ABS
COST-EFFECTIVE PUMPING

nopon

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PROJECT DEFINITION

Project name:	ETAR de Serzelo
Offer number:	
Revision:	2
Revision date:	28-02-2007
Author:	Branco
Saved in file:	E:\Calculos NOPOL\Serzelo-01-03-07.qm3
Definition:	

BASIN DEFINITION

Type	Caroucel	
No of basins:	2	pcs
Channel length (m)	47.90	
Channel width (m)	6.00	
Water depth	6.00	m
Submersion depth	5.75	m
Volume	8 933.35	m^3
Aerated volume:	2 304.00	m^3
Area	1 488.89	m^2
Aerated area	384.00	m^2
Uncovered area	0.00	m^2
No of aerated zones:	2	pcs
Volumes of aerated zones:		
1	1 152.00	m^3
2	1 152.00	m^3

The basin has mixers.

POWER CONSUMPTION

$$P = 9.82 \times 10^{-4} \times Pi \times q \times ((P2/Pi)^{0.283} - 1)/eff$$

Formula	Definition		Value
eff	Blower efficiency		0.65
Pi	Atmospheric pressure	kPa	101.30
Ph	Hydrostatic pressure	kPa	56.41
Pp	Head loss in the pipe	kPa	6.00
Pv	Head loss in inlet valves and filters	kPa	2.00
Price	Energy price	curr/kWh	1.00
hours	Aeration time per day	h/d	24.00
days	Days of aeration/year	d/a	365.00

PIK300

			Min	Avg	Max
q	Airflow per diffuser	Nm^3/h^{**}	1.40	5.90	8.62
Q	Total Airflow	Nm^3/h^{**}	1 135	4 792	7 000
Pd	Diffuser head loss	kPa	2.55	4.10	6.08
	Power consumption/Basin	kW	28.78	123.89	185.36
	Power consumption/2 basins	kW	57.57	247.79	370.72
		kWh/a	504 299	2 170 597	3 247 514
Price		curr	504 299	2 170 597	3 247 514

** in standard conditions(0.00°C;101.30kPa)

SYSTEM PERFORMANCE

LOAD	Zone	SOTR %	SOTR*2 Kg/h	Diff pcs	DD %	SOTE %	q*1 $Nm^3/h/diff$	Q*1 Nm^3/h	MIXING*1 $Nm^3/h/m^2$	EFF*1*2 g $O_2/Nm^{3*}m$	SLANTS + EMPTY AREA*3	HORI FL
PIK300												
Min	1	50	74	406	12.7	43.55	1.40	567	2.96	22.76	1.00	
	2	50	74	406	12.7	43.55	1.40	567	2.96	22.76	1.00	
One Basin		100	149	812				1 135				
2 Basins			297	1 624				2 270				
Avg	1	50	262	406	12.7	36.42	5.90	2 396	12.48	19.04	1.00	
	2	50	262	406	12.7	36.42	5.90	2 396	12.48	19.04	1.00	
One Basin		100	524	812				4 792				
2 Basins			1 049	1 624				9 583				
Max	1	50	344	406	12.7	32.70	8.62	3 500	18.23	17.09	1.00	
	2	50	344	406	12.7	32.70	8.62	3 500	18.23	17.09	1.00	
One Basin		100	688	812				7 000				
2 Basins			1 376	1 624				14 000				

*1 in standard conditions(0.00°C;101.30kPa)

*2 in standard conditions(20.00°C;101.30kPa) at the given aeration depth

*3 The above performances are estimated not guaranteed

*4 The above performances are estimated not guaranteed

DESCRIPTION

The NOPOL® PIK 300 Membrane Disc Diffuser has an elastomeric membrane with slits. The slits open during aeration by the pressure of compressed air and close when not aerated. Air is then spread into small bubbles, the size is between 1 - 3 mm when released through the membrane.

