call handling, contract scheduling, stock control and all the other functions associated with running a business, they relied on passing paper 'job sheets' to the service engineers.

With between 10,000 and 12,000 jobs being generated per year and service engineers based throughout the country, the movement and tracking of these job sheets was a major task in itself. Information from calls made by service engineers could take up to a week to find its way back to the office before appropriate action could be taken.

A real time solution was required. Working with the current service management system designers, during 2005 KEE developed a new version of the system which would allow the information required by the service engineer to be transferred electronically.

### **Refurbishment of existing treatment systems improve process performance and reduce lifetime costs.**

**W**ATER PLC AND PRIVATE CUSTOMERS in the wastewater industry have to take account of operating costs. Therefore, before any treatment plant is condemned for replacement, the option of refurbishing the plant should be considered as most plants of any treatment technology can be upgraded to prolong electro-mechanical component equipment life and therefore the plant life.

Municipal and industrial wastewater treatment plants, both large and small, receive varying degrees of care and attention. The large plants are often constructed *in situ* and use activated sludge technology in different forms for the biological treatment, whereas the smaller installations use what is generally known as packaged plant option.

*continued on page 2 ...*

*continued on page 3 ...*

... continued from front page - Out with old, in with new, or just new!

With the large installations, the plant would include inlet works, preliminary treatment, biological and secondary treatment and possibly tertiary treatment. These various stages are housed in structures cast in concrete and the standard of construction is generally good, which enables the structures to last beyond 20 years, over which the lifetime cost is evaluated. When the major mechanical items come to the end of their useful life they could be readily refurbished to give the plant a new lease of life for a further 20 years. Similarly, packaged plants, which are simpler in concept, can be electro-mechanically refurbished to increase their useful life.

The packaged plants are often housed in prefabricated GRP structures with covers and are either configured as single piece compact plants or are supplied as modular units and could include RBC, SAF or activated sludge biological stage in addition to primary and final settlement. All these packaged plant options can be re-built in their existing enclosures to extend useful life and improve the process performance.

### Why refurbish?

- **ENVIRONMENTAL IMPACT** - refurbishment would enable the plant to be modernised to improve treatment levels, improve efficiency and reduce the need to dispose of large quantities of equipment if the works were to be totally replaced.
- **GREATLY REDUCE AMOUNT OF SITE WORKS**, leading to less disturbance to the neighbourhood.
- **SAVINGS IN TIME** to implement the necessary environmental objectives imposed by the regulators for the AMP programmes and comply with tighter environmental objectives for discharge.
- **REDUCE OR ELIMINATE THE NEED** to acquire further land to rebuild a new plant.
- **FINANCIAL BENEFITS** - refurbishment of existing plants can bring the installation up to date at a fraction of the cost of installing a new system.

The refurbishment concept can also be applied to plants serving larger populations which can be electro-mechanically upgraded to show similar benefits and add 20 years or more useful life to the plant.

(Below) Scottish Water undertook a similar exercise where an existing 4,750 PE activated sludge plant needed to be refurbished to bring the plant back to its full performance requirement without necessarily having to rebuild the works.



Existing Aeration system in need of upgrading as only one surface Aerator was operating.



Over 20 years old – packaged plant with covers – still operating.



New RBC in place with external drive.



Plant totally refurbished with new covers and internal equipment. Site landscaping still to be carried out.

Whether or not to refurbish will always be decided on the basis of value for money and lifetime cost, as would be the case for most projects. Today's project managers have the option of refurbishment, enhanced by modern concepts in advanced wastewater treatment technologies when evaluating all the options available.

With the possibility of reduced lifetime costs and sometimes the implementation of revised environmental objectives, refurbishment remains the number one option.



Plant upgraded with no downtime in less than a week with four KEE Tritons® bolted to the side and one is seen here in operation.



## Integrated Management System

**K**EE HAS BEEN WORKING to a Quality Management System and has been certified to BS EN ISO 9001:2000 since 6 August 2002.

QUALITY MANAGEMENT SYSTEM (QMS) certification reflects on the commitment of an organisation to ensure that their products and/or services satisfy their customers' requirements and expectations and whilst at the same time ensuring that the products and services comply with the relevant regulations applicable to the products and/or services. The basis of a recognised QMS such as BS EN ISO 9001:2000 is that, once an organisation attains certification, it monitors its' customer feed back and implements changes to rectify and/or improve the organisation's procedures.

