

A New Orbital-Mixed 2L-12L Single Use Bioreactor for Cell Culture Scale-Up and Bulk Protein Production

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Small-batch therapeutic protein production requires predictable scale-up to meet bulk delivery timelines. Here, an orbital-shaken 2L-12L bioreactor is presented as an alternative to stirred and shaken vessels for batch production and scale-up. Orbital-shaken bioreactors offer a technically conservative approach which preserves mixing hydrodynamics and k_La 's from the µl stage to scales as large as 2,500L. Cultivation success at well plate, tube or flask scales easily translates to larger volumes. k_La 's, mixing times and some basic application data are shown here for the SB10, 2-12L orbitally shaken disposable bioreactor.

SHAKING MACHINES AVAILABLE TO ROUTINELY SCALE FROM 50µL TO 2,500L

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Sensors may be added to any of these

A Kühner touch panel ISF1-XC (up to 5L)

B Kühner SB10-X (2L-12L)

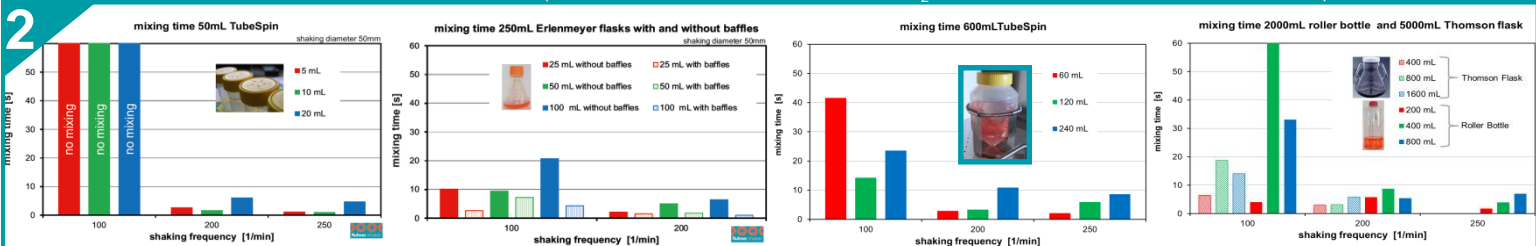
C Kühner SB50-X (10L-50L)

D Kühner SB200-X (40L-200L)

E Kühner SB2500-X (200L-2500L)

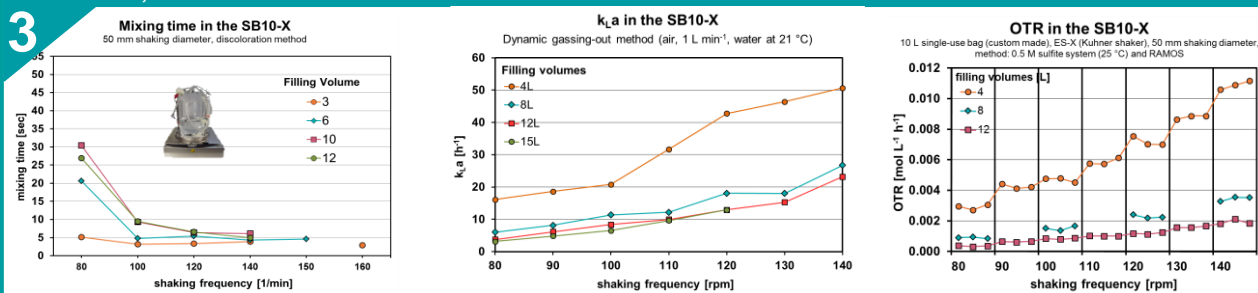
CO_2 -controlled shaker incubators like the Kühner ISF1-XC (A) handle cultures from 50µl to 5L. Well known mixing times (Panel 2), k_La 's and hydrodynamics are used to scale from well plates to larger vessels such as tubes or flasks. Large shaken disposable bioreactors have working volumes of 2L-12L (SB10 – B), 10L-50L (SB50 – C), 40L-200L (SB200 – D) and 200L-2500L (SB2500 – E). Shaken Single Use bioreactors preserve the hydrodynamics of smaller scale cultivations for a straight forward scale-up process - mixing times and k_La 's for these vessels are shown in Panels 3 and 4 respectively.

MIXING TIME DATA FOR SMALL SCALE CULTURES (5ml – 2.5L, COMMONLY USED IN CO_2 -CONTROLLED SHAKER INCUBATORS)

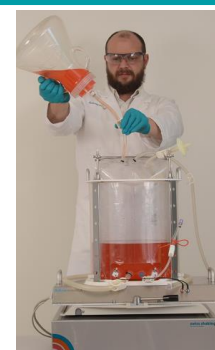


Mixing times for commonly used vessels: 50ml Tubespin®, 250ml Corning Flasks, 600ml Tubespin®, and 5L Thomson Optimum Growth® flasks. At smaller scales, mixing times of <10 seconds are accepted as sufficient. Though not reported here, mixing hydrodynamics are available for each of these scales and are conserved with the hydrodynamics of the larger scales shown below.

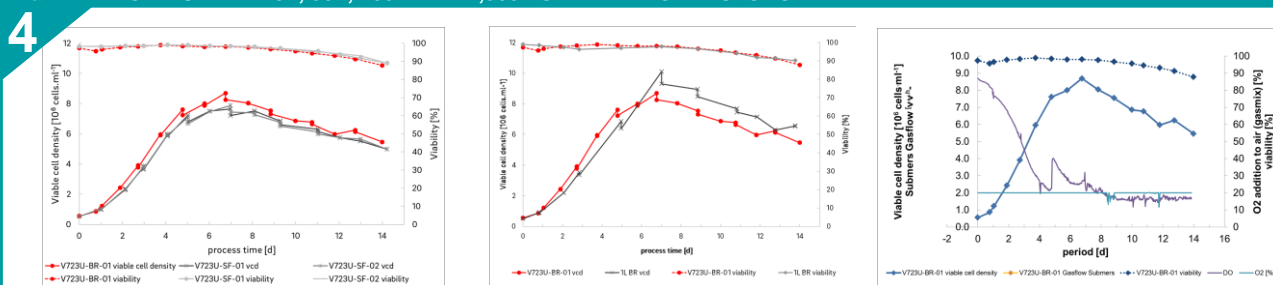
MIXING TIME, k_La and OTR for the SB10 BIOREACTOR AT VARIOUS FILLING VOLUMES



Mixing times, k_La and OTR for various fill volumes and speeds used with the SB10. When scaling up from flasks one may choose filling volumes needed for downstream applications and select shaking speeds



k_La DATA FOR KÜHNER 10L, 50L, 200L AND 2,500L SHAKEN BIOREACTORS



Conclusions:

- Mixing time data is available for commonly used small scale shaker-incubator vessels.
- Small scale mixing time data may be used to select shaking speeds and fill volumes of larger shaken Single Use Bioreactors.
- k_La data from the 10L, 50L, 200L and 2,500L supports their use for CHO and low-OTR microbial cell culture production processes.