The membrane is fixed by a bayonet type screw-on ring (PKR 300) to a main body (PSA 300). Between the screw-on ring and the membrane there is the PVR 300 sliding ring which is antifriction material (POM) thus ensuring free expansion and contraction of the membrane without any mechanical friction. The edge of the membrane is formed like an O-ring sealing the construction when pressed by the sliding ring against the saddle piece. The main body distributes the air evenly over the entire surface of the membrane.

Inside the main body there is the non-return valve which is operating both as a control orifice and automatically closing non-return valve. The orifice ensures even pressure loss between diffusers and thus even air distribution. The non-return valve protects the system from clogging.

Between the main body of the diffuser and the pipe there is a seal which seals the attachment tightly. PLT 15/4 SIL flat seal is used for PP piping, PLT 15/5 flat seal for OD 88.9 mm steel piping and PLT 15/4 flat seal for OD 90 mm PVC piping.

The diffuser is mechanically attached to pipe by a rigid PSK 90 wedge piece without any glue or solvent welding. The requested diameter of the hole to be drilled in the pipe is ∅ 15 mm.

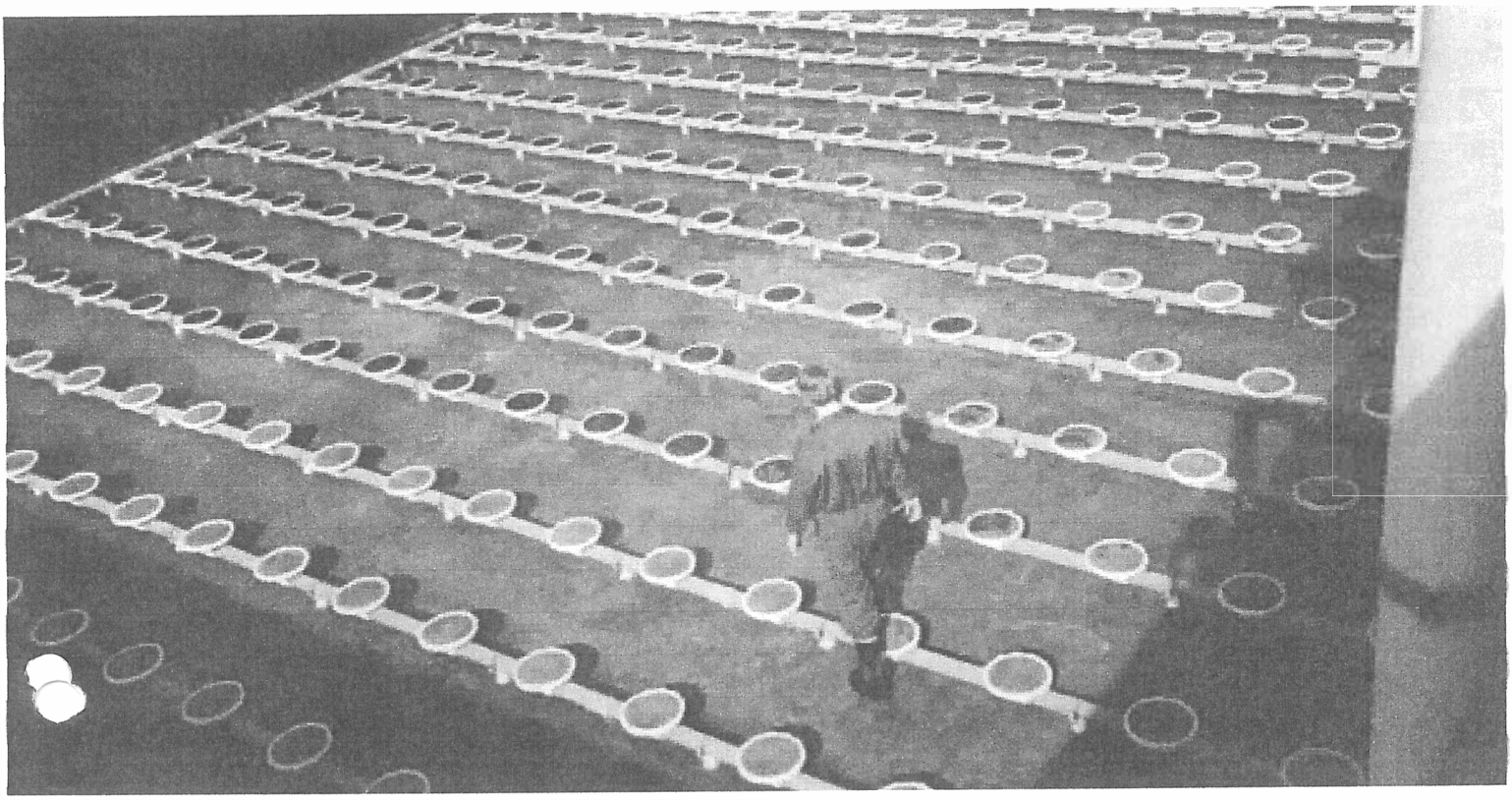
The PIK 300 preassembled diffuser includes the screw-on ring, sliding ring, membrane disc, main body, non-return valve, seal and the separate wedge piece. All the materials of the NOPOL® PIK 300 diffuser are recyclable.

