

Multi-purpose Respirometer

BM-T+ is a easily transportable respirometer, specially developed for practical and efficient biological wastewater treatment management and research



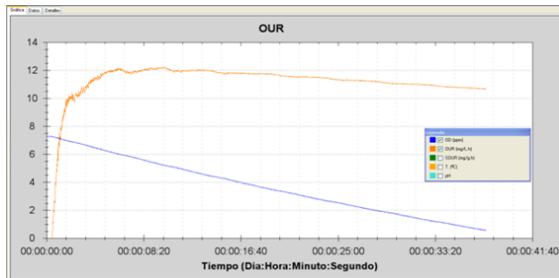
Main features

- Compact analyzer, with very low maintenance and user friendly operation
- Direct oxygen measurements from a *maintenance-free* oxygen sensor
- No oxygenation restriction during test performance
- Full control and results by means a powerful software already loaded in the PC of the system
- Automatic software update versions from internet
- Capacity for test conditions setting and modify them throughout the test performance.
- Automatic measurements: OUR, SOUR, bCOD, rbCOD, sbCOD, U (COD utilization rate) and q (specific U)
- Last, minimum, maximum and moving average results throughout any moment of the test
- Several results at any time during the test and possibility to see them simultaneously on tabular or graphic modes
- Option to open several stored tests and compare their results
- Automatic temperature control by means an external peltier-heating device.
- Package of measurements at any moment during test performance
- Capacity for different respirograms and simultaneous overlying
- BM respirometers measure data that can be directly input into modeling – simulating software
- Option for a special reactor assembly for moving beds bio-films (MBBR)
- Optional suitcases for easy transportation

Operation modes

OUR static

From a mixed-liquor of the aeration tank it is determined the OUR & SOUR within the time and section we have selected in the corresponding respirogram.



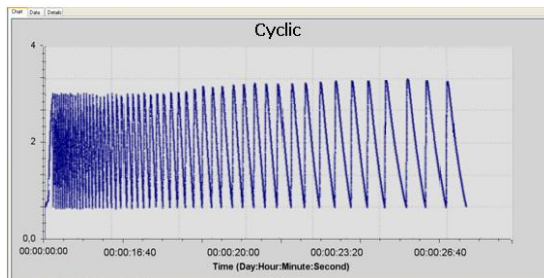
SOUR		
	- 1 -	- 2 -
Time:	1238	2243
OD:	3,27	0,6
SOUR:	7,47	mg/g.h

OUR (mg/l.h) Total oxygen uptake rate from mixed-liquor.

SOUR (mg/g.h) Specific OUR

OUR cyclic

On this mode, the analyzer performs a respirogram within a programmed DO threshold and determines the corresponding **OUR & SOUR** in base of a continuous sequentially measurements.



Time	OUR (mg/L.h)	SOUR (mg/g.h)
00:00:53	4,08	2,27
00:00:54	4,67	2,59
00:00:55	4,58	2,54
00:00:56	4,5	2,5
00:00:57	4,42	2,46
00:00:58	4,97	2,76
00:00:59	4,88	2,71
00:01:00	4,8	2,67
00:01:01	4,72	2,62
00:01:02	5,23	2,91
00:01:03	5,14	2,86

R dynamic

A DO base line is fixed from an endogenous respiration activated sludge and then added a certain amount of sample to be analyzed. In the respirogram, continuous measurements of R_s are showed permitting the simultaneous and continuous determination of CO and bCOD. In this way we can track the values evolution along the time as an actual window of the substrate oxidation from activated sludge.

R_s (mg/l.h) Exogenous respiration rate corresponding to the substrate oxidation.

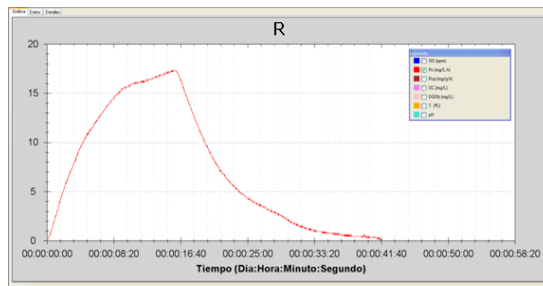
R_{sp} (mg/g.h) Specific R_s .

CO (mg/l) Consumed oxygen accumulated in the substrate oxidation (BOD_{st})

bCOD (mg/l) Biodegradable fraction of total COD (bCOD) or Readily biodegradable fraction of COD (rbCOD)

U (mg COD/l.h) Substrate utilization rate

q (COD/SS.d) Specific substrate utilization rate



Test		Entrada filtrada	Results
Name:			Select a data type from the list to view the results :
Operator:			DO (ppm)
Date:	6/11/2010		R_s (mg/L.h)
Baseline:	8.53 ppm		R_{sp} (mg/g.h)
Solids:	1.28 g/l		CO (mg/L)
Vr:	1150 ml		bCOD (mg/L)
Vm:	100 ml		pH
s:	2		
Y:	0.65		
Estimation:	0 mg/l		
Duration(hh:mm:ss):	00:01:03:36		
Remarks			
First value : 0			
Last value : 104.8			
Minimum : 0			
Maximum : 104.8			
Average : 51.43			

Typical applications

Oxygen requirement and energy optimization

Actual oxygen requirement for any specific process.

