



BioMonitor

BOD-ANALYSIS

Monitoring biological treatment processes.
Online measurement of BOD and ASR.

Fast. Simple. Accurate.



MONITORING BIOLOGICAL TREATMENT PROCESSES.

The efficient and economical control of aeration systems can only be ensured by determining the total BOD.



As population and industry grows there is an increasing demand for more effective monitoring and treatment of waste water. Understanding the test methods available is the first step to identify the most economical and efficient treatment process for your waste water.

In brief: The history of the BOD.

Already in the middle of the 19th century waste water analysis gained growing importance – especially, as the usability of sewage as fertilizer had been recognized. The interrelationship between decay of organic matter and oxygen demand as well as oxidation potential of sewage followed. In the 1920ies, in order to find a measure for organic pollution the parameter Biochemical Oxygen Demand BOD₅ was defined.

Until the 1970ies this BOD₅ remained unchanged, measuring the oxygen needed for the degradation of carbon and nitrogen compounds. Then additionally the nitrification inhibitor was complemented. The nitrification process is the degradation of nitrogen compounds by micro organisms. Thus, finally the measurement results in the long-desired carbonaceous BOD (cBOD).

Importance of monitoring treatment processes.

Generally, the aim of monitoring is the economical control of treatment processes including aeration, activated sludge concentration and gradual inlet of incoming peak-loads in order to reach the optimal treatment performance.

Nowadays, the BOD₅ is commonly used as a gauge of the effectiveness of sewage treatment.

Rapid monitoring of BOD is of great importance for the effectiveness of biological treatment processes.

Fluctuating waste water volumes and unexpected load concentrations may disturb biological degradation. Consequently, the treatment performance may be significantly reduced. Hence, three questions arise:

- How much is the sludge able to decompose?
- How high is the oxygen demand for this?
- How can an effective and efficient treatment be achieved?

Common BOD method and its limitations.

With the BOD₅ measurement, in the first step the water sample is diluted with high oxygen water in order to ensure that there is enough oxygen. Then, for five days, the sample is incubated at 20°C (68°F) in the dark. The decomposition of nitrogen compounds is suppressed by adding allylthiourea (ATU).

The conditions of the BOD₅ measurement are internationally standardized and the method is commonly used at laboratories. Due to its long duration, the timely control and monitoring of waste water is hardly realizable. Additionally, once a toxin appears, the whole measurement system may be affected making the complete replacement of the test organisms necessary.

As a consequence, the method is not suitable for continuous online monitoring.

Total BOD and Sludge Activity.

The total BOD is the sum of cBOD and the oxygen demand of the nitrification. As the nitrification is an important part of the biological sewage treatment, it has to be provided with sufficient oxygen in the aeration tank. Its monitoring cannot be neglected.

Hence, the efficient and economical control of the aeration system can only be ensured by determining the oxygen demand for the nitrification as well - that is by monitoring the total BOD.

The sludge activity indicates the degradation potential of the plant's activated sludge. It can be disturbed significantly resulting in an insufficient treatment performance. Thus, its monitoring is essential for the effective treatment of waste water.

BioMonitor: The short-time measurement method.

The BioMonitor helps operators to maintain maximum performance of their treatment processes with an automated, online method. This provides the most useful data as quickly as possible. Using the plant's own activated sludge it delivers direct information on the treatment processes.

Its design allows the reproduction of the processes within the sewage plant, guaranteeing the direct applicability of the gained results on the waste water treatment plant's real process parameters.

BioMonitor is the online respirometer that most closely reproduces the biological treatment processes. On the following pages, you will learn more about the many advantages of the BioMonitor and its simple operation.

AT A GLANCE

- Monitoring of BOD and Sludge Activity allows to maintain maximum treatment performance.
- BOD₅ refers to the carbonaceous BOD (cBOD) and indicates the degradation of organic carbon compounds only.
- The degradation of nitrogen compounds (nitrification) is an important treatment process and has to be monitored as well.
- BioMonitor reproduces most closely the treatment processes and delivers results within only 3-4 minutes.

THE ANALYSER.

The short-time monitoring of BOD and Sludge Activity (ASR).

BioMonitor warns you extremely fast.

