

**Diamond**  
sewage treatment plant

**(DMS/DMS-IPc/DMC)**



**User Guide**  
**Operation & Maintenance**



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## **1. GETTING THE BEST FROM YOUR DIAMOND**

### **1.1 Hints and Tips**

The Diamond requires minimal servicing, provided it is installed as per the instructions in the WPL Ltd Installation Manual, and is used and maintained properly as set out in this User Guide & Operation and Maintenance Manual. Regular but simple maintenance will keep the system running efficiently and will reduce the number and cost of unnecessary service call-outs.

### **DO**

- ✓ Ensure all servicing is carried out by the WPL Service Team, or another British Water Accredited, Qualified Service Engineer.
- ✓ Make sure the air blower is installed in a dry, well ventilated area. Alternatively if it is situated outside, ensure it is installed in an approved waterproof housing.
- ✓ Check the access lid is properly and securely fastened at all times.
- ✓ Make sure the electrical supply is maintained at all times.
- ✓ Regularly check to make sure the air blower is operating, you should be able to hear it running.
- ✓ Arrange for regular maintenance to be carried out, (see section 2 in his manual), and that it is recorded in the separate maintenance log book.
- ✓ Arrange for the excess sludge to be tankered away at the appropriate interval.

### **DO NOT**

- X Turn off the electricity supply.
- X Attempt to service the system yourself if you are not qualified to do so.
- X Use any replacement parts other than those supplied by WPL Limited.
- X Alter, repair or modify the system without authorisation from WPL Limited.
- X Allow surface water to form a pool around the access lid or blower housing.
- X Allow storm water from roofs or hard standings to enter the treatment plant.

## **1. GETTING THE BEST FROM YOUR DIAMOND (continued)**

### **1.2 Recommendations**

The Diamond system uses highly efficient aerobic bacteria to treat the organic contaminants in domestic sewage and wastewater. As the system is based on a biological process it is important to ensure that you do not put anything down the sink, toilet or drains that will harm these bacteria which bio-degrade the sewage. The way you use cleaning products and the type you use can also significantly affect the efficiency of the system.

### **WPL DOES RECOMMEND**

- ✓ Thinking before you put anything down the sink, toilet or drains.
- ✓ Using the manufacturers' recommended doses relevant to the hardness of your local water for household cleaning products.
- ✓ Using cleaning products little and often, as this will allow the bacteria to become accustomed to the brands and amounts you use.
- ✓ Spreading your laundry throughout the week and overnight.
- ✓ Sticking to the same washing, dishwasher and other cleaning products as the bacteria will work more efficiently with familiar products.
- ✓ Using liquids, not powders, in washing machines and dishwashers as they dissolve more easily.

### **WPL DOES NOT RECOMMEND**

- X Putting sanitary towels, tampons, disposable nappies, baby wipes, cotton wool, incontinence pads, cotton buds, rubber products or other non-biodegradable products down the toilet.
- X Pouring waste fat, grease or cooking oil down the sink or drains.
- X Using bleach or strong chemicals excessively or having a spring cleaning day.
- X Having a laundry day.
- X Emptying bottles of medicine or mouth wash down the toilet.
- X Constantly changing your brands of cleaners and washing chemicals.
- X Using water softening agents.
- X Pouring any garden chemicals, paint or car engine oil down the drains.
- X Using your waste disposal unit like a rubbish bin - please try to use it sparingly.

## **1. GETTING THE BEST FROM YOUR DIAMOND (continued)**

### **1.3 Letting Visitors Know**

It is important that your family, guests and visitors are made aware that your house is connected to a specialist, biological sewage treatment system. They need to know that they should not put anything down the toilet, sinks or drains which could harm the bacteria or block the system.

The easiest way to tell guests or visitors that you have a specialist biological sewage treatment system is to put up notices in your kitchen and bathroom(s).

