

Concurrent biological treatment for heavily and lightly oil-polluted waste waters with subsequent recycling

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Natural soft methods of waste water treatment are also suitable for the use in an industrial environment where conditions are fierce. Until recently, experts doubted whether biological waste water treatment is possible at all for mineral-oil loaded waste water and whether this process can cope with the continuous change in waste water composition. In contrast, the BioClassic System series of wasserschmidt GmbH has proved evidence of the system's unlimited suitability for the high demands of every-day industrial use.

The BioClassic system series is a modular biological system for the treatment of waste waters from vehicle washing, cleaning and repair operations.

Originally intended as pure recycling systems for automatic external car wash with a high availability and little maintenance work the BioClassic systems have soon shown that the efficiency of biological systems is much higher than initially expected.

The high purity of the processed water does not only offer very good car wash results. BioClassic systems also offer other advantages like clean brushes of the washing units, the car wash technology as a whole and clean washing plants with a minimum of cleaning maintenance. Selling cleanness is an enormously important competitive advantage and leads to customer satisfaction.

Savings in these areas are often underestimated. The easy operation of the BioClassic systems proves the operators the high economy which goes far beyond clear fresh water savings by the recycling system itself.

The high stability of the BioClassic systems even in the case of accidental discharges can be seen if used as a recycling system at self service wash stations.

Due to their high process stability BioClassic systems offer the opportunity to additionally treat heavily loaded waste waters, for example from repair shops or



BioClassic system installed in the exit area of a car wash plant

parts washing, without having to accept a reduced cleaning performance.

The treatment of these waste water flows, which is problematic for other system technologies, does not influence the process water quality. Nor does it affect a simultaneous recycling process of the purified waste water in washing or high pressure units.

There is no separate control, treatment or disposal of highly loaded waste water flows required. The savings gained in this way more than compensate a higher investment in a BioClassic system especially designed to meet these requirements.

Often an adapted BioClassic system constitutes the most cost-efficient solution when renovating an existing waste water system.

Soil working can often be almost completely avoided and existing parts integrated. The required system enlargement can be carried out above-ground. The BioClassic System often turns out to be the only economical solution for the

renovation of existing units.

