INTRODUCTION

It is widely recognised that effective wastewater distribution is essential for achieving the optimum performance of a fixed film reactor

process (trickling filter). Veolia Water Solutions & Technologies, a division of VWS(UK)Ltd, has invested more than 35 years in designing,

commissioning & operating aerobic fixed film systems and has used this knowledge to create a range of the most effective rotating

DISTRIBUTOR SYSTEMS

Innovative Solutions

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VWS (UK) Ltd is accredited by Lloyds Register Quality Assurance to BS EN ISO 9001:2000 - Quality Management Systems.

Veolia Water Solutions & Technologies previously operated under the names of Kruger, Edwards & Jones, Mass Transfer International, OTV and PTS.

VEOLIA WATER
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DISTRIBUTOR SYSTEMS AVAILABLE IN THE MARKET

This range of distributors include Cascade, HiGARD, MiniGARD and Cascade MiniFlo units. All being engineered to the highest quality and include technical features unique to the Veolia Water Solutions & Technologies, a division of VWS(UK)Ltd range, placing these units at the leading edge of liquid distribution technology. Each Distributor, designed by Veolia Water Solutions & Technologies, a division
of VWS(UK)Ltd not only addresses the basic requirements to achieve even liquid distribution across the surface of the media bed but also the effects of irrigation rates, recirculation requirements, flushing intensity together with surface organic & hydraulic loading rates onto the reactor.

Where conditions and duty allow reaction driven units are typically utilised. These units are driven by the motive force of the wastewater delivered to the distributor. In most cases this will be a pumped flow but where site gradients permit gravity fed units can be designed and installed.

For advanced fixed film reactor systems where high performance and increased levels of process control are required Veolia Water Solutions & Technologies has developed power driven rotary distributors with variable speed control. The ability to vary the speed of rotation enables the flushing intensity (SK) to which the media is subjected to be optimised thereby permitting the solids inventory and biofilm thickness to be operationally regulated. This "SK" factor in mm/pass refers to the depth of liquid penetration into the media depth per pass of the distributor arm. Biomass accumulation in the filterbed can result in a deterioration of treatment performance. Since the aerobic fraction of the total biofilm attached to the media may be only 5 to 10%, the remaining biofilm serves no useful purpose in organic removal. Excessive accumulation of biofilm can produce numerous operational problems, it is therefore beneficial to control the film thickness to low levels, typically less than 1mm.and provide a biofilm layer which is predominantly aerobic. This is achieved by utilisation of a speed controlled distributor which allows the instantaneous flushing intensity (SK) to be varied, thus allowing control of the solids inventory by way of hydraulic shear. Speed controlled distributors also enhance substrate distribution and encourage even biofilm development within the packed media bed.

The flushing intensity is defined by as the SK (spulkraft) value and is determined by the following formula:

$$SK = \frac{(q + r)\ (1000\ mm/m)}{(a)\ (n)\ (60\ min/hr)}$$

Where "SK" represents the flushing intensity per pass in mm/pass, "q + r" represents the total average hydraulic flow in m3/m2.hr, "a" represents the number of Distributor arms and "n" represents the rotational speed in rev/min.

HiGARD Distributor units

Possibly the most advanced distributor available in the market-place. This 'state of the art' design features a trapezoidal or box cross-section arm profile with adjustable, large diameter, non-clog orifices integrated into the top arm section to provide accurate adjustment for even distribution of the flow.

The design also incorporates large area inclined plane flow spreader plates to ensure a curtain wall flow regime is maintained over the complete flow range.

The distribution system is designed to provide even distribution of the influent across the full cross-sectional area of the trickling filter media bed.

The distributors include a trapezoidal or box section cross-sectional arm profile with fully adjustable, large diameter, non-clog orifices integrated into the top arm section to provide accurate adjustment for even distribution of the flow. The design also includes large area flow spreader plates to ensure a curtain wall flow regime is maintained over the complete flow range. The distributor is designed for minimum maintenance with top-mounted long life bearings and motor drive unit, maintenance free internal seal-less weirs, stabiliser assemblies, automatic lubrication system and quick release flush gates on the end of each arm.