You might like to copy this suggested wording:

**WARNING!**

**This toilet is not connected to mains drainage.**

**It leads to a biological sewage & wastewater treatment system.**

**DO NOT PUT THE FOLLOWING DOWN THE TOILET:**

**ANYTHING OTHER THAN TOILET TISSUE**

**EXCESSIVE AMOUNTS OF CHEMICAL CLEANERS/BLEACH**

**WARNING!**

**This sink is not connected to mains drainage.**

**It leads to a biological sewage & wastewater treatment system.**

**DO NOT PUT THE FOLLOWING DOWN THE SINK:**

**FAT, OIL OR GREASE**

**EXCESSIVE AMOUNTS OF CHEMICALS**

## **2. HOW THE DIAMOND WORKS**

### **2.1 Operating Conditions**

The plant is designed to operate automatically with the minimum of maintenance after it has been commissioned. The plant will provide effluent within the designed discharge consent standard after an initial start up period of 4-10 weeks, depending on the water temperature. It is important that the sewage input conditions are kept within the plant design criteria, including population equivalent (as set by British Water).

### **2.2 Inside the Diamond**

The Diamond system consists of two treatment chambers in a single tank. The centre aeration chamber is a circular tank with a sloped, open bottom, which empties into the bottom of the outer clarifier chamber. Located in the centre of the aeration chamber is a circular draft tube, which extends towards the bottom of the clarifier.

### **2.3 The Treatment Process**

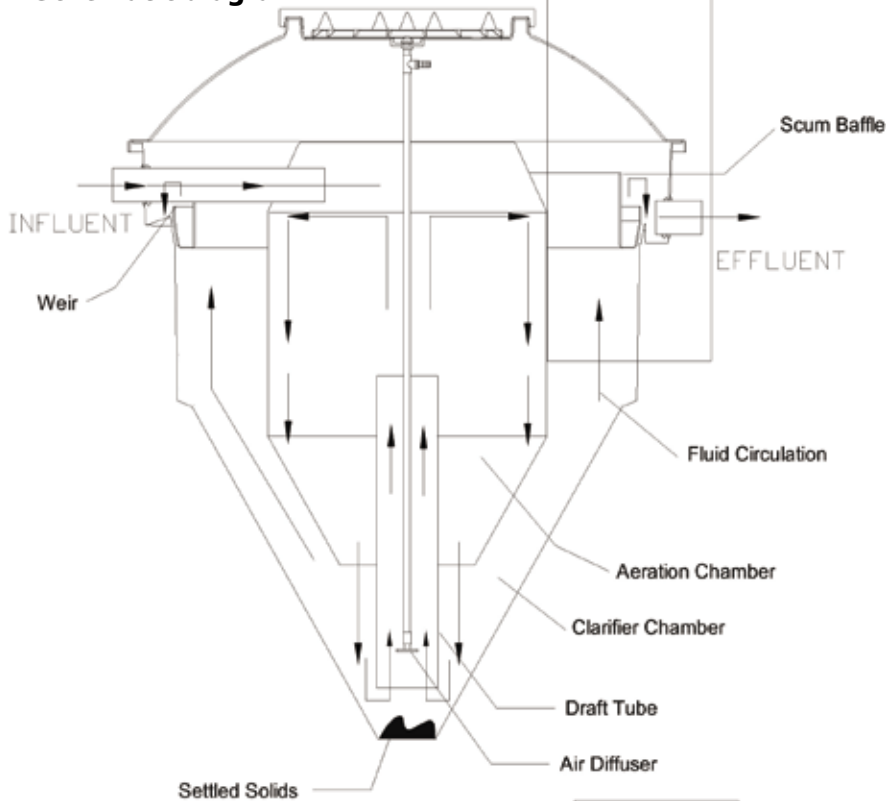
Air is released at the bottom of the draft tube through a disc plate diffuser and as the diffused air rises in the draft tube, it causes an upward flow of process fluid. This draws the settled solids from the bottom of the clarifier up through the draft tube where they are discharged at the surface of the aeration chamber. The design of the draft tube ensures continuous and complete mixing of oxygen with the sewage, allowing for the growth of various aerobic organisms that biologically degrade the wastewater contaminants.

Gravity causes the aerated solids to settle back to the bottom of the tank where they are again drawn back up through the draft tube. As raw sewage enters the aeration chamber, it displaces biological solids from the aeration chamber to the clarifier. Quiescent conditions in the clarifier allow the digested solids to settle to the bottom of the clarifier where they are again returned back to the aeration compartment.