The analyser detects even rapid changes in oxygen demand and with a response time of 3 to 4 minutes it is extremely fast. BioMonitor measures the total BOD including the oxygen demand for the nitrification as well as the activated sludge respiration (ASR) in order to monitor the sludge activity.

The results allow a most consistent correlation ($r > 0,95$) to the standard methods for BOD₅ (DIN 38409-H51, APHA-AWWA-WPCF 5210 B, EPA).

The short-time monitoring of the degradation processes at WWTP.

With the BioMonitor the biological degradation processes take place at conditions quite similar to those of a waste water treatment plant. The measured oxygen consumption delivers direct information about the oxygen demand of the plant's activated sludge. By optionally adding the nitrification inhibitor it may measure the BOD₅. However, as the BioMonitor determines the total BOD, it monitors the complete treatment process.

Multi-Step-Respiration measurement.

Compared to systems with just one reaction vessel the BioMonitor is a flexible 2-stream respirometer with a fast degradation. With the multi-step construction even hard degradable substances are decomposed without any extra dilution - exactly like in the original treatment plant. The benefit of this unique measuring principle is the precise and fully continuous determination of the BOD in 3 - 4 minutes.

Simultaneous measurement of ASR and BOD.

The measurement of the activated sludge respiration (ASR) ensures not only the exact calculation of the BOD. The ASR provides also important information on the condition of the plant's own biomass (activated sludge) which is especially of importance for controlling and supervision. For Example: If the ASR is falling slowly, it may be an indication of a slow poisoning of the activated sludge by toxic substances.

With its sensitive touch screen BioMonitor responds to your needs.

The BioMonitor is equipped with a 10.4" touch screen display that allows clear graphical surveys of measured values. All graphics and results may be printed out through the printer interface. Of course, they can also be transferred to a PC. Moreover, remote control is optionally available

With BioMonitor, the electronic compartment is separated from the analytical compartment.

The separated compartments are easily accessible.



