NitriTox

TOXICITY

Online Toximeter that protects the biology of waste water treatment plants.
Especially the nitrification process.

Fast. Safe. Simple.

PROTECTING BIOLOGICAL TREATMENT PROCESSES.

Nitrification is one of the most important aspects of modern waste water treatment and highly sensitive to a variety of pollutants.

Nitrification is the stage in biological waste water treatment where certain bacteria oxidise ammonium to nitrate. These bacteria are called nitrifiers. Due to their high sensitivity peak loads can affect them very easily. Toxicity is the most common disturbance to this important treatment process.

A failure within the nitrification not only leads to a breakdown of treatment processes, but can cause an increased discharge of ammonia into rivers and lakes causing fish to die. The fast and reliable monitoring of incoming loads for toxicity warns of the danger in time, helping to protect the biological treatment processes. Additional pollution of public water and high discharge fees are prevented.

Protection through rapid monitoring.
Safe at all times.

Usually, unknown pollutants are determined by laboratory tests at waste water treatment plants. However, the costs for such tests are high. Since the results are only available after a number of hours or even days it is far too late to take countermeasures. In the case that the nitrification process is affected it may even take weeks until the biomass has regenerated again.

An online toximeter that is able to test at any time using a permanently self regenerating culture of highly sensitive biomass can be used as a early-warning system.
By using nitrifiers, the bacteria which are to be mo-

Rapid monitoring of toxicity is of great importance for the protection of biological waste water treatment processes.

nitored within the treatment precesses, the plant operators gain an immediate impression about the potential effects of the incoming loads.

Last but not least, reproducibility and reliability are deciding factors: The culture of nitrifiers within the breeding pond must not be affected by toxic substances, not even when toxic effectes are detected.

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What Toxicity is and how it is determined.

Toxicity is described as the direct harmful effect of a substance on organisms. These effects can already occur at low concentraions of toxic substances and are dependent on the incubation period and the dosage.

Some test methods that are available on the market can detect toxicity. They do not, however, identify exactly which toxins are present. By using fish, daphnia, molluscs, algae or luminous bacteria, they test whether a water sample has a toxic effect on the organisms.

The problems with the methods: Many organisms are difficult to attain and cultivate. For example, daphnia can be cultivated in a laboratory, but are only suitable for testing at a particular point in their lifespan. Moreover, many of the organisms named are not sensitive enough to be used for testing, or they are only sensitive to particular substances. Algae react strongly to pesticides, for example, but do not, unfortunately, react so strongly to other substances.

Additionally, organisms can develop a tolerance to toxins, which of course falsifies the test results. Just as problematic are long incubation times because of slow reactions to pollutants.

Once a toxin appears, the whole measurement system is often impaired, meaning that the complete replacement of the test organisms is necessary. As a consequence, these methods have a limited suitability for continuous online monitoring.

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The answer from LAR: An online measurement method with an pre-warning system.

With 25 years experience in the field of water analysis, LAR has developed an online method that considerably reduces cost, maintenance and operational expenditure: NitriTox. This measurement system contains a highly sensitive, self-regenerating bacteria culture, which can be continuously used to test the toxicity in water samples within 5 minute intervals.

The NitriTox is used in municipal and industrial waste water treatment plants in order to monitor the toxicity of incoming waste water. Even high amounts of particulate matter such as in the pulp and paper industry do not affect its operation. The toximeter is also applicable for laboratory use as it is ready at all times and reliably measures the toxic effects of waste water on the biomass. The determination is in accordance to DIN EN ISO 9509:2006.

On the following pages, you will read about the many advantages of NitriTox and its simple operation.

AT A GLANCE

- Nitrification is highly sensitive to pollutants.

- The biomass can be protected from toxins within the incoming loads.

- An early-warning system helps.

- Fast and reproducable methods are necessary.

- Previous test methods have had limited suitability for online monitoring.

- NitriTox is able to make tests at all times.

THE ANALYSER .

We have something against water pollution: NitriTox.
The early-warning system.

No more 'should haves, would haves, could haves''. NitriTox warns you in good time.
With the NitriTox, measurements can be taken within 5 minute intervals. Thus allowing enough time to introduce countermeasures after the occurance of pollution. What's more, the NitriTox offers three warning levels, which can be individually set.

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The bacteria are self-reproducing.
In this case a huge advantage.
NitriTox contains a bacteria culture (nitrifiers), which constantly and independently produces biomass. This means that there is enough bacteria at all times for each new measurement. As every water sample is tested with a fresh amount of bacteria, the risk of the fermenter being contaminated is removed (↗Fig.1). Subsequently, the measurement cell is rinsed out with a cleaning solution so the memory-effect, the falsification of test results through remaining traces from previous measurements, are prevented.