We at KEE value our customers and their feedback and constantly strive to exceed their expectations. We also recognise the effect of work related tasks on the health and safety of both people and the environment. As a result KEE has decided to put in place systems for management and compliance with recognised Health and Safety and the Environment in addition to the Quality.

To reinforce our commitment, both internally to our staff and externally to our customers, we have recently applied for and received formal registration and certification from the British Standards Institution (BSI) for an:

- Integrated Management System (IMS) PAS 99 : 2006,
- Quality Management System (QMS) ISO 9001: 2000,
- Health & Safety Management System (OHS) OHSAS 18001 : 1999
- Environmental Management System (EMS) ISO 14001 : 2004.

The IMS is a recent concept which arose from the number of organisations seeking registration to several standards and was made possible because of the many overlapping items required by each standard. Rather than having several different management systems that duplicate information, take up resources and may generate conflicts, the IMS will allow the company to manage many different areas within one system only. It makes it simpler to evaluate performance and to act on improvements that concern Health & Safety, the Environment and Quality.



## ACCREDITED SERVICE ENGINEERS



**A** S A COMMITTED SERVICE PROVIDER working in both the private and commercial wastewater industry for the last 45 years KEE Services appreciate the requirement for properly trained staff. KEE Services have always undertaken their own comprehensive training.

These concerns for training can be overcome by KEE Service Engineers who unlike other service providers are able to deal with different types of treatment systems throughout the country.

It is now a requirement of all discharge consents that the system is maintained by a competent engineer. KEE's answer to controlling pollution of rivers and Aquifers from the Wastewater Treatment Plants is to ensure they are maintained by fully trained engineers.

British Water in association with the Environmental Agency and the wastewater industry have overseen the development and implementation of a training programme for accreditation of engineers to a competent level for maintaining the wastewater plants.

All those engineers who have reached the minimum requirements set by the British Water training scheme and accreditation are provided with a certificate of competence once they have achieved full qualification. All those who have qualified are listed on the British Water website.

KEE have at the moment 29 British Water Accredited Engineers, KEE Services are at the vanguard for the new Accreditation scheme with more qualified engineers than any other major companies in the industry. Each engineer is issued with a British Water identification card which includes the full name of the engineer, together with his company, name and an expiry date.

KEE Services fully support the accreditation scheme, it is written into the training programme for all new field staff. An engineer's training is not complete, nor are they allowed to visit any site single-handedly, until they have obtained the qualification from British Water.

The PDA (Personal Digital Assistant) uses GPRS to connect to the servers at KEE head office. Each PDA unit has a built-in camera which, coupled with the ability to send and receive e-mail with attachments, means information from site can be transmitted between engineers or back to the office instantly. This provides the engineer with the instant support of all their colleagues and the e-mail facility also means the engineers in the field are kept fully up to date with developments at head office.

In order to allow the capture of more information and to provide the engineers with a tool which will allow them access to the company database of drawings and manuals, the system has been further refined to operate via a laptop computer.

This technology was initially alien to the majority of the service engineers who, while they could strip down and rebuild a component within a wastewater treatment system, they found a handheld PDA new to grasp. Complete training was provided in the use of the PDA with emphasis on the e-mail facility and its advantages. The system was introduced in November 2006.

The remote service management system works on a push, pull basis. This means that once a job is registered on the main system and allocated to a service engineer, the next time he connects to the office and asks for a system sync (synchronization), those jobs allocated to him are transferred to his laptop. Any jobs he has completed are returned to the office during this process, so they are available for processing as required.

The information provided to the service engineer on the laptop includes the full site details together with contact details and special instructions for access. Details of the equipment on site and the service contract are supplied, together with the call problem as reported by the customer. Once the call has been completed, the service engineer uses the laptop to confirm how the problem was resolved, his arrival and departure times from site, together with any parts used during the service call. The engineer also has the facility to say if the call is complete or if additional parts and further work is required. The next time the engineer performs a sync, the information is sent back to the office for action and the job disappears from his list on the laptop.

The system works in conjunction with KEE stock system, so the engineer is able to see the actual parts he is holding as van stock, along with their current price. This information is useful when discussing options for repair or replacement with a customer. The real-time display of van stock enables the service engineer to keep a positive tally on the parts he is carrying around and ensures he requests replenishment when required, rather than carrying superfluous quantities of parts.