Optimal and minimum DO level in the aeration tank, without any detriment of the process efficiency.

Bioaugmentation control and tracking

By means the regular respiration rate measurement we can assess the result of the augmentation effect, to know if it is necessary to increase the dose of biomass and when it has reached its maximum effect.

COD fractioning

Automatic calculation of the COD biodegradable fraction (bCOD) or COD readily biodegradable (rbCOD)

BOD5 estimation

The software has the option to automatically estimate the BOD5 when the system is calibrated with three BOD standards and their corresponding consumed oxygen parameters (CO) measured in the respirometer.

Influence of the temperature, pH and oxygen and other conditions on the activated sludge process

Thanks to the capacity to set and modify the test conditions, we can analyze the influence of any of them (or any combination) in the biomass activity and figure out break-points, optimum and minimum working levels.

Operative parameter optimization

Loading rate (F/M), Sludge age (SRT) y Returned sludge rate (RR).

Nitrification

Nitrification rate (AUR), optimal DO range for nitrification, Necessary hydraulic time for ammonium-nitrogen removal, Nitrification capacity, minimum sludge age for nitrification (SRT_N)

Denitrification

Starting from the actual value of rbCOD, it is possible to determine the actual nitrate concentration that the process is capable to remove.

Starting from the specific respiration rate of the anoxic biomass, it is possible to estimate the corresponding denitrification rate (NUR)

Toxicity referred to one specific biomass

Fast screening qualitative test and by means of comparison of the actual respiration rates of one mixed-liquor prepared with the sample and another from one standard compound as reference.

Nutrients

Nutrients ratio calculation based on rbCOD / N / P.

Kinetic parameters

For heterotrophic and autotrophic biomass.

SBR

Aeration cycle control in SBR systems.

Biomass carrier (MBBR)

By making use of a special reactor we can calculate the total number of carriers per volume unit, Amount of oxygen needs to maintain the biomass carriers under optimal condition, COD and Ammonium removal capacity, and rest of same applications we can do in a normal activated sludge process

Support for simulation programs

Such as GPS-X, BioWin, ...

Others

BM-T+ respirometer is an open system and, as such, supports all kinds of combinations to step into an endless number of applications.

BM-T+ Technical specifications

Type	Optimized batch with closed recirculation.
Use	Laboratory.
Oxygen sensor	Maintenance free oxygen sensor. It is not necessary to replace neither membrane nor electrolyte
Measurements	Dissolved oxygen (OD) and Temperature. OUR & SOUR, Rs & Rsp, CO (Consumed Oxygen) and bCOD determinations. Calculation of U (Substrate utilization rate) and q (Specific U) Measurements visualization on tabular and graphical modes throughout the time. Overview of the results package at any time. Data acquisition interval setting. During the test, we get the last, minimum, maximum and average values.
Test files	Automatic generation of a security file just when the test is starting. Possibility to save any test under the own software format and/or Excel.
Operation modes	Static, Cyclic and Dynamic controlled by a specific software loaded in the PC of the system. Automatic respirograms generation throughout the test. Preset test conditions (T, DO, sample volume,...) and possibility to change them during its performance.
Aeration system	From a small air compressor and a ceramic diffuser. The air flow can be controlled by means the software for different percentages of air supply for a non limited time.
Respirograms	Automatic generation of graphic respiromgrams with the possibility to overlay them for comparison. Zoom application for total or partial periods. Option for simultaneous visualization of several data displays under tabular and/or graphic modes.
Partial measurements	During the test and to its finalization there is the option to get selective partial measurements from the values table or from any period that we can select in the respirogram.
Dynamic calibration	Only for R mode the measuring system is calibrated by means the reaction of a chemical standard in distilled water, where the total oxygen demand is already known.
Biomass-carrier reactor	Option for a special reactor for biomass carriers to get all respirometry applications for any MBBR process type.
MBBR reactor	Option for a special reactor assembly for moving beds bio-films (MBBR)
Option for ORP	Option to measure the ORP (Redox) – Consult to Surcis -
Temperature	10 to 50° C, by means a peltier & heating external system (D-40), connected to the surrounding shirt in the reactor glass.
Ouput	RS232 (for bench computer) or USB (for Laptop)
Display	LCD in sensor controller, LEEDS in front panel and PC screen.
Suitcases	Optional padded suitcases for easy console and peltier & heating device transportation.
Power	230 ACV or 115 ACV (under demand) 50/60 Hz - 1800 W
Dimensions/Weight	34 x 33 x 46 (wide x deep x high) / 12.5 kg

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