Any toxic event can be followed with NitriTox from start to finish, without interference to the test or-

ganisms through the appearance of a high level toxicity. Not only can the appearance of harmful substances be determined, but the decrease in the toxicity concentration can also be identified.

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Robust Analyser. Sensitive test organisms.
The bacteria are extremely sensitive to a multitude of toxins. Through their reaction to the harmful substances in the water sample, toxicity can be reliably determined. For example, with phenols a reaction already starts at a concentration of less than 0.10 mg/litre.

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Reduced maintenance. No further purchase necessary.
Firstly, it is not necessary to purchase or cultivate test organisms, such as fish or daphnia, externally. Secondly, the analyser is extremely low in maintenance because the bacteria mass constantly proliferates on its own for months at a time. Its only requirement is the feeding of a nutritional solution every two weeks.

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With its sensitive touch screen NitriTox responds to your needs.
By way of its touch screen, the NitriTox is comfortable and easy to operate. With a 10.4" character size display, the measurement results are optimally presented. Of course, they can also be transferred to a PC. Moreover, the analyser can be controlled by remote.

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

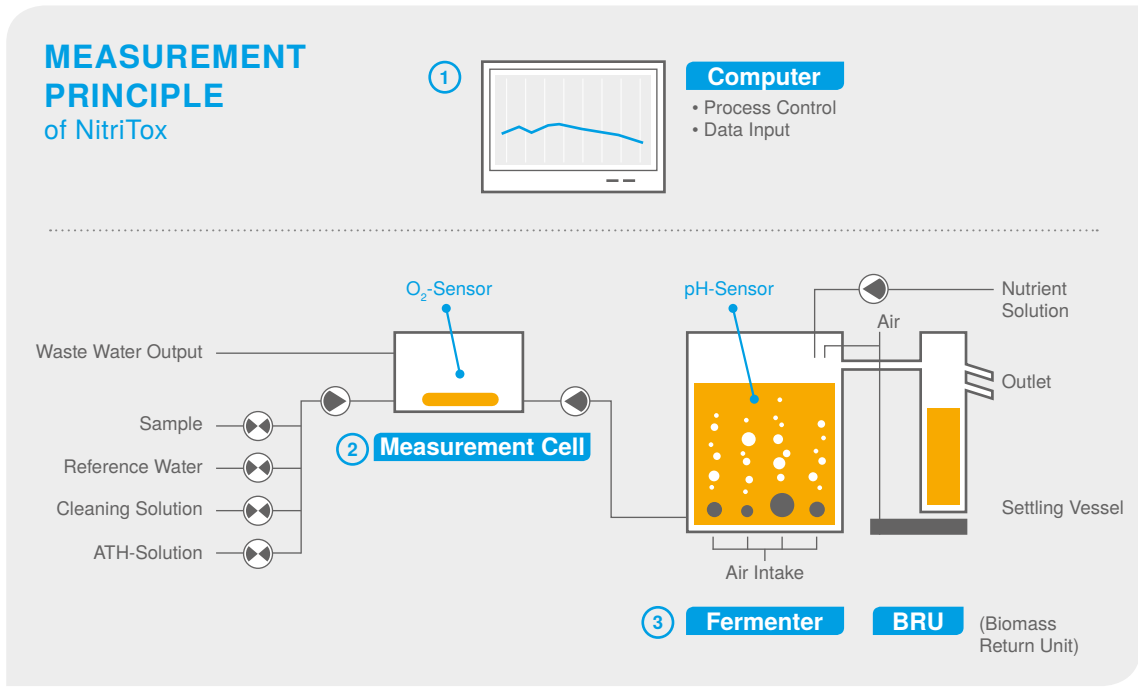The separated compartments are easily accessible.

MEASUREMENT PRINCIPLE
of NitriTox

① Computer
• Process Control
• Data Input

O₂-Sensor

pH-Sensor

Nutrient Solution

Air

Waste Water Output

Sample

Reference Water

Cleaning Solution

ATH-Solution

② Measurement Cell

Outlet

Settling Vessel

Air Intake

③ Fermenter   BRU   (Biomass Return Unit)

Fig. 1

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

2) Sample intake and feed of nitrifiers-consumption rate measurement

3) Constantly self-regenerating bacteria culture

THE PRINCIPLE.

Actually it runs by itself.
Nevertheless, we are happy to explain it.

