ZETA
EVOLUTION OF TECHNOLOGY

CHARACTERIZATION OF BIORACTOR SYSTEMS FOR THEIR OXYGEN TRANSFER RATE

Special focus on measurement of the mass transfer coefficient k_La

Bioreactors are expected to provide optimum conditions for growth and product formation of microorganisms or the cell culture with the aim of maximising product formation.

The oxygen transfer rate (OTR), and the k_La value in particular, are the decisive parameters for the design of bioreactors. The volumetric mass transfer coefficient k_La is used as the efficiency ratio of the transport of a gas from the gaseous phase to the liquid phase. In biotechnological processes, the k_La coefficient indicates the efficiency of oxygen supply to microorganisms in a bioreactor. Possible measures to increase the k_La value under gentle process conditions, which will in turn improve the overall performance of the organic process, include for example: increased agitator speed and gassing rate, optimization of fermenter and agitator geometry, enlarging the phase boundary (e.g. by aeration with finer gas bubbles) or optimization of the media composition. Since the k_La value depends on numerous factors, it cannot be precisely calculated but needs to be determined by means of k_La measurement at critical process points.


highly flexible connection ports

ZETA Services

Characterization of fermenters

- Measurement on site at the customer premises
- Analysis of data and results
- Customer briefing
- Development of scale-down models

Optimization of installed systems

- Process: Operational parameters
- Retrofitting: Agitator design – sparger design

Designing and planning the optimum fermenter

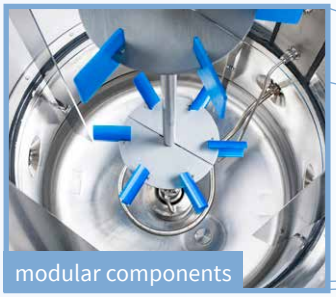
- Pilot testing at the ZETA technical centre including scale-up calculations
- Specification and design of agitation systems in line with the process
- Customized solutions for individual processes

Features of ZETA k_La Measurement

- kLa measurement in real time
- All process parameters are user definable
- Determination of the power input for the agitation system
- Adaptable for different gassing systems and sparger types
- Impeller power number determination
- Comparison of different cultivation broths
- Modular design for highest flexibility

Benefits of ZETA k_La Measurement

- Improved upstream process
- Optimized agitator geometry
- Improved product quality and safety
- Higher product yield
- Enabling QbD principles



modular components

1. k_La test stand
2. bubble free sampling
3. multi port probe belt
4. control tower
5. control panel (aeration, agitator speed)

ZETA k_La measurement method

- Measurement of any point in the fermenter
- No structural changes of fermenter required
- Bubble separation prior to measurement for optimum measurement result
- Optical high-speed oxygen sensors with response times of < 0.5 sec

High speed pO_2 sensor

Torque measurement cell