

Advanced Multi-purpose Respirometers BM™ Series

BM-Respirometers are laboratory analyzers specially developed for practical and efficient biological wastewater treatment management, design and research



BM- Advance / BM-Advance Pro



BM-T+



BM-EVO

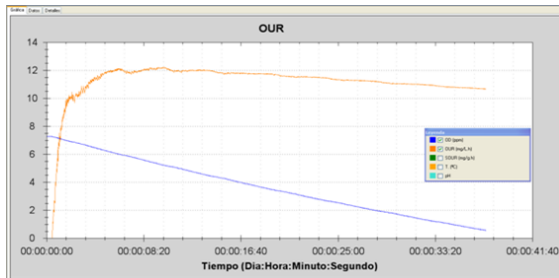
Main BM Multi-purpose Respirometer features

- 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 see them simultaneously on tabular or graphic modes
- Option to open several stored tests and compare their results
- Automatic temperature control: in the analyzer with EVO & Advance and out of the analyzer with BM-T+
- pH monitoring and automatic control system in the BM-Advance and BM-Advance
- ORP monitoring in the BM-Advance Pro
- Results package 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)

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.



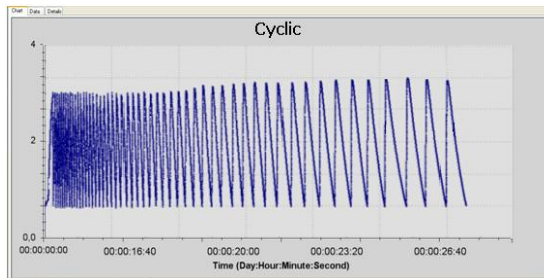
SOUR		
	- 1 -	- 2 -
Time:	1238	2243
OD:	3,27	0,6
SOUR:	7,47	mg/g.h

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.

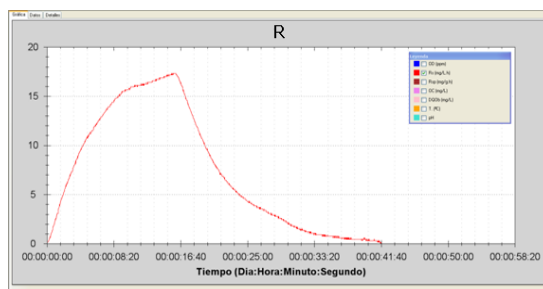
R_{sp} (mg/g.h) Specific R_s .

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:			
Date:	6/11/2010		DO (ppm)
Baseline:	8,53 ppm		R_s (mg/L.h)
Solids:	1,28 g/l		R_{sp} (mg/g.h)
Vr:	1150 ml		CO (mg/L)
Vm:	100 ml		R_s (mg/L)
s:	2		pH
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)

Influence of the temperature, pH and oxygen and other conditions

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), Specific nitrification rate (SAUR, q_N), 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)

In model BM-Advance Pro, together with the pH, we can analyze the ORP evolution during denitrification.

Anaerobic process

In model BM-Advance Pro, together with the pH, we can analyze the ORP evolution during denitrification.

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.

Kinetic parameters

For heterotrophic and autotrophic biomass.

SBR

Aeration cycle control in SBR systems.

Biomass carrier (MBBR)

Calculation of the total number of carriers per volume unit, Amount of oxygen needs to maintain the biomass carriers under optimal conditions, COD and Ammonium removal capacity.

Support for simulation programs

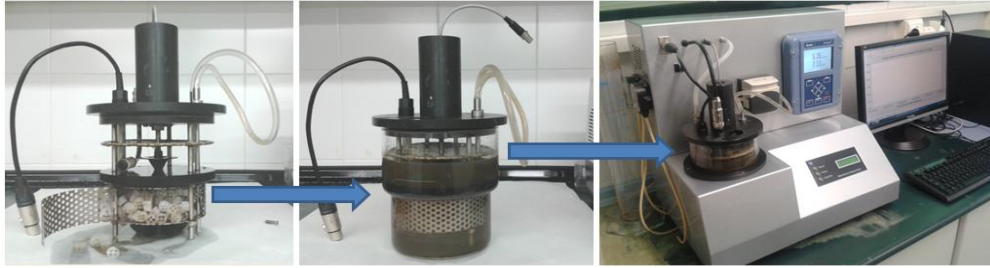
Such as GPS-X, BioWin, ...

Others

BM respirometers are open systems and, as such, support all kinds of combinations to step into an endless number of applications.

Option for biomass carriers

BM-respirometers can be easily adapted to biomass carriers, and run any respirometry test by means the simple installation of a special reactor provided with a special cage vessel where the carriers are contained.



Comparative table between BM respirometers

Comparative items	BM T+	BM EVO	BM Advance Pro	Comments
Automatic measurements: OUR, SOUR, Rs, Rsp, CO, bCOD, rbCOD, U, q	✓	✓	✓	From the automatic measurements we can go to the corresponding applications.
Thermostatic system installed in the analyzer console		✓	✓	Cooling (Peltier) + Heating system included in the own console.
External thermostatic unit	✓			External unit (separated unit) formed by Cooling (Peltier) + Heating system.
Easy transportable system: Console & Thermostatic Unit	✓			Console + case → 20 kg Thermostatic unit + case → 5 kg (aprox.)
Padded aluminum cases for easy transportation	✓			1 case for the console + 1 case for the external thermostatic unit.
pH measurement and control throughout the test			✓	Especially important where there is a special sensitivity to the pH changes.
Possibility to set the conditions at the start of the test and be able to modify them during its course	✓	✓	✓	Important to carry out studies to analyze the influence of the conditions (pH, OD, T,...) changes in the process activity.
Latest generation BM-software	✓	✓	✓	Powerful software
BM software update from Internet	✓	✓	✓	When connected to the internet URL, the BM software is automatically updated.
Option for biomass-carrier reactor	✓	✓	✓	The biomass carrier reactor for BM-T+ is rather different (and more expensive) than the one for EVO y Advance
Dimensions (cm)	34 x 33 x 46	50 x 40 x 46	50 x 40 x 46	
Weight (kg)	12.5	37	38	

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