



QuickTOCcondensate

TOC-ANALYSIS

Online TOC for steam and condensate circuits. Analysing hot samples accurately.

Precise. Fast. Reliable.



THE MEASUREMENT SYSTEM FOR HOT WATER.

Organic loads in hot water like condensate return may - under pressure - convert to carbonic acid or other acidic substances, which in turn may cause corrosion and deposits. Hence, the TOC should be as low as possible.



— An analyser shelter with three heat exchangers. Mainly, the TOC is monitored directly downstream to the heat exchangers in order to detect promptly any product spills or leakages.

Acidic substances such as carbonic acid cause corrosion and sedimentation within boiler systems. Additionally, foaming and layers have to be avoided or kept as small as possible as they will disturb the efficient operation of the boiler. The continuous monitoring of any organic impurities is essential for the economic and safe operation. At high boiler pressure the TOC content may be between 10 to 500 ppb.

— **Letting off steam may be expensive. It is pure energy.**

In power plants and related industries water-steam cycles are used to generate electricity. The water or steam that is used for that, is very hot and, therefore, additionally can be reused for other processes. Using this thermal energy further is an enormous advantage as it saves the costs for the warming up process. Hence, the medium pressure steam as well as the low pressure steam flows through many heat exchangers where all kinds of liquids such as

oils and chemicals are heated up. In the case of contamination caused by leakage or product spills, organic substances will enter the system. The polluted condensate has to be drained off and the backfeed of costly treated make-up water into the circuit will be necessary. If the contamination is too serious, the plant will be shut down.

In the event of any contamination the operators need to act fast. By using quick online analysers that deliver accurate and reliable measurement results, expensive hot water and steam losses will be minimized.

— **What TOC means and how it is measured.**

A whole variety of organic matter can be present in water, which cannot be determined individually. At least not without considerable analytical effort and within a short time. This is why the so-called sum parameter TOC (total organic carbon) is used.

At 1,200°C,
water samples
are completely
and precisely
analysed.

It measures a samples organic loads and is thus an important indicator for water quality.

The TOC content is best detected by using the difference method. Through a combustion at 1,200°C all organic and inorganic carbon bonds are oxidised, producing CO₂ which can then be detected and quantitatively measured. As an intermediate value the total carbon (TC) of the sample is given. Finally, a separate analysis of the inorganic carbon (TIC) takes place. The TIC value is subtracted from the TC value. The result being the organic carbon, TOC (Fig. 1).

TC measurement. Quickly and beneficial.

Inorganic carbon (carbonate) reacts in the boiler and forms to carbonic acid that causes corrosion in boilers, pipes, and heat exchangers. Monitoring the TC content includes the TIC and minimizes the risk. Furthermore, the measurement of TC takes only 1 minute, and hence, a fast and reliable monitoring of pure water is guaranteed.

Exact Analysis.

At 1,200°C, the TRUE TO C is determined.

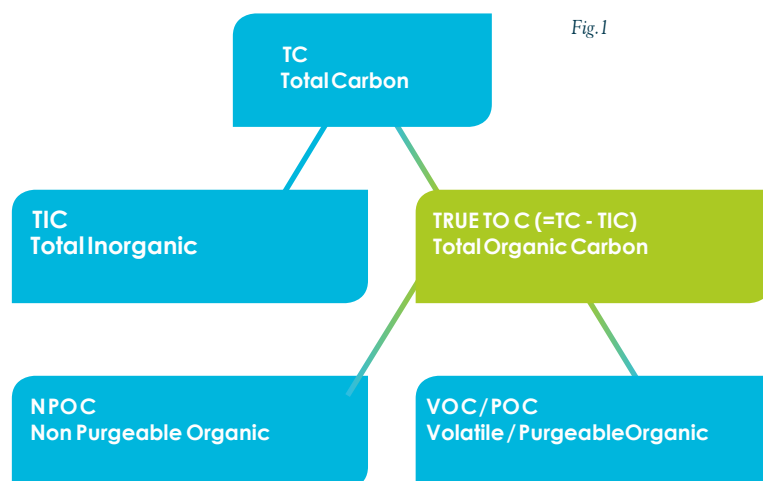
Vital to this method: For an exact TOC measurement all carbon bonds must be reliably combusted. Using a temperature of 1,200°C, LAR Process Analysers AG have developed a high temperature method which makes this possible! This temperature was chosen due to the proven fact that a complete oxidation of a sample cannot occur at temperatures below this: For example, the carbon bonds of carbonates only break fully when reaching a combustion temperature of 1,200°C. Basically, the lower temperatures deliver less exact measurement results. For this reason, to distinguish ourselves from these other methods, we at LAR talk of the TRUE TOC.