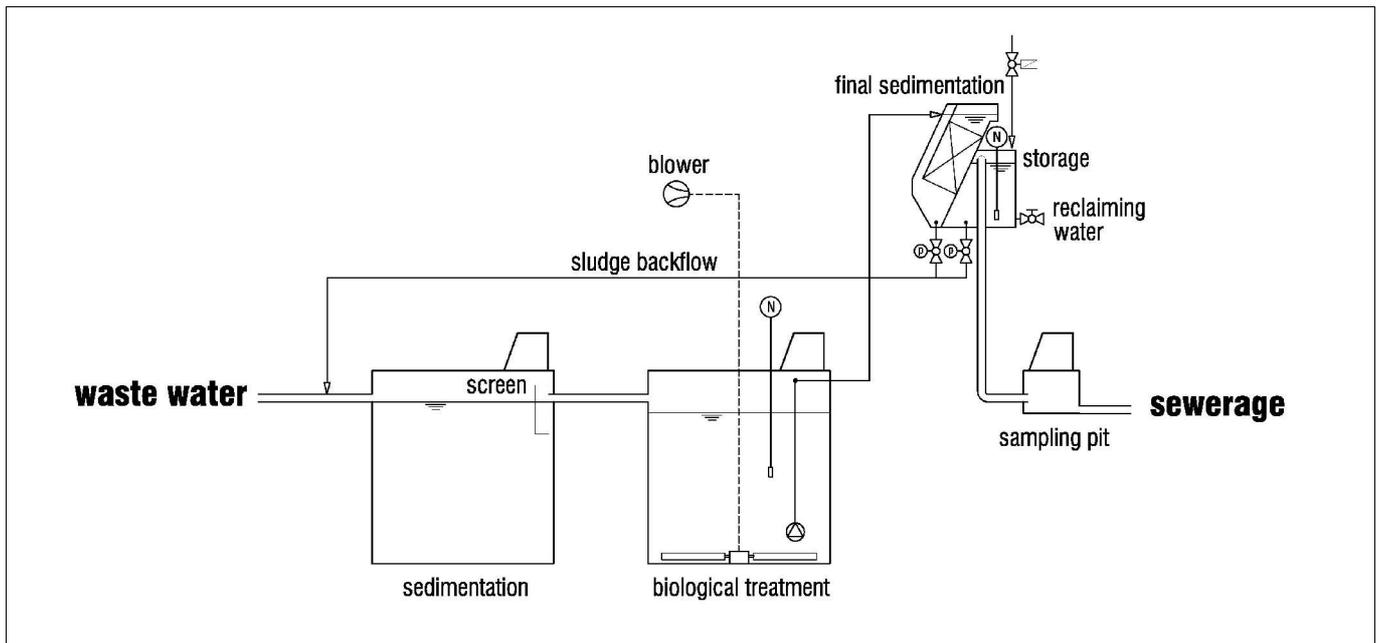
Design of BioClassic systems

The BioClassic system series is typically based on a conventional biological 3-stage design: mechanical preliminary sedimentation, biological treatment and mechanical final settling.

Preliminary sedimentation - separation of solid particles from the waste water - is carried out by gravity sedimentation in an underground sludge pit. Floating solid particles, such as leaves, are filtered by a screen in the drain of the pre-clarifying stage.

Biological treatment takes place in a subsequent biological reactor, which has a large-surface ground-based aeration and large settlement surfaces for micro organism.

Depending on the wastewater quantity, its pollution and the desired treatment result it may be advisable to use a 2-stage biofilm reactor.



basic flowchart of a BioClassic system

Finally the treated waste water is carried by an alternating lifting equipment to a mechanical final settlement stage, the above-ground lamella separator.

Here remaining suspended sludge from the biofilms is separated and led back to the preliminary sedimentation stage.

From the overflow of the final clarifiers the purified waste water is led to a waste water storage tank and, if required fed to the water circulation system of the washing unit. Not used purified waste water is discharged to the local sewerage from the waste water storage tank in a free overflow.

The discharge of purified waste water into the local sewerage system is in accordance with local regulations (German waste water ordinance, Anhang 49, AbwV) and does not require the use of an oil separator according to DIN 1999 resp. DIN-EN 858 any more.

Process advantages

As a consequence of natural metabolic processes, organic substances, the presence of large settlement surfaces, and an intensive aeration in the biofilm reactor, a high-performance biocoenosis is produced independently at the settlement surfaces within a short time.

In this way organic waste water substances including mineral oils are biologically eliminated. The pollution

values obtained are far below the results achieved by statutory minimum treatment processes.

Typically, the residual loads in the treated waste water from a BioClassic system are considerably below 5 mg/l hydro carbons (H53) and smaller than 200 mg/l COD.

Heavy metals which may be contained in the waste water will accumulate in the cell material and also be extracted from the

waste water for the most part.

In a BioClassic system 90 % of the zinc and 80 % of the copper load is typically removed from the waste water. This can be especially important in regards to the treatment of additional waste water from repair shops.

Due to the metabolic processes in the biological stage CO₂ is produced. In this



Bild: Blick auf die Oberfläche einer oberirdisch aufgestellten Biostufe



Biological stages of a BioClassic system in PE construction

way, alkaline waste waters can be neutralised in an independent and reliable manner to a pH-value close to 7.5.

Fine dispersed suspended and inert particles which basically sediment only slowly due to their density difference and particle size, are accumulated at the biofilms in order to form larger agglomerates.

The settlement behaviour is considerably improved in this way, so that a concentration of less than 50 mg/l of filtering substances (25 μ m) can be kept reliably at the drain of the final settlement stage without flocculants.

This allows the direct use of process water with piston pumps. Moreover, the process water does not need to be filtered by means of gravel or sand bedding

The biological stage is designed as a biofilm reactor with a fluidized fixed bed, which shows considerable advantages over systems which use the activated sludge process or a simple waste water aeration only. By immobilising the biomass a controlled sludge return to obtain high organism concentrations is not necessary anymore. Compared with the systems mentioned before biofilm processes show a constantly high cleaning performance, mainly in the case of intermittently occurring waste water flows with strongly fluctuating loads.