The diffuser construction is shown in the exploded views and drawings LD 5173, LD 5637 and LD 5636.

APPLICATIONS

The NOPOL® PIK 300 diffuser is suitable for normal continuous aeration systems as well as where intermittent aeration is required, e.g. biological nutrient removal and SBR processes.

Due to its non-clogging nature the PIK 300 rubber membrane diffuser is also suitable for industrial effluents.



ABS NOPON DISC DIFFUSER SYSTEM PIK 300

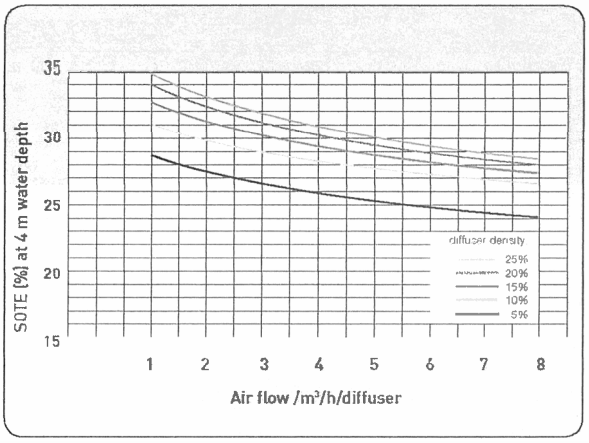
- ☐ **Recyclable materials**
- ☐ **High temperatures up to 100°C**
- ☐ **Wedge mounting**
- ☐ **Safe in use**
- ☐ **A longer operational life**

The "state-of-the-art" ABS NOPON disc diffuser system PIK 300. The unique design and construction makes it the only "smart" disc diffuser available on the market.