The remote service management system allows all the information from a call to be held in a central area within the service management system. Photographs and inspection reports are logged for each individual call. This means information can be retrieved from one point, rather than two or three, as was the case in the past.

Looking to the future, the next development is for the information within the system to be made available to our customers. This will be provided via a web-based customer portal. Customers will be given access to the service manager system, they will be able to track a call once it has been logged and see when it is allocated and to which engineer. Once the engineer has completed his call, the customer will have access to the call notes and details of the time spent on site and any parts used. The customer, via their unique customer log-on details, will also be able to see their statement and payment details.

# KEE process a five star treatment

'Grace Bay Club'  
five star resort selects  
KEE Process Modular  
RBC for critical  
wastewater treatment  
requirements

**THE TURKS & CAICOS ISLANDS** are an assembly of 40 islands and cays of which eight are inhabited. Providenciales, the main island, boasts Grace Bay whose beach has been frequently named one of the most beautiful beaches in the world.

Grace Bay Club, located on Grace Bay, features a hotel, individual villas and town homes. The club selected Waste Water Solutions International (WWSI Inc.), and their local representative, Carlisle Supplies Ltd, to provide the KEE Process Managed Flow Modular RBC System as the process technology to provide wastewater treatment in this environmentally sensitive Grace Bay locale. The KEE RBC technology was selected for its reliable, high-quality effluent and inexpensive ease of operation. WWSI Inc., has always promoted the KEE RBC technology as being a most sustainable technology with the least expensive operating costs in the industry.

The initial phase of treatment consists of a KEE Managed Flow RBC Module Model DC17 and a modular fibreglass hopper bottom final settlement tank.

The system provides treatment for 47,000 US gallons (177.89m<sup>3</sup>) per day, producing an average effluent <20/20mg/l BOD/TSS.

Typical installations in the Caribbean would also include Automatic Backwash Tertiary and Micro-filtration to further improve the final effluent and remove organic and inorganic particulate matter >5µm. This would be followed by disinfection of the treated wastewater thus allowing the wastewater to be used for irrigation of lawns and gardens.



*KEE Managed Flow RBC Module Model DC17 and a modular fibreglass hopper bottom final settlement tank installed at the Five Star Grace Bay Club.*

There are more than 500 installations of the KEE RBC processes and systems throughout the Caribbean. As factory assembled and tested units, the KEE RBC systems are selected for their ease of installation, self-regulating operation and their minimal operating costs.

The development is operated by Ritz Carlton and is one of the premier resort facilities presently under development in the Turks and Caicos Islands. KEE Process and WWSI Inc. are proud to have been selected as the process treatment providers for this secluded and environmentally sensitive property.



# **KEE Process proves to be the most economic upgrade for Carden Park and Norton Manor Hotel**

**Two recent installations were provided for prestigious hotels where failing sewage systems, expansion of the hotel capabilities and environment agency revision in the consent limits for the higher flows, made it necessary to upgrade the sewage treatment plant to satisfy current and future needs.**

As the original plants at both the

*KEE Managed Flow RBC Modular Wastewater Treatment System*

With both applications, sewage is pumped to the plant and the primary stages are sized to accommodate the delivery rates. The flow through the biological stage is evened out using the KEE patented managed flow system incorporated into the RBC stage.

For both the sites, KEE Process provided turnkey solutions. This ensured that the design of the system equipment and its correct installation was controlled by one contracts manager. Peace of mind for the Hotels was built into the turnkey solution, where they only had to deal with KEE Process for all aspects of the installation. KEE Process are also contracted to provide regular maintenance and effluent testing to ensure that the plant is always operated under optimised conditions and continues to meet the discharge consents imposed by the Environment Agency.

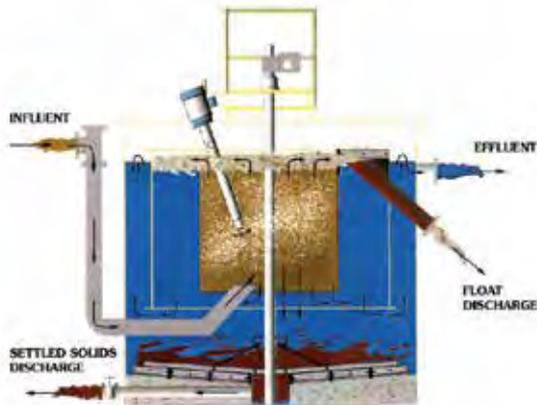
The managed contract offered by the sister company KEE Services Limited, provides total operation of the plant, including out of hours emergency cover around the clock.

sites were failing to meet the Environment Agency consent parameters, the Hotels required process guarantees to ensure that such occurrences are avoided.