Each distributor includes the following components:

- Centre column and upper bearing assembly
- Distributor drum
- Distributor arms
- Distribution orifices
- Arm Supports
- Drum stabilisers
- Variable speed drive unit -optional
- Variable speed control -optional

The rotary distributor include a stationary centre inlet column of adequate height to develop the hydraulic head required for flow distribution. The central column is of welded construction and fabrication from aluminium alloy, Stainless Steel or GMS. The centre column is designed to withstand moment loads caused by wind or eccentric loading on the distributor arms. The centre column base includes a convenient means for levelling the distributor unit during installation. The standpipe is designed for direct bolting onto a duckfoot bend. A 3 mm thick Permanite (or equivalent) full face gasket is provided for installation between the flanges. Incorporated into the standpipe are four outlets allowing effluent to flow into the rotating body section, a wear band for the body stabilisers, a mounting at the top for the support bearing and a jacking plate to assist in the changing of the support bearing.

The upper bearing assembly incorporates the following design criteria.

- The upper bearing assembly is located above the wastewater elevation to eliminate the possibility of contaminating the bearing with wastewater.
- The bearing can normally be replaced without removing the distributor drum and arms.
- The minimum bearing life is normally 10 years - when operated within the specified design parameters
- The spherical roller bearing are grease lubricated with convenient grease lines.
- The rotating distributor drum is designed to operate within the available head at all flows between minimum and maximum. The distributor drum is of welded construction and fabricated from aluminium alloy, Stainless Steel or GMS
- The height is sufficient to contain the operating wastewater column at the maximum flow. Incorporated in the design are flanged connections to the arms, and anchor points for connection of the vertical rigging supporting the arms.

The number and dimension of the distributor arms are designed for handling the maximum and minimum flow. The arms are of welded construction and fabricated from aluminium alloy, Stainless Steel or GMS .

The arms incorporate the following:-

- Cross-sectional arm profile suitable for maximum and minimum flow rates with inclined plane flow spreader plates to ensure curtain wall flow regime over the design flow range.
- Wedge-tight, quick opening clean–out/flush gate at the end of each arm to facilitate arm draining.
- Large diameter, non-clog overflow orifices
- Thrust-reverser assemblies, where required, to reduce rotational speed

Mini-GARD Distributor Units

The Mini-GARD units have all the design benefits of the HiGARD range but have been specifically developed for use in the smaller sized trickling filters, typically between 5 and 20 meter diameter.

The distribution system is designed to provide even distribution of the influent across the full cross-sectional area of the trickling filter media bed.

The distributors include a trapezoidal or box section cross-sectional arm profile with fully adjustable, large diameter, non-clog orifices integrated into the top arm section to provide accurate adjustment for even distribution of the flow. The design also includes large area flow spreader plates to ensure a curtain wall flow regime is maintained over the complete flow range. The distributor is designed for minimum maintenance with top-mounted long life bearings and motor drive unit, maintenance free internal seal-less weirs, stabiliser assemblies, automatic lubrication system and quick release flush gates on the end of each arm.

Cascade Distributor Units

Cascade distributors include both standard units and units of a highly advanced design for non-typical applications. The tubular arm concept was scientifically developed to provide an effective irrigation profile across the entire surface area of the filter-bed.

Features of the Cascade Distributor unit include:

- Individually designed and sized units specific to plant and process requirements and site conditions
- Single or multi-stage distributor body designs permit operation at high turn down flow ratios, under both low and high flow conditions.
- Computer modelled distribution hole sizing and spacing in the arms to ensure even liquid distribution over the total media surface.
- Distributor internal flow design eliminates entirely the requirement for liquid seals.
- Sealed self aligned heavy duty bearings located at the top of the distributor body eliminating wastewater contact and providing easy access for maintenance and replacement.
- Specific bearing life of c100,000 hours
- A range of fabrication materials selected to meet specific effluent and duty for the distributor body, arms and rigging.
- These include Stainless Steel, GMS and specialist material finishes.
- Horizontal and vertical fully adjustable rigging
- Simple flange mounted installation
- Designed to provide years of trouble-free operation and low maintenance.
- Reaction driven or variable speed motor driven units available

Cascade MiniFLO units

These units have been specifically designed for the very small trickling filter, typically between 2 and 4 meter diameter. The units are mounted from 2 beams located across the top of the trickling filter containment vessel, with easily assessable bearing assembly and optional motor drive unit. The distributors are available in a variety of materials i.e. 304 Stainless Steel, 316 stainless steel, GMS and plastic. and can be supplied in single or multi-stage configuration thereby enabling them to accommodate a wide flow range.

All Veolia Water Solutions & Technologies distributor systems are designed to provide even distribution of the influent across the full cross-sectional area of the trickling filter media bed which can be demonstrated by use of pan tests that confirm the variation across the entire surface is a maximum of 10%. All motor-driven units can be supplied with a facility to allow the units to be operated in reaction mode in the event of a power failure and then revert back to motor drive once the power is restored.