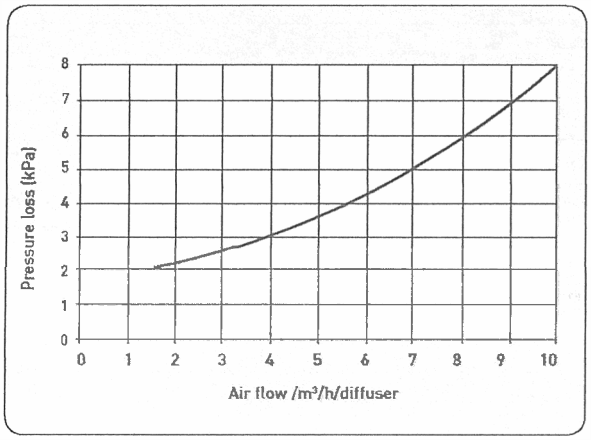
Benefits

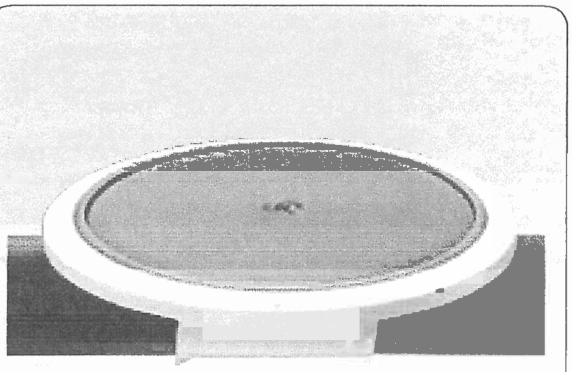
- The components of the ABS NOPON PIK 300 diffuser body are manufactured from recyclable materials. Such materials can also be offered for the complete pipe system as an alternative.
- All materials withstand long term operations as temperatures up to 100°C. Therefore the ABS NOPON PIK 300 is particulary suitable for aeration in deep basins.
- The ABS NOPON PIK 300 wedge piece fixing is safe and reliable. It is quick and easy to install even on site and with various pipe materials. No solvent welding is necessary which also means that, if necessary, changing the diffuser layout is extremely easy.
- The ball-type non-return valve acts as an additional safety feature by efficiently preventing sludge from entering the pipe work and clogging the whole system. The construction guarantees lower pressure drops and therefore higher efficiency.
- The unique sliding ring made of water lubricated anti-friction material allows abrasion-free expansion of the membrane and minimizes friction between the materials. Thanks to this feature, it is easy to open the diffuser for maintenance even after a long running period. The membrane is not stuck to any threaded ring or fastener.
- The advanced material engineering allows the membrane to slip out of the fixing ring when excessive clogging increases the internal pressure. This feature preserves the physical characteristics of the membrane guaranteeing a longer operational life and a more consistent transfer efficiency.
- Even after years of operation, opening the diffuser for maintenance is easy. Every part can be easily accessed and replaced. ABS ensures long term availability of spare parts for all items.

