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


Main BM Multi-purpose Respirometer Features:

- PC and software included in the system
- Compact analyzer, with very low maintenance and user friendly operation
- Direct oxygen measurements from a *maintenance-free* oxygen sensor
- Double reactor in models BM-EVO2 and BM-Advance2
- No oxygenation restriction during test performance
- Full control and results by means of a powerful software already loaded in the system's PC
- Automatic software updates from Internet
- Capacity for setting and modifying test conditions throughout the analysis
- Automatic measurements: OUR, SOUR, bCOD, rbCOD, sbCOD, U (COD utilization rate) and q (specific U)
- Current, minimum, maximum and moving average results are available at any moment throughout the test
- View 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 BM-EVO, BM-EVO2, BM-Advance/Advance Pro, BM-Advance2, and out of the analyzer with BM-T+
- pH monitoring and automatic control system in the BM-Advance/Advance Pro and BM-Advance2
- ORP monitoring in the BM-Advance Pro
- Capacity for different respirograms and simultaneous overlying
- BM respirometers measure data that can be directly input into modeling – simulating software
- Additional options include a special reactor assembly for moving beds bio-films (MBBR) and/or granular biomass

Operation Modes:

OUR static

Determination of OUR & SOUR from a mixed-liquor sample of the aeration tank within the time and section selected in the corresponding respirogram.
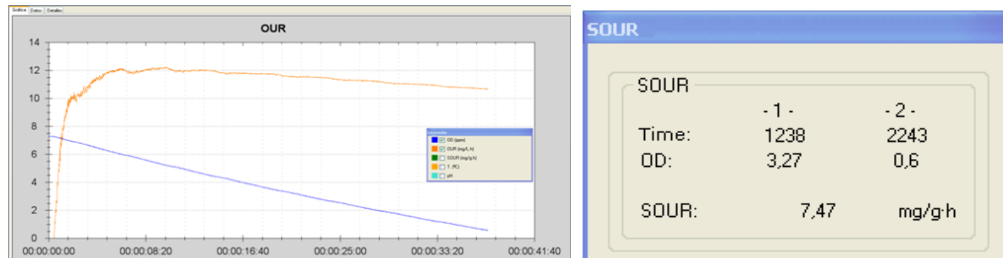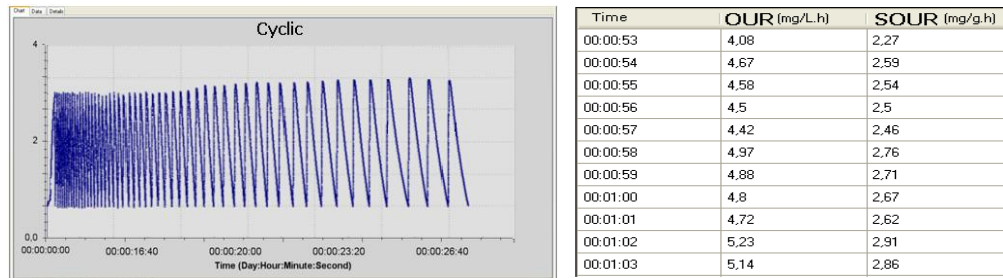

OUR (mg/l.h)   Total oxygen uptake rate from mixed-liquor
SOUR (mg/g.h)   Specific OUR

OUR cyclic

In this mode, the analyzer generates a respirogram within a programmed DO threshold and determines the corresponding **OUR** & **SOUR** in relation to continuous, sequential measurements.

R dynamic

This measurement allows the user to continuously track changes in the respiration rate of endogenous sludge after a substrate addition. A DO baseline is fixed from the endogenous respiration of activated sludge, then additional samples of substrate are added. The respirogram shows continuous measurements of Rs, along with simultaneous and continuous determinations of CO and bCOD.

Rs (mg/l.h)   Exogenous respiration rate corresponding to the substrate oxidation
Rsp (mg/g.h)   Specific Rs
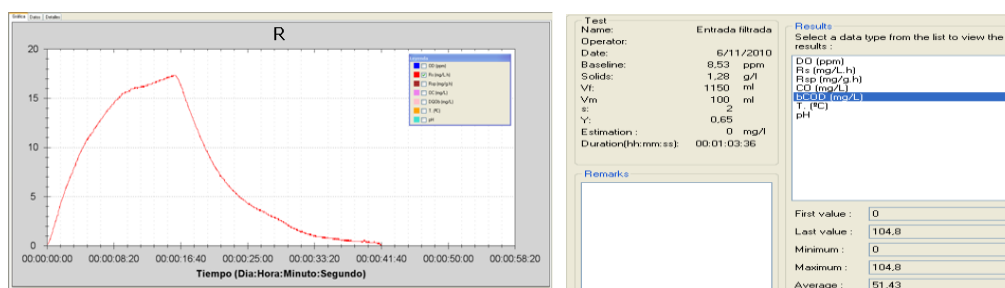**CO** (mg/l)   Consumed oxygen accumulated in the substrate oxidation
bCOD (mg/l)   Biodegradable fraction of total COD (bCOD) or Readily biodegradable fraction of COD (rbCOD)
U (mg COD/l.h) Substrate utilization rate
q (COD/SS.d)   Specific substrate utilization rate
pH   Available in BM-Advance, BM-Advance2 and BM-Advance Pro
ORP (mV)   Available in BM-Advance Pro