Designs were prepared and submitted for assessment. Due to the low ammonia requirements, there was a limited choice of technologies which would be effective in fully nitrifying the effluent. The KEE Process plant, being a fully engineered solution, proved to be the most economic in both applications when considered based on life-time costs for supply, installation and operation.

The equipment solution was selected from KEE's modular RBC range, due to the high anticipated daily flow and BOD concentration. This allowed KEE to dimension each stage of treatment to offer the most cost-effective solution.

# KEE Microfloat Dispersed Air Floatation Technology Reduces Pollution



**KEE HAS INTRODUCED** improvements to tried and tested effluent technology in a bid to minimise environmental pollution from wastewater.

Many industrial processes, particularly food processing, generate a large volume of effluent that is discharged into the sewer. The raw wastewater has high Biochemical Oxygen Demand (BOD) and high Chemical Oxygen Demand (COD). To reduce environmental pollution, companies often pre-treat the wastewater before it is discharged into the sewer. Until now, a system known as Dissolved Air Floatation (DAF) has been used to do this.

The conventional DAF system uses a high-pressure pump and venturi system to dissolve air into the wastewater. The solution of air and water is stabilised in a pressure vessel under high pressure.



A stream from the pressure vessel is discharged into a separating vessel where the air comes out of solution and is released as a fine bubble spray. These bubbles greatly reduce the pollutants by floating them to the surface where they are removed by equipment designed to remove the floating layer.

## Some major advantages of the Microfloat system are that it:

- Removes up to 90% of fats, oils and grease (without chemical addition).
- Substantially reduces the BOD and COD of the effluent.
- Eliminates the need for fine screens either before or after fat traps.
- Requires no balancing of flow rates and removes the need for balancing the flow.

*Dawn Meats in South Wales recognised the advantages of the new Microfloat system and commissioned KEE to build the first Microfloat system.*

The KEE Microfloat system achieves the same results without the need to use a high-pressure pump and venturi. Instead, it incorporates a patented system from Aeration Industries that uses a low-power motor. A specially designed propeller disc on the aerator's shaft produces extremely fine bubbles and transfers these 10 to 50 micron air bubbles into the water through special ejectors. The whole system is mounted in the circular floatation tank.



# KEE EXPERIENCE



KEE RBC Modular  
Wastewater Treatment  
System

**KEE PROCESS** has been working with private companies and public bodies in Ireland for more than 30 years. Its managing director, Suru Nathwani, explains the challenges.

KEE Process is a supplier of process engineered treatment systems to local councils and private companies in Northern and Southern Ireland. Over the past three years, KEE has supplied and installed plants at 25 sites in southern and western divisions of Water Services, Northern Ireland, for population equivalents (PE) ranging from 100PE to 3,000PE. The applications vary from simple municipal WwTWs providing basic treatment to supplying plants designed to produce high-quality effluent with less than 3mg/l of ammoniacal nitrogen and less than 5mg/l BOD and suspended solids on a 95%ile spot sample basis.

KEE Process is also working with Irish councils to upgrade treatment plants to allow the discharge of highly polluted industrial effluent into their systems. In many cases, the requirements are stringent, requiring total nitrogen and phosphorus removal. KEE has a team of experienced process and project engineers capable of delivering solutions that combine simplicity of process design with low lifetime cost. Municipal WwTWs for small communities can be designed to accommodate and treat industrial discharges as long as these are taken into account at the design stage. However, sudden or intermittent discharge of industrial wastewater would shock-load a small treatment plant and cause the municipal treatment plants to become overloaded and malfunction.