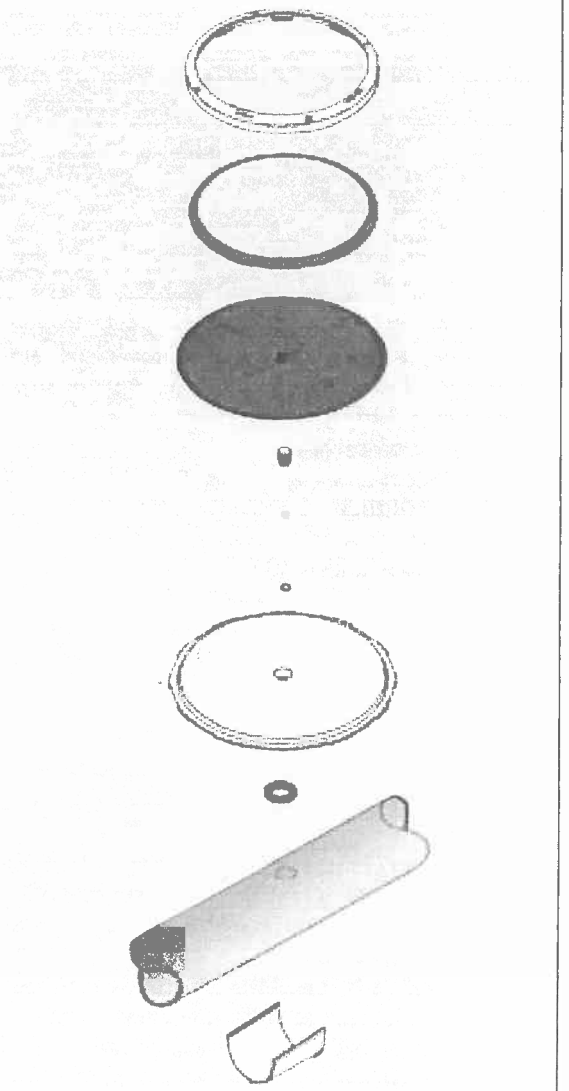
Standard Oxygen Transfer Efficiency



PIK 300 Diffuser Pressure Loss







Components and materials

PKR300	Screw-on ring	polypropylene
PVR300	Sliding ring	POM (polyacetal)
HIK300	Membrane disc	EPDM rubber
PTV 15	Non-return valve Ball O-ring	polypropylene stainless steel AISI 316 VITON
PSA300	Main body	polypropylene
PLT	Flat seal	EPDM rubber
PSK90	Wedge piece	polypropylene

Specific Data of the PIK 300 Diffuser

Operating air flow	1,5-10,0 m³/h/diffuser
Diffuser diameter	336 mm
Membrane surface area	0,060 m²
Size of bubbles	1-3 mm
Diffuser weight	0,795 kg
Maw Air temperature	+ 100°C

ABS reserves the right to alter spec(ons due to technical developments.

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We know how water works

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SPECIFIC DATA OF THE PIK 300 DIFFUSER

Table 1. Diffuser specification

Design air flow range	0,5 - 8,0 m^3 /h/diffuser (+20 °C; 1 013 mbar)
Membrane diameter	304 mm
Membrane surface area	0,060 m^2
Size of bubbles	1 - 3 mm
Diffuser weight	0,795 kg
Air temperature, max	+ 100°C in operation conditions
Max/min interval, c/c	1,2 / 0,450 m
Diffuser level	250 mm above tank bottom (standard)
Performance (SOTE)	5,5...8 %/m water depth; see graph 41-31045 / 2
Pressure loss	2,0...6,0 kPa, see graph 41-31045 / 2

COMPONENTS AND MATERIALS

Table 2. Components and materials

PKR 300	Screw-on Ring	polypropylene
PVR 300	Sliding Ring	POM (polyacetal)
HIK 300	Membrane Disc	EPDM rubber
PTV 15	Non-return Valve	polypropylene
	Ball	stainless steel AISI 316
	O-ring	VITON
PSA 300	Main Body	polypropylene
PLT 15/4 SIL	Flat Seal	silicon
PLT 15/5	Flat Seal	EPDM rubber
PLT 15/4	Flat Seal	EPDM rubber
PSK 90	Wedge Piece	polypropylene

ATTACHMENT ALTERNATIVES

The PIK 300 D90 diffuser is fitted to an OD 90 mm PP pipe (outer diameter 90,25 mm ± 0,05 mm) with a wedge piece PSK 90 and sealed with a flat seal PLT 15/4 SIL.

The PIK 300 V D90 diffuser is fitted to an OD 90 mm PVC pipe (outer diameter 90,25 mm ± 0,05 mm) with a wedge piece PSK 90 and sealed with a flat seal PLT 15/4.

The PIK 300 S D88.9 diffuser is fitted to an OD 88,9 mm stainless steel pipe (outer diameter 88,9 mm ± 0,75 %) or PVC pipe (NS 3": 88,9 mm ± 0,20 mm) with a wedge piece PSK 90 and sealed with PLT 15/5 flat seal.

The PIK 300 4" diffuser is fitted to an OD 114,3 mm pipe (NS 4") with a wedge piece PSK 4 and sealed with PLT 15/4 flat seal.

The PIK 300 T 3" diffuser is fitted to an OD 88,9 mm stainless steel pipe (outer diameter 88,9 mm ± 0,75 %) or PVC pipe (NS 3": 88,9 mm ± 0,20 mm) with a wedge piece PSK 3 and sealed with PLT 15/4 flat seal.