Catalysts.

For our analysers simply not necessary.

Because of their high temperatures our analysers do not need any catalysts. These are only necessary for the low temperature catalytic "high temperature" oxidation (680 – 1,100°C) to support the oxidation of the carbon bonds. However, the performance of the catalysts is lowered over time. This affects the measurement results, necessitates continual new calibration and eventually requires that the catalysts are replaced. We want to save you the trouble: With the QuickTOC_{condensate}.

What is the TRUE TO C derived from ? And what is it composed of?



AT A GLANCE

- Organic contamination may cause corrosion, deposits, and coatings in water-steam circuits.
- Steam is an effective heat energy carrier that is reused in many industrial processes.
- A TOC analyser has to determine smallest impurities fast and reliably.
- Samples should be analysed with temperatures up to 90°C without any cooling processes.
- Losses of heat and energy should be reduced considerably.

THE ANALYSER.

A hot oven: Where temperature makes the difference.

Warm, warmer, hot.

Tracking pollution at 1,200°C.

The catalyst-free ceramic oven is the centre piece of the QuickTOC_{condensate}. At 1,200°C, it reliably dissolves all carbon bonds and thus enables a complete analysis of samples. Despite the high temperatures used, absolute safety is guaranteed in all settings. For this end, the QuickTOC_{condensate} can be delivered with a number of different housings, depending on the intended location. That way the analyser itself can be safely at high corrosive places as well as in Ex-Zones.

The determination is in accordance to DIN EN 1484:1997-08, ISO 8245:1999-03 and EPA 415.1.

The building blocks principle for a tailor made measurement instrument.

The modular system offers high flexibility. When your application demands it, you can measure

up to six different sample streams with one machine for example. Each sample stream is individually lead into the analyser in order to avoid cross contamination. Furthermore, you may build in additional detectors to determine the TNb and COD parameters.

The QuickTOC_{condensate}.

Ultra quick measurements and maintenance.

The TRUE TOC measurement takes place in less than 3 minutes. The TRUE TC is measured even in one minute. The TC is particularly advantageous if a high proportion of TIC is present. This speed guarantees that very short peaks can be determined very well during a daily cycle. The maintenance service is also fast: Less than half an hour per month. The analyser's availability is over 98%.

Calibration and validation. Ready at any time.

With the patented calibration and validation technique QuickCalibration LAR offers the opportunity to check the analyser automatically and remotely at any time. Another benefit: No need of liquid standards, that must be produced or purchased expensively. In combination with the 1,200 °C oxidation LAR uses a defined gas. Such a test gas is stable for a long time and cost efficient. Thus, you can find out easily whether your analyser works correctly.

Who is allowed to do what?

It's up to you to decide.

Through separately programmable user access levels, you can assign access rights to individual operators. With a 10.4 inch touch screen, the QuickTOC_{condensate} is easy to operate. Another option would be to control the analyser via remote control using a PC, which is connected to your network.

With the QuickTOC_{condensate} the analytical area is isolated from the electronics.

All areas are easily accessible.