KEE Process has provided solutions to overcome these problems. It has upgraded municipal facilities without upheaval and also overcome the problems by providing partial treatment of industrial discharges at source. This is particularly the case with municipal facilities which become oxygen-limited in the activated sludge stage. One solution is to install a versatile dual-mode Triton processor, which provides mixing or introduces dissolved oxygen in to the mixed liquor. KEE used its Triton Aerator to upgrade an overloaded municipal plant to accommodate loads generated from a distillery and are also in the process of upgrading a dairy plant using Triton to overcome oxygen deficiencies and to further introduce biological phosphorus removal in the plant. A KEE dispersed air flotation (DAF) Microfloat system can also be used to provide partial on-site treatment for industrial discharges, reducing the load discharged into the sewer and the municipal treatment plant.

KEE Group technologies include physico-chemical processes such as DAF, simple gravity solids and grease separators, biological processes such as anaerobic reactors, fixed-film reactors and suspended growth reactors. With the introduction of the European Water Framework Directive and the need to treat pollution, the polluter pays. Consequently, industries which discharge large quantities of heavily polluted wastewater into the sewer will have to consider the options for on-site treatment to reduce their costs and the loads on the municipal treatment facilities. The treatment options which they should consider are physical, physical/chemical or biological treatment, or a combination of all or any of these.



Many of KEE's projects in Ireland offer total supply and installation packages with fully comprehensive after sales support. Projects include plants built at the following sites:

## Woodenbridge Hotel, Co. Wicklow

The Woodenbridge Hotel had a WwTW that was failing to meet consent and was expensive to maintain and operate. The onerous discharge requirements included reduction of total nitrogen and phosphorus with BOD <20mg/l SS <30mg/l, COD <80mg/l, NH<sub>4</sub>-N <20mg/l, NO<sub>3</sub>-N (Nitrate Nitrogen) <5mg/l, Phosphate as PO<sub>4</sub> <12mg/l, FOG (fat, oil and grease) <20mg/l and Detergent (MSAS) <1mg/l. The proposal involved KEE supplying, delivering, installing and commissioning a 60m<sup>3</sup> primary settlement tank, a Module DC16 Rotating Biological Contractor and an ST6 hopper bottom GRP final settlement tank.

## Muskerry Golf Club

This was a design and build turnkey contract for JME and KEE as process partners. The discharge licence was direct to the water course and specified a BOD <20mg/l SS <30mg/l, NH<sub>4</sub>-N <20mg/l, and Phosphate as P <2mg/l. KEE supplied their compact single piece NuDisc Model 1200.

## Portmarnock Golf Club

Portmarnock Golf Club in North County Dublin is one of Ireland's premier links courses. The treated wastewater discharge licence specified a BOD <20mg/l SS <30mg/l, COD <80mg/l, NH<sub>4</sub>-N <10mg/l, NO<sub>3</sub>-N (Nitrate Nitrogen) <15mg/l, Phosphate as PO<sub>4</sub> <5mg/l and FOG (fat, oil and grease). KEE Process designed the process, supplied and installed a single-piece compact packaged plant NuDisc F13N with inbuilt de-nitrification and phosphate removal stages. This provided the treatment requirements.

# TOTAL Nitrogen and Phosphorus REMOVAL

**K**EE PROCESS LTD HAS ALWAYS BEEN A LEADER in innovative technology for wastewater treatment. The company offers packaged plants for medium to large flows in single piece or modular configuration for BOD<sub>5</sub> reduction, ammoniacal nitrogen reduction (nitrification), total nitrogen reduction or phosphorous removal.



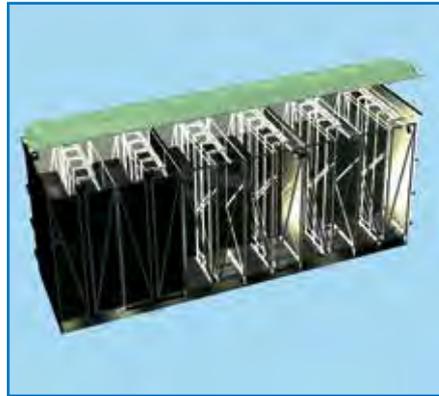
KEE 1600 single piece NuDisc® plant.

The single piece NuDisc® and EnviroSAF® systems are versatile and can be applied to achieve any one or a combination of the requirements for the treatment objectives listed above and are suitable for flows up to 70m<sup>3</sup> / day. For larger flows, modular configuration is used.