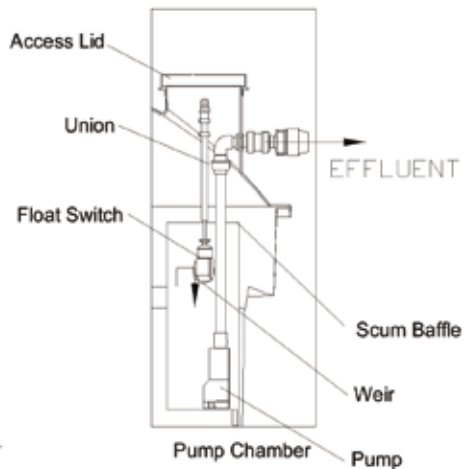
The clarified (treated) effluent flows slowly up through the clarifier and over a weir that extends around the periphery of the tank. The effluent collects in an outer trough where it discharges through a 110mm-pipe connection. A scum baffle, located inside the overflow weir, prevents floating solids from passing over the weir.

## 2. HOW THE DIAMOND WORKS (continued)

### 2.4 Schematic diagram



The diagram opposite shows the exploded section for Diamond DMS-IPC models, which have an integral pump chamber.



## **3. MAINTENANCE**

### **3.1 Health and Safety**

3.1.1 Health Warning - There are significant Health and Safety risks associated with servicing and maintenance of any sewage treatment plant.

WPL Ltd only recommend servicing and maintenance is carried out by their British Water Accredited WPL Service Team, or any other British Water Accredited, Qualified Service Engineer.

Please contact WPL Ltd on 023 9224 5404 for any further Health and Safety advice, or to arrange a WPL Ltd Service Package.

3.1.2 Dangerous Gases - Sewage gases are potentially explosive and toxic. DO NOT enter any of the below ground compartments of the Diamond sewage treatment plant.

### **3.2 Routine Maintenance**

The Diamond plant requires routine, periodic inspection and maintenance to ensure continuous, trouble-free operation. At a minimum, the Diamond should be inspected every six months (see separate log book for details) by a WPL Service Team Engineer or by another British Water Accredited, Qualified Service Engineer. More frequent inspections may be required if mandated by local or stated regulatory authorities, or if the Diamond is used on a non-residential application.

3.2.1 Weekly - Check that the air blower is operational. The motor should be running, which you can hear externally, and the air failure beacon should NOT be flashing. The beacon indicates that the air pump auto stopper has activated, not power failure.

3.2.2 Quarterly - (If required by prevailing temperature, dust and humidity conditions.) Check air blower filter cleanliness and clean or replace the filter as necessary. Air blower instructions are supplied in the air blower packaging.

3.2.3 Six-Monthly - The air blower and kiosk, aeration chamber, air diffuser system, clarifying chamber, integral pump chamber (depending on model), outlet weir and sample chamber (if applicable) all need to be checked and maintained as necessary.

### **3. MAINTENANCE (continued)**

#### **3.3 Air Blower Information**

3.3.1 DMS/DMS-IPC Models - Each DMS system is supplied with a linear air blower covered by a comprehensive 60 month materials and workmanship warranty, subject to the correct maintenance procedures being adhered to.

Each DMS system is supplied with air blower servicing consumables sufficient to carry out 3 services of the air blower. Further service kits and spares can be obtained from WPL Limited on 023 9224 5404.

For DMS-IPC Model with Integral Pump Chamber, please also ensure the operation and cleanliness of the integral pump chamber is checked during servicing (see log book for section on integral pump chamber maintenance).

3.3.2 DMC Models - Each DMC System is supplied with a rotary vaned air blower covered by a comprehensive 24 month materials and workmanship warranty, subject to the correct maintenance procedures being adhered to.

(Please refer to the specific instruction manual supplied in the air blower packaging.) For spares contact WPL Limited on 023 9224 5404.

#### **3.4 De-sludging**

3.4.1 De-sludging Frequency - The rate at which the solids (biomass) accumulate in the Diamond, and subsequently the rate at which the excess solids must be removed, is dependant upon the total volume and strength of the wastewater entering the plant.

Diamond DMS/DMS-IPC systems serving domestic residential properties typically require de-sludging every 36 to 60 months. Diamond DMC systems serving domestic residential properties will typically require de-sludging every 12 months.