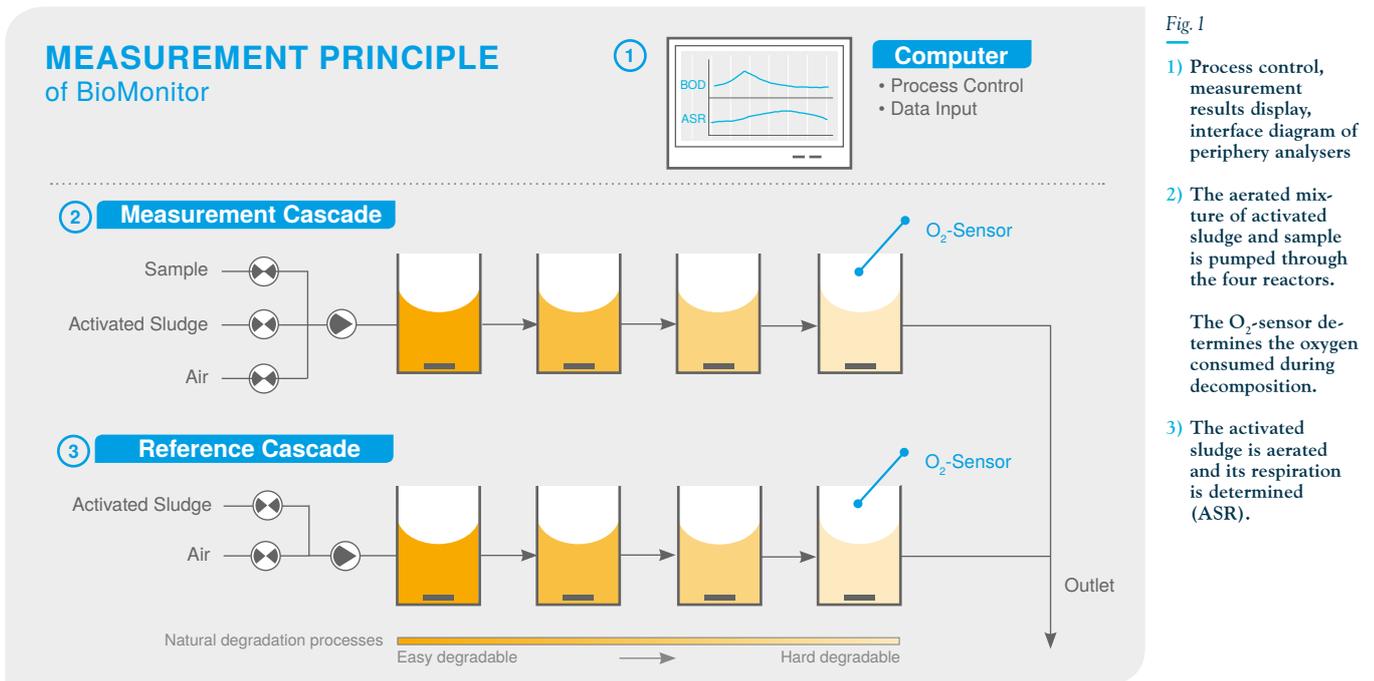


Fig. 1

1) Process control, measurement results display, interface diagram of periphery analysers

2) The aerated mixture of activated sludge and sample is pumped through the four reactors.

The O_2 -sensor determines the oxygen consumed during decomposition.

3) The activated sludge is aerated and its respiration is determined (ASR).

THE PRINCIPLE.

The miniature WWTP.

Imitating the natural processes of a WWTP.

BioMonitor's measurement principle (↗ Fig. 1) allows the reproduction of the processes within the sewage plant. The activated sludge, either supplied directly from the plant or circulating with the sludge recycling system, degrades the substances present in the waste water. The oxygen required for this process is measured by a O_2 -sensor. This process takes place in the measurement cascade which works exactly like an aeration tank.

2 reactor cascades. 4-Step degradation.

The two reactor cascades - measurement cascade and reference cascade - with four reactors each, ensure the extensive decomposition of the organic load as well as the monitoring of the activated sludge respiration (ASR). Both cascades are maintained by predefined conditions ensuring high reproducibility.

Imitating the natural degradation processes.

The four reactors allow the imitation of the natural degradation processes, whereby the easily de-

gradable substances are decomposed first. The increasingly difficult to decompose substances will be gradually converted within the following reactors. At the end of the fourth reactor the degradation rate allows to draw conclusions about the biodegradability of the activated sludge.

Detecting the oxygen consumption.

Within the measurement cascade both the activated sludge and the sample are aerated continuously. Simultaneously, within the reference cascade only the activated sludge is aerated. At the last reactor of each cascade the oxygen consumption is detected during the gas phase by use of O_2 -sensors with exceptionally wide measurement ranges. In addition, having no contact to the waste water these sensors are maintenance-free.

The results.

The measurement cascade delivers the total biochemical oxygen consumption (mg/l) and the reference cascade delivers the activated sludge respiration (ASR in mg/l/min). Subtracting the result of the total biochemical oxygen consumption from the ASR, the oxygen consumed for the biological degradation of the ingredients is determined. This measurement parameter is called Biological Oxygen Consumption (BOC in mg/l).

BioMonitor AN OVERVIEW

Online BOD analyser for the optimization of the biological waste water treatment.

BioMonitor simultaneously measures BOD and ASR. Thus, it helps to optimize the treatment processes at waste water treatment plants. It can be operated with the plants own activated sludge and delivers results within 3 - 4 minutes.



Highly sensitive bacteria in a robust analyser.

ADVANTAGES AND FEATURES

- ✓ short-time monitoring of total BOD and Sludge Activity (ASR)
- ✓ minimum response time 3 - 4 minutes
- ✓ original Activated Sludge for direct WWTP reference
- ✓ fast and effective monitoring for efficient process control
- ✓ high reproducibility
- ✓ low operational costs and limited maintenance necessities
- ✓ excellent correlation to common BOD₅

TECHNICAL DATA

Measurement Technique and Sample Preparation

Measurement Method	Continuous 2-stream respiration measurement
Bacteria Culture	Original Activated Sludge
Measurement Range	BOD: 1 - 50 mg/l, 1 - 200,000 mg/l ASR: 0 - 5 mg/l/min
Response Time	min. 3 - 4 minutes (application dependent)
Accessories	<ul style="list-style-type: none"> • Maintenance-free particle separator • Sludge recycling unit

Dimensions and Weight

Housing	IP 54
Dimensions	W 640 x H 965 x D 580 mm
Weight	90 kg approx.