The biological stage uses the well proven principle of attached growth rotating biological contactor (RBC) or submerged aerated filter (SAF), where the inert structured media supports a biologically active film (biomass) for biological treatment of the wastewater. The biological stage is divided into two specific zones, the first one acting as anoxic reactor and the second one as aerobic reactor.

In the compact, single piece plant, the whole system, including the primary settlement tank, the biological stage and the final settlement tank, are housed in a single GRP tank and arranged in such a way that flow attenuation becomes an integral part of every plant.

The partially clarified liquor from the primary settlement stage is discharged into the first anoxic stage of the biological reactor, where partial degradation of BOD<sub>5</sub> and de-nitrification take place. The biomass in the anoxic stage



KEE single piece EnviroSAF® plant.

also provides biological attenuation of organic pollutants, which are partially treated and degraded into much more readily treatable substrate for the aerobic stage. The downstream aerobic biological stage is operated under plug flow conditions, where further BOD removal and nitrification takes place.

For larger flows and for industrial applications, it would be appropriate to use different technologies and *in situ* construction for achieving nutrient removal. For such applications, KEE would use the concept of biological nutrient and phosphorus removal using activated sludge technologies. Depending on the nature and character of the influent, the process plant would include an inlet screen, balancing tank, anaerobic reactor, anoxic reactor, aerobic reactor and final clarifier with internal recycle streams between aeration chamber, anoxic stage, anaerobic stage and RAS stream from final clarifier to anoxic and aerobic stages.

With the high-efficiency biological nutrient removal system, total nitrogen of less than 20mg/l and total phosphorus of less than 2mg/l can be achieved in normal domestic/municipal applications without the need to introduce external carbon source or dosing chemicals to precipitate phosphorus.

## BRISTOL HARBOUR SELECTS KEE PROCESS MANAGED FLOW RBC SYSTEM

**B**RISTOL HARBOUR IS A PRIVATE residential community located on the west shore of Canandaigua Lake, in the Western Finger Lakes district of New York State, in the USA. This golfing community operates through Home Owners Association for building and maintaining the infrastructure and services and pay for these services through annual fees.

Up until now the development was served by an aeration plant which was experiencing mechanical failures, deviations in effluent performance and the operating costs were high. The community recognized the need to upgrade the wastewater treatment plant to minimise operating costs, plan for expansion of the community and consistently meet the more stringent treatment requirements mandated by State Law.

The design requirements were to provide for the treatment of domestic sewage:

- Average daily flow of 100,000 USG/day (378.5m<sup>3</sup>/day)
- Final effluent criteria for summer: BOD <20mg/l and TSS <20mg/l
- Final effluent criteria for winter: BOD <20mg/l and TSS <20mg/l and NH<sub>3</sub>-N <2mg/l

During the summer, the treated effluent is sent to a polishing pond for reuse in irrigating the local golf course. During the winter months the treated effluent is discharged to a dry stream bed.

Waste Water Solutions International, Inc, the North American Partner of KEE Process Limited, were contacted for consultation and recommendation. The limited site space location were ideal for the implementation of the KEE Process Modular packaged fibreglass systems.

To provide flexibility, two streams were installed to operate in parallel. Following primary treatment and a flow splitter, each stream consists of a balancing tank and a KEE Process Managed Flow RBC Model DN19-S and a KEE Process Final Settlement Tank model ST9.

Each ST9 includes automatic pump assisted sludge return system to the head of plant. The complete process also includes an existing gravity sand filter with automatic backwashing capability.

KEE Managed Flow® process and equipment were selected for their reliability to continually produce a high quality effluent, with minimal operator attention, very efficient operating costs, lack of nuisance and their suitability for installation in an environmentally sensitive setting and location; a sustainable technology for now and the future.



PAS 99  
Process : IMR 512239  
Services : IMR 517921



BS EN ISO 9001  
Process : FM 515540  
Services : FS 517918



OHSAS 18001  
Process : OHS 515542  
Services : OHS 517920



BS EN ISO 14001  
Process : EMS 515541  
Services : EMS 517919



Specialists in Domestic & Industrial Wastewater Treatment

KEE Process Ltd & KEE Services Ltd, College Road North, Aston Clinton, Aylesbury, Buckinghamshire HP22 5EZ, U.K.  
T: +44 (0)1296 634500 F: +44 (0)1296 634501 E: sales@keeprocess.com W: http://www.keeprocess.com