3.4.2 Determining De-sludging Frequency - This service is provided as part of a WPL Service Package, or any other British Water Accredited Qualified Service Engineer. Check the percentage of settled sludge (i.e. sludge volume) to the clear liquor. The optimum level of solid settlement is normally between 5-50%. Whenever the sludge volume reaches 70%, the plant should be de-sludged.

### 3. MAINTENANCE (continued)

#### 3.4 De-sludging (continued)

3.4.3 Procedure For De-sludging The Diamond - De-sludging MUST be carried out by an approved tankering company. This can be arranged as part of a WPL Service Package, or by any other British Water Approved Service provider.

When de-sludging is carried out, approximately one third of the volume of sludge should remain in the plant.

3.4.4 Approximate De-Sludge Volumes - This table is a guide only.

The amount of sludge accumulated depends on the loading of the plant. Each site has its own characteristics.

MODEL	App. De-sludge Volumes (ltrs)
DMS2	1500
DMS3	2100
DMS4	2650
DMS5	2650
DMC6	6000
DMC7	6000
DMC8	10000
DMC9	10000

#### 3.5 WPL Service Package Information

The WPL Service Team has been awarded the "Qualified Service Engineer" accreditation by British Water and delivers high quality service to its customers. Our service packages comprise an all-year preventative maintenance plan to provide total peace of mind.

The Service Package includes the following:

- 6 Monthly inspection and rectification of faults.
- Full compressor maintenance in accordance with manufacturer's specifications.
- Full inspection, maintenance and tuning of air distribution system.
- Replace worn parts as required.
- Advice on plant operation and system de-sludge frequency.
- Advice on effluent sampling.

**Please contact the WPL Service and Spares Department direct on 023 9224 5404 for prices and information.**

## 4. TROUBLESHOOTING AND PROBLEM SOLVING

### 4.1 DMS/DMC Models

A - SYMPTOM	B - CAUSE	C - REMEDIAL ACTION
<p>1. Air blower is running but little or no turbulence is observed in aeration chamber.</p> <p>Due to insufficient air supply to aeration chamber, caused by one or more of the reasons opposite:</p>	1. Blocked air diffuser	1. Disconnect air pipe at the union and clean or replace air diffuser
	2. Blocked air hose or pipe	2. Inspect hose and pipe for blockages, especially at joints. Unblock as necessary
	3. Leaking hose or pipe joints	3. Inspect all hose and pipe joints and tighten as necessary
	4. Kinked, crushed or split air hose or pipe	4. Inspect and replace as necessary
	5. Excessively worn carbon vanes in Rotary Vaned Air Pump	5. See specific air blower manual
2. Aeration chamber contents have a greyish (dishwater) appearance	6. As B 1-4	6. As C 1-5
3. Noticeable odour & poor effluent quality	7. As B 1-4	7. As C 1-5
<p>4. Aeration chamber contents are grey/brown to black. Slight to strong septic odour. Air blower is running and good turbulence is evident. Effluent quality is poor and is grey</p>	<p>8. Heavy hydraulic surge flows from laundry or kitchen activities</p>	8. For commercial applications, install a surge tank before the Diamond
		9. For residential applications, reduce the frequency of laundry to 1-2 loads per day
<p>5. Aeration chamber has a clear appearance with very few suspended solids (&lt;5%). White suds observed. Effluent is clear with no odour</p>	<p>9. Light loading resulting in total digestion of solids</p>	10. No action required if effluent quality is acceptable. Typical of intermittent use.
		11. If effluent quality is unacceptable, slow down the oxidation by providing a timer on the air blower. Contact WPL for on/off periods
<p>6. Aeration chamber as 5, but with very fine particles in the effluent causing it to appear turbid or murky</p>	10. See B 8	12. See C 10-11
<p>7. Aeration chamber contents have a grey appearance and slightly septic odour</p>	11. System is lightly loaded and has been in use for less than 3 months	13. Continue start-up regime of minimal laundry and minimal cleaning chemicals.
	12. Insufficient organic matter present in the influent resulting in a slow start-up	14. See C 1-5
	13. See B 8	15. "Seed" plant with WPL Formula 33 to help initiate start-up
<p>8. Aeration chamber contents are grey to black. Effluent is grey and has a strong septic odour</p>	14. Organic overload due to excessive use of waste disposal unit	17. Refrain from discharging food scraps, grease, oil, etc into the waste disposal
	15. As B 1-4	18. As C 1-5