The nitrification respiration inhibition test.
Simpler than its name.

The bacteria live on (consume) oxygen from the conversion of ammonia into nitrate, which is why they are described as nitrifiers. ToxAlarm measures this oxygen consumption. Toxic substances in the sample contents can inhibit the respiration of the bacteria, which leads to a lowering of the oxygen consumption. Thereby the nitrifiers' oxygen consumption enables us to draw conclusion about the toxicity of a sample.
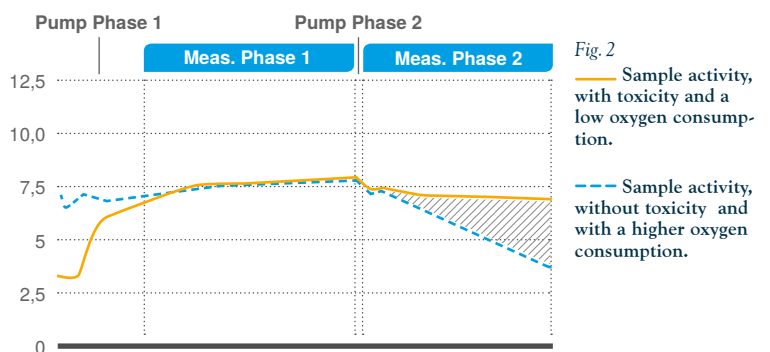
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The construction. Memory-effect removed.

The container for the biomass (fermenter) is separated from the measuring cell (↗ Fig.1). Thus, the Biomass cannot be contaminated by the sample. Furthermore, the analyser has an extremely user-friendly construction, so that without much effort, all areas within the analyser are accessible. The electrics are optimally isolated from the wet chemical area

The measurement process. In less than 5 minutes.

In the first phase, the sample is pumped into the measurement cell, which is followed by the measurement of its consumption rate. Microorganisms which are insensitive to harmful substances could already be present in the sample and affect the oxygen consumption. The actual toxicity measurement, which follows thereafter, is based on the initial oxygen concentration. Therefore, in the second phase, a small amount of bacteria is added and the oxygen consumption is measured anew.

At a higher rate of consumption, the curve sinks noticeably, which means that there is no toxicity in the sample (↓ Fig. 2). In contrast, a flatter curve shows the bacteria to have consumed only a small amount of oxygen. Hence, the inhibition in their respiration. This indicates that toxins are present in the sample.

Fig. 2

— Sample activity, with toxicity and a low oxygen consumption.

--- Sample activity, without toxicity and with a higher oxygen consumption.

NitriTox AN OVERVIEW

Online Toximeter for the protection of the biological waste water treatment.

NitriTox continually checks incoming waste water for pollutants. Additionally, the reaction of highly sensitive nitrifiers to potential toxins in water is determined and that within an measurement interval of just 5 minutes.

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**Highly sensitive bacteria
in a robust analyser.**

ADVANTAGES AND FEATURES

✓ continuous monitoring of toxicity

✓ self-regenerating bacteria within the analyser

✓ response time in less than 5 minutes

✓ highly sensitive bacteria

✓ no memory-effects

✓ low operational costs

✓ high reproducibility

✓ low maintenance

✓ no purchase of test organisms necessary

TECHNICAL DATA

Measurement Technique and Sample Preparation

Measurement Method	Determination of toxicity through the measurement of oxygen conversion
Bacteria Culture	Nitrifiers
Measurement Range	0–100 % Toxicity
Response Time	5-10 Minutes (application dependent)
Sample Preparation	Maintenance-free particle cutter

Dimensions and Weight

Housing	IP 54
Option	Stainless Steel, IP65 (further on request)
Dimensions	W 630 x H 965/1265 x D 580 mm
Weight	70 kg approx.

Electric and Hydraulic Specifications

Inflow and Outflow	20 mm ID tube, 6 x 1 mm and 4 x 1 mm
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
Remote Control	TCP/IP Protocol (Internet) (option)

Equipment Devices and Data Output

High resolution and backlit 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.

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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.

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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.

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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.

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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	COD-ANALYSIS	BOD/TOXICITY	TN$_b$/TP-ANALYSIS	FURTHER PRODUCTS
From complex industry waster water to phamaceutical pure water, our TOC analysers determine the parameter quickly and precisely.	With our analysers, the chemical oxygen demand is cleanly and safely determined online, without using hazardous chemicals.	We detect the BOD with the plant's own biomass and determine the toxicity with highly sensitive bacteria, fast and reliably.	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.	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.**

TOXICITY

NitriTox

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