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Typical Applications:

Oxygen requirement and energy optimization
Calculate the actual oxygen requirement for any specific process.
Determine the optimal and minimum DO level in the aeration tank, without any detriment of the process efficiency.

Bioaugmentation control and tracking
By means of the regular respiration rate measurement, 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 fractionation
Automatically calculate of the COD biodegradable fraction (bCOD) or COD readily biodegradable fraction (rbCOD).

Influence of the temperature, pH and oxygen and other conditions
Set and modify the test conditions, to determine their influence on the biomass activity.
Figure out break-points, including optimum and minimum working levels.

Operative parameter optimization
Determine the loading rate (F/M), sludge age (SRT), and returned sludge rate (RR).

Nitrification
Calculate the nitrification rate (AUR), specific nitrification rate (SAUR, q_N), optimal DO range for nitrification, hydraulic time for ammonium-nitrogen removal, nitrification capacity, and 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 of removing.
Estimate the nitrate utilization rate (NUR) from rbCOD uptake rate.
In model BM-Advance Pro, together with the pH, analyze the ORP evolution during denitrification.

Anoxic - Anaerobic process
Analyze the ORP evolution during denitrification, together with the pH analysis, using model BM-Advance Pro.

Toxicity to Specific Biomass
Perform a fast, qualitative screening comparing the respiration rates of a control sample to a mixed-liquor prepared with a sample of waste stream to be evaluated.

Kinetic parameters
Determine the heterotrophic and autotrophic biomass' kinetic coefficients.

Biomass carrier (MBBR)
Calculate the total number of carriers per volume unit, amount of oxygen needed to maintain the biomass carriers under optimal conditions, COD and Ammonium removal capacity.

Support for simulation programs
Pair these respirometers with programs such as GPS-X, BioWin, etc.

Many others
BM respirometers are open systems that support numerous applications.

Option for Biomass Carriers:

BM-respirometers can be easily adapted to evaluate biomass carriers. Run any respirometry test by means of a simple installation of a reactor provided with a cage vessel where the carriers are contained.
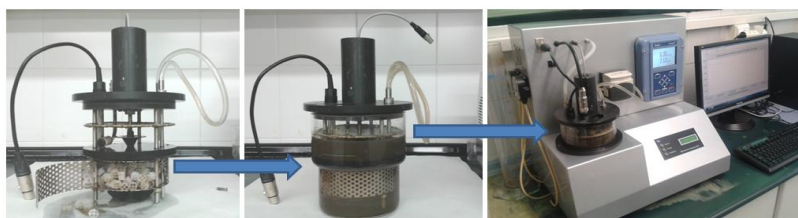
Comparative Table of BM Respirometers:

Comparative items	BM T+	BM EVO	BM EVO2	BM Advance	BM Advance2	BM Advance Pro	Comments
Automatic measurements: **OUR** (mg/l.h) **SOUR** (mg/g.h) **OUR & SOUR** cyclic **Rs dynamic** (mg/l.h) **Rsp** (mg/g.h) **CO** (mg/l) **bCOD** (mg/l) **rbCOD** (mg/l) **U** (mg DQO/l.h) **q** (mg DQO/mgSS.d)	✔	✔	2 x ✔	✔	2 x ✔	✔	The automatic measurements can be applied to the corresponding applications
Thermostatic system installed in the analyzer		✔	2 x ✔	✔	2 x ✔	✔	Cooling (Peltier) + Heating system included in its own console
External thermo unit	✔						External unit (separate unit) formed by Cooling (Peltier) + Heating system
Easily transportable system	✔						Analyzer + case → 20 kg MD-40 + case → 5 kg
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				✔	2 x ✔	✔	Especially important in all tests related to nitrification and in those where there is a special sensitivity to pH changes
ORP measurement						✔	Redox
Set the conditions at the start of the test and modify them during the course of the analysis	✔	✔	2 x ✔	✔	2 x ✔	✔	Important feature when carrying out studies to determine the influence of condition changes (pH, DO, Temperature) in the biological process
BM software update from Internet	✔	✔	✔	✔	✔	✔	When connected to the Internet URL, the BM software is automatically updated
Capability for biomass-carrier reactor option	✔	✔	2 x ✔	✔	2 x ✔	✔	The biomass carrier reactor for BM-T+ is different than the one for EVO and Advance