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# STIP Toximeter Applications

***Abstract***

In the following I would like to present two success stories of STIP Toximeter STIPTOX Adapt (W) applications in Switzerland. The flexibility of STIP analyzers allows to use these for applications from highly contaminated industrial waste water up to cooling water and river monitoring without appearing of any natural substrate.

A relatively good knowledge of the analyzers is needed to make the most of all possibilities and also a relatively good understanding of biological/chemical reactions to install successful applications. All applications need a three months starting time until it is possible to use them in everyday business.

Regarding sales aspects as well, a 3 months test period is nearly imperative as each customer is primarily interested to achieve certainty of proper functioning of his application. During this trial operation, the STIP representative has to give a strong support for making a successful deal at last.

## *STIP Toximeter Application 1*

1) The measuring site's specific characters

   A chemical plant (production of dyes) is constantly collecting the waste water in several 15 $m^3$ collecting tanks. Previous to the diversion of this batch to the WWTP the content has to be tested on TOC, pH and once more on toxicity. Copper salts, resulting from the dyes production, are the probable toxicity. The average volume of waste water per day is between 100 and 200 $m^3$, which corresponds to approximately 6 to 15 batches per day. At a level of 80 % in the tank analysis is automatically carried out. For that 12 minutes are at one's disposal. After 12 minutes it will be decided according to the analysis, if the diversion of the tank will be to treatment plant or to storage basins. During this period a $2^{nd}$ tank is filled and a $3^{rd}$ one is available as stand-by.

2) Integration of the STIP toximeter into application 1

   As in this case a continuous measurement is not possible the STIPTOX is principally operated with an artificial substrate (STIP recipe). In the cycle of diversion of the tank the STIPTOX is supplied with pre-neutralized wastewater (pH 5.5) during 12 minutes. Here the respiration curve shows no – a low – a massive inhibition of respiration (toxicity). The TOC-concentration of the wastewater is between 3'000 and 10'000 mg/l.

The adjustments of the toximeter are approx. QP1 60 ml/min, QP total 500 ml/min, permanent dose of substrate (concentration according STIP recipe) about 1000 ml per day (as per STIP dosing pump).

As the cycles are relatively regular (6 to 15 measuring cycles per day) it is not necessary to dose apart from the glucose substrates additional wastewater portions. By the dilution with freshwater the pH-value of 5.5 of the pre-neutralization of the wastewater sample becomes harmless with reference to the biology. To avoid the precipitation of the copper load the pH-value is controlled at 5.5.

Under these circumstances copper loads from approx. 40 mg/l are of slight – from approx. 60-70 mg/l of medium – from 100 mg/l of heavy toxicity.

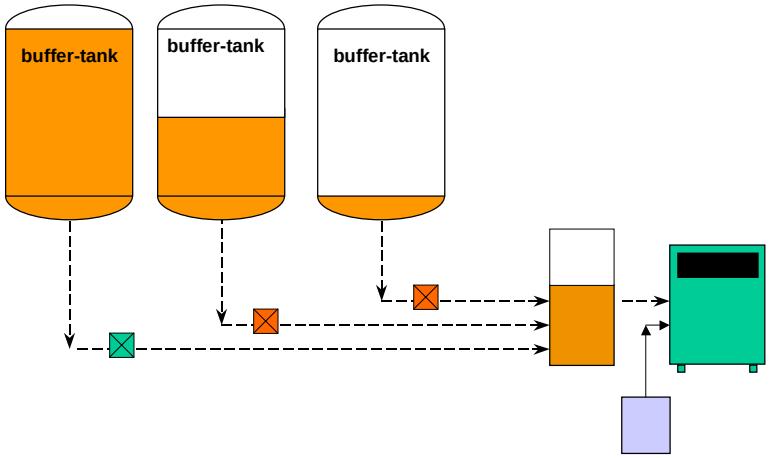
*Experimental:*
The inhibition of respiration decreases more and more after repeated copper doses of 70 mg/l. Due to this the set toxicity alert limit will not be reached within 8 hours after more than 5 copper doses. The biology recovers after 24 hours.

3) Operational results (application 1)

Compared with the LAR analyzer, which was installed at the same site for testing during the 3 months test period, the STIPTOX has shown a high performance by error free operation. The toxicity tests (70 mg/l copper) up to 3 times per day gave alarm.

*Difficulties were:*
To find the optimized adjustments, which on the one hand had to take into consideration the biological requirements (feeding) and on the other hand the irregular measuring cycles (6-15 per day). Another difficulty was to explain to the operating authority, that for its purpose a specific adjustment, which could not be found in a file of a manual, had to be found. All measurements of the customer known up to now have been physical parameter as TOC, pH etc. and therefore are not under discussion. In contrast toximetry as biological parameter could result to endless discussions, if the pro- arguments are not selected carefully. In addition to this as well the operators of the analyzers and their superiors have constantly to be provided with information.