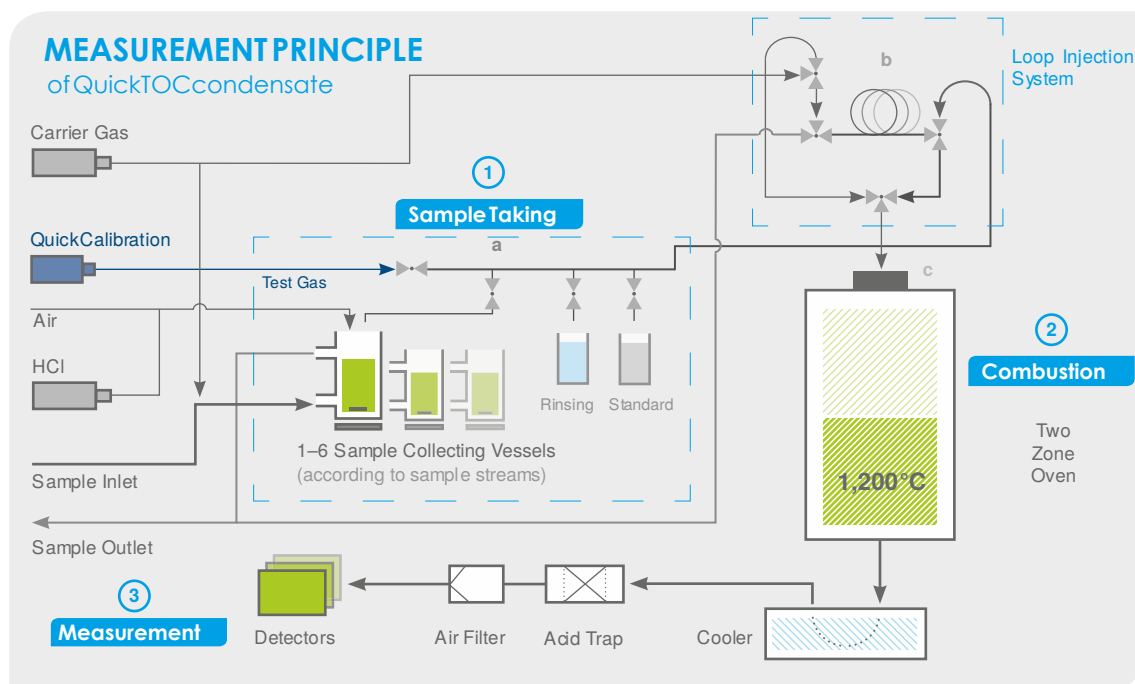


Fig.2

- 1) Sample transportation via injection loop
 - a) Extraction of sample from sample stream
 - b) Definition of sample volume
 - c) Injection through lock valve
- 2) Combustion, oxidation to CO₂
- 3) Measurement of CO₂ concentration

THE PRINCIPLE.

The measurement is precise, even in the purest water.

The loop injection.

For clean sample dosing.

The loop injection of the QuickTOC_{condensate} is a closed system and hence, protected against environmental influences and other impurities. Small, defined sample volumes are injected to the carrier gas stream, that continuously flows through the high temperature oven.

Depending on the expected load of the respected application, various injection volumina between 200 and 400 µl are available. At a very low concentration the multi loop injection can be used, in which a defined sample volume is injected multiple times into the oven. Thus, the load is determined accurately even in the lowest µg-ranges.

Inside of the ceramic oven: We like it hot.

And it is that hot, that - without catalysts - the sample's content of organic and inorganic carbon is completely converted into CO₂. It is oxidised by use of a carrier gas that is supplied by filtered pressurized air. Optionally, the

QuickTOC_{condensate} can prepare the gas itself requiring no extra external gas supply at all. With LAR's oxidation method lowest measurement ranges of TOC, TC and TNb are reliably detected.

Difference or direct.

The measurement task defines the method.

Generally, in low TOC ranges the direct method is the preferred analyses method. Here, the sample is transferred to a sample vessel, in which a weak acid is added as required. As a result, the demand for acid of the QuickTOC_{condensate} has been minimized considerably. The sample mixture is stripped with air, and the inorganic matter are removed from the sample. Finally, the stripped sample is fed into the oven through the injection loop and the organic content of the sample is thermally oxidized and detected.

If volatile organic carbons (VOC) have to be considered, then the TOC difference method can be used. The decisive advantage of the QuickTOC_{condensate}: Due to the closed loop system the VOC and POC (purgeable organic carbon) will be determined reliably.

The CO₂ detection. Reliable and simple.

First the gas that is produced by the combustion

condenses in the cooler. The remaining combustion gas is purified by a filter before its CO₂ concentration is determined.

QuickCalibration.

No expensive standards anymore.

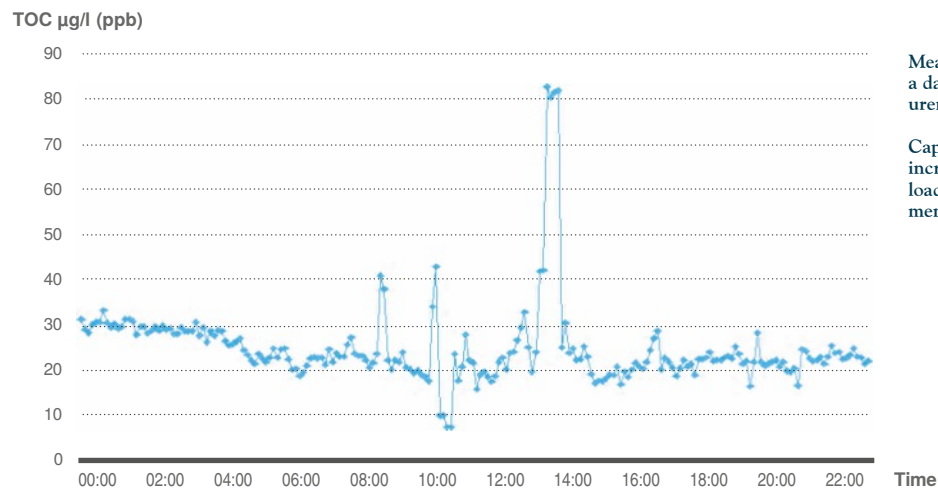
Common calibration and validation methods require liquid standards whose concentration ranges are lower than those of conventional drinking water. Therefore, they are only short-term durable and can be produced or purchased only with great effort. In particular, the QuickCalibration provides a ready at any time fully automatic validation of the system using a defined gas. Such a test gas is stable for a long time and is ideal for automatic