MAINTENANCE AND INSTALLATION TOOLS

Due to the self-cleaning properties of the diffuser membrane no extra cleaning method is normally required. However, if needed due to process conditions, the whole aeration system can be cleaned during operation by using the bumping system (mechanical shock given by shortly increasing air flow rate) or using the patented NOPOL® CLEAN method. The cleaning liquid, formic acid, is fed into the air supply to remove materials such as lime and iron deposits from the membrane disc.

Special tools requested for installation and maintenance are delivered with the diffusers.

MECHANICAL GUARANTEE FOR NOPOL® DDS AERATION SYSTEMS

The basic mechanical guarantee for NOPOL® DDS aeration systems is valid for 12 months from start of operation or maximum 24 months from the delivery, see "General Guarantee Terms for NOPOL® Aeration Systems".

No mechanical guarantee is granted for waste waters having high concentrations of mineral oils, vegetable oils, fats, organic solvents and chlorides. For operating and durability requirements, see Table 1.

Table 1. Process parameter specification

Water quality		normal municipal
Mineral oils		max. 10 mg/l
Vegetable oils		max. 40 mg/l
Fats		max. 40 mg/l
Organic solvents		max. 0,6 mg/l
pH		5,5 - 9,5
Cl_2		max. 0,3 mg/l
Water depth		3 - 8 m
Ambient air temperature		max. 40 °C
Air temperature at diffusers	PIK 300	max. 100 °C
	others	max. 80 °C
Specific air flow	PIK 300	max. 8 m^3/h/diffuser
	PRK 300	max. 8 m^3/h/diffuser
	KKI 215	max. 4 m^3/h/diffuser
	HKL 215	max. 5 m^3/h/diffuser
	MKL 215	max. 6 m^3/h/diffuser
Cleaning		cleaning with formic acid

SYSTEM DESCRIPTION

In fine bubble aeration systems compressed air is distributed through pipework to the aeration device, called diffusers. Compressed air is dispersed into fine bubbles and oxygen is transferred into the surrounding fluid. The grids of pipes with diffusers installed, called an aeration group, cover the basin bottom. The pipework is fixed to the basin bottom. Even distribution of diffusers gives equal dissolved oxygen concentration and uniform mixing energy distribution throughout the tank.

NOPOL® DDS systems consist of one or several aeration groups. Each group is made up of diffusers, air distribution pipes, pipe expansion joints and bottom mounting brackets. The NOPOL® DDS system is complete including all necessary accessories for installation. The prefabricated modular elements make installation easy and fast. An aeration group and its main components are shown in the drawings LD 3950 and LD 5462.

COMPONENTS OF THE SYSTEM

There are five kinds of NOPOL® DDS systems for various applications. The HKLE, MKLE, KKIE, and PIKEV systems have different disc diffusers, but they are all made of similar pipework and components. The PIKE system can be used with many kinds of pipework and the components are different from the other systems.

Table 1. NOPOL® DDS systems and diffusers

System name	Diffuser type	Diffuser disc
HKLE	HKL 215	Porous HDPE, fine bubble, Ø 200 mm
MKLE	MKL 215	Porous HDPE, medium bubble, Ø 200 mm
KKIE	KKI 215	Elastic membrane, Ø 200 mm
PRKE	PRK 300	Elastic membrane, Ø 300 mm
PIKEV	PIK 300	Elastic membrane, Ø 300 mm
PIKE	PIK 300	Elastic membrane, Ø 300 mm

The HKL 215, MKL 215, KKI 215, and PRK 300 diffusers are designed for mounting on a PVC or stainless steel pipe by a wedge piece attachment. The PIK 300 diffusers are designed for mounting on a PP, PVC or stainless steel pipe by a wedge piece attachment. No solvent welding is required at site. Details of the diffusers and its components, materials and performance are described in the respective technical specifications.

Preassembled diffuser elements are made of O.D. 90 mm uPVC or PP pipes, cut in length up to 5 m, to hold the diffusers and to form lateral rows spanning the whole group. Characteristics for the pipe are given in the PVC (41-31012) and PP pipe specifications (41-51012).