# Toxicity measurement : industrial wastewater




## Process Analyzer for Toxicity
## Type STIPTOX-adapt

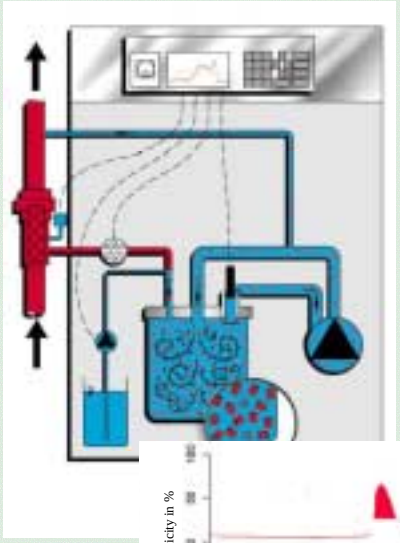
- true continuous
- response time 3-15 minutes
- measuring range 0-100% toxicity
- sample preparation with automatically self-cleaning coarse filter
- automatic calibration
- limit value alarms
- signal outputs for control
- charts and current toxicity level displayed on LCD graphic display

# Process Analyzer for Toxicity
# Type STIPTOX-adapt-W

**As with the BIOX-1010, the microbes grow on the inner surface of small hollow cylinders. They take up the dissolved oxygen almost completely.**

**A toxic impact inhibits the biomass respiration and hence the amount of oxygen in the biomass increases.**

**Automatic dilution of the toxic sample is activated when the reduction of respiration exceeds about 20%. The dilution is adjusted that the reduction in biological activity does not exceed 20% in case of a toxic impact.**



**The toxicity is calculated from the mixing ratio of waste water and dilution water and the oxygen uptake.**

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***STIP Toximeter application 2***

1) The measuring site's specific characters

In a chemical plant (intermediate chemical and agro-chemical products) wants to monitor the cooling water toxicity before the water returns into the river (Rhône) regarding TOC, conductivity, pH and turbidity. In this application the STIPTOX replaces a 20 year old fish-tox-monitor.

2) Integration of the STIP TOX into application 2

The STIPTOX has to be fed with a glucose solution (recipe by STIP) as there substrate is missing in the cooling water sample. To indicate toxicity of a copper (>5 mg/l Cu) a 400 ml/min sample volume must be injected in to the BIO reactor chamber. This is done via a pump using 2 tubings and a reinforced peristaltic pump gear. A tube heating device, installed at the inlet, is pre heating the large amount of sample at 28 °C). The cover of the BIO reactor is made of SS instead of copper to avoid the contamination by copper caused by the system.
Caused by the seasonal microsediment load of the cooling water stream a continuous micro-filtration 10 µm has to be superposed.

3) Operational result (application 2)

After a 3 months adaption period the STIPTOX replace the fish toximeter.

The modifications on the STIPTOX are resulting out of the necessary optimizations to be in the position to execute a continuously dosing of large samples. It is obvious to include the customer in this process of modification. A lot of time is needed to clarify all these necessities. This shows once more that a discussion about toxicity has to be led with strong arguments from us STIP dealers. Here I put the focus especially on avoiding an endless arguing and as well on being open for all ifs and buts.

An on-line micro-friltration (Inducon), which is imperative for this sampling, is used.

This application is into service now since 3 years. 2 times a year a large maintenance is made by our service stuff. The Daily / weekly maintenance work is done by the customer it self. There are approximately 3 to 4 TOX alarms per year. The grade of toxicity is relatively low and corresponds with < 5 mg/l Cu.

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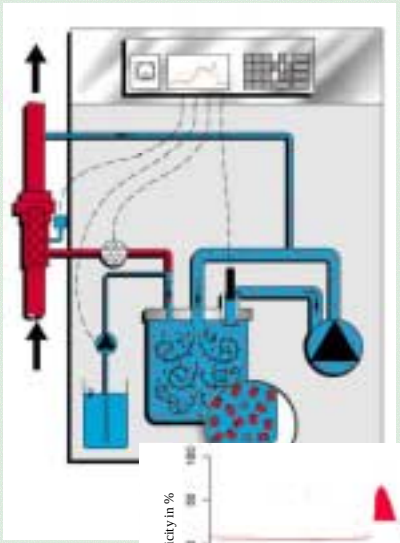

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