calibrations. However, the innovative method enables the use of liquid standards too. A contamination of the sample in the loop system is technically impossible.

Clean. Even at complex samples.

The QuickTOC_{condensate} is equipped with a rinsing solution that is lead into the loop system via a special valve when needed. Hence, the loop injection system and the oven can be cleaned before and/ or after each measurement. Salts and adhesive materials are thoroughly removed and potential carry over effects of previous measurements are eliminated.

Fig.3



Measurement peaks during a daily cycle with a measurement cycle of 3 minutes.

Capturing the rapid increases and decreases of load accurately and without memory effects.

ALL c^{Le}LAR?

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

We are the leading provider for water analysis instruments for industrial and communal waste water technology, process monitoring, as well as for pure water analysis. Further products in the areas of industrial process and environmental technology complete our product range.

LAR offers application specific analysers which are developed by its our research and development team. Maintenance is carried out globally by our own technicians or by our local qualified service partners. Technical support per telephone or e-mail is available at all times.

TOC-ANALYSIS

From complex industry waste water to pharmaceutical pure water, our TOC analysers determine parameters quickly and precisely.

COD-ANALYSIS

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

BOD/TOXICITY

We detect the BOD with the plant's own biomass and determine the toxicity 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 them in combination 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. Find out more: www.lar.com

QuickTOC_{condensate} AN OVERVIEW

Online TOC for pure water – especially for hot water circuits.

QuickTOC_{condensate} continually checks the TOC content of pure water with lowest concentrations, whereby the sample temperature may be up to 90°C. At 1,200 °C, samples are completely oxidised and within only a few minutes the TRUE TOC is determined.

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TECHNICAL DATA

Measurement Technique and Sample Preparation

Measurement Method	Thermal oxidation
Measurement Ranges	0.1–20 mg/l (ppm); 1–2,000 µg/l (ppb) further options available
Parameter	Combinable with COD and TNb
Response Time TC	1 minute
Calibration Type	Multi point calibration
Calibration/ Validation	QuickCalibration

Dimensions and Weight

Housing	Steel IP 54, powder coated
Options	Stainless steel, IP 65, ATEX Zone 1 and 2 for T3 and T4 classes
Dimensions	700 x 1.020 x 520 mm (W x H x D)
Weight	115 kg (Standard)

Electric and Hydraulic Specifications

Inflow and Outflow	Tube 4,8mm ID
Power Supply	230/115 V~, 50/60 Hz
Analogue Output	0/4–20 mA
Serial Interface	RS232
Safety	10 A intern, 16 A external
Remote Control	option: via TCP/IP protocol (Internet)

Equipment Devices and Data Output

TFT Touchscreen-Graphic-Display, 10,4", high resolution, back lit

Autostart function

Self explanatory software

Standard data interfaces to office PC (USB)



Fast, precise and safe –
the QuickTOC_{condensate}
is reliable even in
hazardous areas!



ADVANTAGES & FEATURES

- ✓ exact determination of TC, TOC (TRUE TOC), TIC, TNb
- ✓ highest combustion temperature available (1,200°C)
- ✓ catalyst-free
- ✓ calibration and validation at any time
- ✓ samples with up to 90°C possible
- ✓ multi-stream measurement (optional)
- ✓ programmable operator access level
- ✓ Ex-proof housings (optional)
- ✓ analyser availability minim. 98%
- ✓ maintenance and service max. 30 min/ month
- ✓ exceptionally low maintenance and operational costs

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TÜV certified company

TOC-ANALYSIS

QuickTOC_{condensate}

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** / **PAPER MANUFACTURE** / **BREWERIES** / **FOOD MANUFACTURE** / **DRINK MANUFACTURE** / **MILK PROCESSING**

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**



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