Chemical compounds (EPS), which are formed by the biocoenosis to keep the biofilms together act as an absorptive storage.

In this way the active biomass remains largely constant over a certain period even if there is no waste water flow for some time, which is not the case in the activated sludge process. Even if there has been no waste water supply for several days the full cleaning performance is obtained

within a very short time after new waste water has been fed.

By immobilization a very high sludge age is obtained, which leads to an almost complete mineralization, and consequently to very small amounts of excess sludge. By immobilization and the resulting high sludge age very special organisms with slow growth rates are formed. The resulting biological diversity has the effect of degrading organic compounds which are categorised as biologically hardly degradable.

Consequently, the BioClassic system is also suitable for the treatment of organically loaded waste water with unfavourable COD to BOD5 ratios.

Process Water

The previously mentioned strengths of the BioClassic system series have a direct positive influence on the process water quality.

Since the content of filtering substances (25 μ m) is kept reliably below 50 mg/l the process can be used directly with high pressure or self-service wash units. Based on many years of experience with biologically purified waste water the

BioClassic system uses a well-tryed optimised procedure for stabilising the salt content in the process water without the necessity of expensive measuring and regulating equipment.

A defined amount of fresh water for clear-rinsing according to the specifications of the manufacturer of the washing unit is supplied. In this way water losses can be compensated and a defined small quantity of excess water is discharged in the local sewerage.

The directed use of fresh water as additional water or water for desalination leads to the smallest consumption of fresh water in the long run if you use it directly on the vehicle.

Practical operating results (1)

The Landesgewerbeanstalt Bayern (LGA) was authorised to supervise the operation of a BioClassic system for several weeks and to evaluate the results.

The BioClassic system selected in agreement with LGA has been in operation for several years at a freight forwarder in Crailsheim, Germany.

With this system in addition to waste waters from the truck wash unit all waste



BioClassic System set up above-ground from inside cleaning of bio-waste collection vehicles, with recycling system



Tank wash station Varde barracks

waters from manual cleaning operations with high pressure units (engine and parts washing), dripping water and waste waters from the repair shop floor.

The samples were taken and evaluated according to the "admission standards for waste water units used for the reduction of mineral oils from waste waters", Berlin, 13.11.2001.

With regard to the cleaning performance of the tested BioClassic system the following results were obtained:

Parameter	Untreated Waste Water Ø	Recycling Water Ø
filtering subst. (> 25 µm) [mg/l]	1100	14
HC [mg/l]	234	0,6
COD [mg/l]	675	83
BOD ₅ [mg/l]	100	8

In summary, the LGA confirmed that all requirements set to the indirect discharge as well as to the process water could be met in compliance with the admission standards.

Practical operating result (2)

The base of the Danish Military in Varde is equipped with a large repair workshop and a spacious wash unit for their tanks.

Waste water from this tank wash unit is treated by a BioClassic System and recycled as process water.

In practical operation the following residual loads are typically obtained in the recycling water :

- COD < 80 mg/l
- BOD₅ < 20 mg/l
- Mineral oils < 0,5 mg/l
- Suspended particals < 3 mg/l

Without any further hygienization of the

recycling water the following bacterial loads are found in the drain of the final clarifier:

- Coliform bacteria < 50/100ml
- Faecal coliform bacteria < 1/100ml
- Faecal streptococcus < 1/100 ml
- Salmonella not found
- Overall bacteria rate < 10⁴

Summary

The BioClassic system series constitutes a flexible modular biofilm system for the treatment of industrial waste water which can also meet high demands set on the cleaning performance.

Each individually designed BioClassic system consists of the three steps of treatment: mechanical preliminary sedimentation on the basis of commercially available sludge pits, a biological stage with a biofilm reactor and a subsequent mechanical final settlement in lamella separators.

The BioClassic system series has been installed in almost 750 systems comprising wash units, self-service wash stations, vehicle repair shops and other industrial applications, where it demonstrates its high reliability in everyday use.

With the BioClassic system series a coherent system for the treatment of waste water has been consequently developed, while at the same time great importance is attached to cleaning performance and operational safety.

Moreover, the system is characterized by easy operation so that it can be handled by normally qualified operating staff without the necessity of extensive special knowledge.