Electric and Hydraulic Specifications

Inflow and Outflow	30 mm ID tube or threaded, 32 mm OD or as specified
Power Supply	230 / 115 V~, 50 / 60 Hz, 100 VA
Analogue Output	0/4-20 mA
Serial Interface	RS 232, Combined alarms, Life-Zero, USB 2.0
Remote Control	Through TCP/IP Protocol (Internet)

Equipment Devices and Data Output

High resolution and back-lit TFT touch screen graphic display, 10,4"
Autostart function
Self-explanatory software and service checklist
Standard data interfaces, e. g. office PC

ALL cLeAR?

LAR Process Analysers AG: Water is our Element.
We do everything for its protection.

We are the leading manufacturer of water analysers for industrial and municipal waste water treatment, process monitoring, as well as for pure water analysis. Further products in the areas of environmental technology and industrial processing complete our product portfolio.

Unique and state of the art.

LAR's Ultra High Temperature Method at 1,200°C!

LAR formed in 1986, gained prominence through their TOC and COD analysers. LAR is the only company worldwide that, using a high temperature method at 1,200°C, can completely oxidise a sample to accurately determine sum parameters. Particularly when measuring the TRUE TOC with differing concentrations.

LAR is only satisfied once the customer is.

We offer application specific analysers developed by our research and development team. In addition, we maintain close contact with our clients and continually analyse the exact problem areas of every application.

Since the availability of our devices is a deciding criteria, they are constructed in a very user-friendly way. All important areas require little effort

to be accessed and the protective housing offers additional safety.

After Sales. A familiar word to us.

Servicing is carried out by our qualified partners worldwide. Technical support, via telephone or e-mail is available at all times. Additionally, we offer practically orientated seminars and trainings, operator meetings and workshops, that leave no questions unanswered.

We always take a closer look.

Setting ourselves the highest quality standards, we closely cooperate with our partners to fulfill the customers expectations throughout the world. Thus, we regularly evaluate our distributors and when necessary, introduce measures to improve our collaboration with them.

LAR has established its own system for guaranteeing its standards of quality. Not only do we fulfill the requirements of the ISO 9001, but we also work continually on improving our standards of quality. To enable this, we collect information about all applications in our database that are subsequently analysed and evaluated. Regular meetings are held to address every issue guaranteeing highest quality standards.

TOC-ANALYSIS



From complex industry waster water to phama-ceutical pure water, our TOC analysers determine the parameter quickly and precisely.

COD-ANALYSIS



With our analysers, the chemical oxygen demand is cleanly and safely determined online, without using hazardous chemicals.

BOD/ TOXICITY



We detect the BOD with the plant's own bio-mass and determine the BOD-Analysis with highly sensitive bacteria, fast and reliably.

TN_b/ TP-ANALYSIS



TN_b and TP are important parameters for waste water treatment. We are the only ones who offer a combination of these with TOC and COD in one system.

FURTHER PRODUCTS



LAR offers a specific solution for nearly all applications. With our protective housings, you are always on the safer side. Learn more about our product range at www.lar.com.

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TÜV-certified Company

BOD-ANALYSIS

BioMonitor

AREAS OF APPLICATION

ENVIRONMENT / MUNICIPAL FACILITIES / INDUSTRY

INDUSTRIES

ENVIRONMENTAL MONITORING / WASTE WATER TREATMENT /
WASTE PROCESSING / PHARMACEUTICAL / LABORATORY /
PETROCHEMICAL / REFINERIES / CHEMICAL / COAL AND STEEL /
POWER / AIRPORTS / AUTOMOBILE / BREWERIES / BEVERAGE /
PAPER MANUFACTURE / FOOD MANUFACTURE / MILK PROCESS-
ING / SEMICONDUCTOR MANUFACTURE

TYPES OF WATER

GROUNDWATER / SURFACE WATER / DRINKING WATER /
WATER INFLUENT / WATER EFFLUENT / DISCHARGE CONTROL /
INDUSTRIAL WASTE WATER / DE-ICING WATER / PROCESS
WATER / HIGH SALT CONCENTRATION / OIL-IN-WATER / COOLING
WATER / PURE WATER / BOILER FEED WATER / CONDENSATE
RETURN / PHARMA HPW / PHARMA WFI / SEMICONDUCTOR UPW