## 4. TROUBLESHOOTING AND PROBLEM SOLVING (continued)

### 4.1 DMS/DMC Models (continued)

A - SYMPTOM	B - CAUSE	C - REMEDIAL ACTION
9. Grease balls are observed in the aeration chamber contents	16. Excessive laundry use	19. As C 8-9
	17. As B 1-4	20. As C 1-4
	18. Insufficient Dissolved Oxygen (DO)	21. At the time of a peak flow, turn air blower off for 15 minutes and check DO with a metre. If DO is less than 1.0 part per million, contact WPL for assistance
10. Effluent sample contains brown suspended solids, more noticeable during peak flow periods	19. Heavy build up of mixed liquor suspended solids (MLSS), due to normal, long-term usage	22. De-sludge the Diamond
	20. Excessive (>125mm) of scum has accumulated in the clarifying chamber. The scum is being carried under the scum baffle	23. Remove scum back to aeration chamber with a scoop
11. System requires de-sludging on a more frequent basis	21. Excessive use of powdered laundry detergent	25. Use liquid detergents or "concentrated" powders
12. Effluent sample contains excessive suspended solids. Aeration chamber contents have a normal chocolate brown colour, but sludge settles slowly in a jar and forms a light floc	22. Overabundance of "filamentous" bacteria that prevent compaction and settling of the sludge	26. Contact WPL for specific recommendations

### 4.2 DMS-IPC Models with integral pump

A - SYMPTOM	B - CAUSE	C - REMEDIAL ACTION
1. No discharge.	1. No flow as pump not working.	1. Check power supply.
		2. Check operation of float.
2. Beacon flashing.	2. High level alarm.	3. As C1-2.
3. Plant overflowing.	3. No power.	4. Check power supply.

## **6. GUARANTEE AND WARRANTY INFORMATION**

### **6.1 Process guarantee**

The process is guaranteed to meet the designed Effluent Discharge Standard for the life of the plant provided that:

- All aspects of the Installation Manual and User Guide Operation & Maintenance Manual are adhered to.
- The flows and loads (based on industry standard figures, ref. BW COP: 1/05) do not exceed those stated on the design sheet.
- There is sufficient hardness in the water where nitrification is required.
- Grease from commercial kitchens is not present in the influent.
- Performance is measured after the process has matured.
- Biological inhibitors are not present in the influent.
- The pH is 7 to 9.

### **6.2 Warranty period**

The warranty period for Diamond DMS systems is 60 months from date of purchase.

The warranty period for Diamond DMC systems is 24 months from date of purchase.

### **6.3 Parts covered under warranty**

WPL Ltd warrants all of the parts in each of their Diamond range of package sewage treatment systems, when properly registered with the manufacturer, to be free from defects in materials and workmanship in normal use and service.

WPL Ltd's sole responsibility under this warranty is limited to repairing, exchanging or replacing any component part or parts that in their judgement show evidence of defects within the warranty period.

The defective part or parts must be returned to the point of purchase, factory or a designated agent.

### **6.4 Warranty limitations/exemptions**

WPL Ltd shall not be liable for any labour involved for the removal or replacement of its equipment nor the subsequent transportation, handling or packaging of any part or parts thereof.

In no case will WPL Ltd be liable for loss incurred because of interruption of service or for consequential damages, labour or expense required to repair defective units, nor shall this constitute a cause for the cancellation of the contract of purchase and sale.

Specifically exempt from this warranty are limited life consumable components subject to normal wear and tear, such as air pump vanes, diaphragms and filters.

### **6.5 Chargeable non-warranty work**

Service charges incurred (including parts and labour), due to unauthorised alteration, accidental damage, improper use, abuse, tampering, failure to follow installation instructions or failure to follow operating and maintenance procedures, are not covered by this warranty and are not assumed by WPL Ltd. All service visits for non warranty work are chargeable. This warranty gives specific additional benefits. Statutory rights are unaffected.



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