



4,000L V_n CSR Bioreactor Train (50L V_n, 250L V_n, 1,000L V_n and 2 x 4,000L V_n)

ABEC's CSR single-use cell culture bioreactors and microbial fermenters have set new industry benchmarks in productivity and performance. Leveraging decades of ABEC design experience and innovation, the CSR systems enable customers to recognize the cost, flexibility, and time to market benefits of single-use processing while also achieving economy of scale and lowest cost of goods sold (COGS). The CSR bioreactor and fermenter designs are also consistent with well-established stirred-tank reactor configurations, allowing for seamless process scale-up and transfer.

TYPICAL SPECIFICATIONS

ABEC's CSR systems are customizable to meet specific process and operational requirements. Typical design elements and specification ranges are shown.

BENEFITS

- Highest productivity/lowest cost of goods
- Maximum process performance and multi-product flexibility
- Lower supply chain risk
- More reliable batch-to-batch operation

SPECIFICATION	CSR BIOREACTORS	CSR FERMENTERS
Working Volumes	50L – 6,000L	50L – 1,000L
Turndown Ratios	5-10:1	
Agitator Mounting	Bottom Center	
Agitator Motor Coupling	Mechanical	
Agitator Seal	Mechanical/SiC	
No. Baffles	3-4	
Impeller Types	Low Shear 'Elephant Ear' Hydrofoil	Rushton Axial Flow
Spargers	Single/Dual, Drilled Tube	Ring Type or Open Tube
Performance	K_a @ 6,000L > 45 1/hr Blend Time @ 6,000L < 60 s	OTR @ 1,000L > 350mmol/L/hr
Disposable Container (DC) Materials of Construction	Film: RENOLIT SOLMED Inflex 9101 Multilayer LDPE/EVOH Impellers: HDPE Seal Housing, Shaft Coupling: LDPE Agitator Shaft: 316L SS	
Automation/Control Systems	Emerson DeltaV™ Allen Bradley/Rockwell Automation Siemens PLC and DCS	

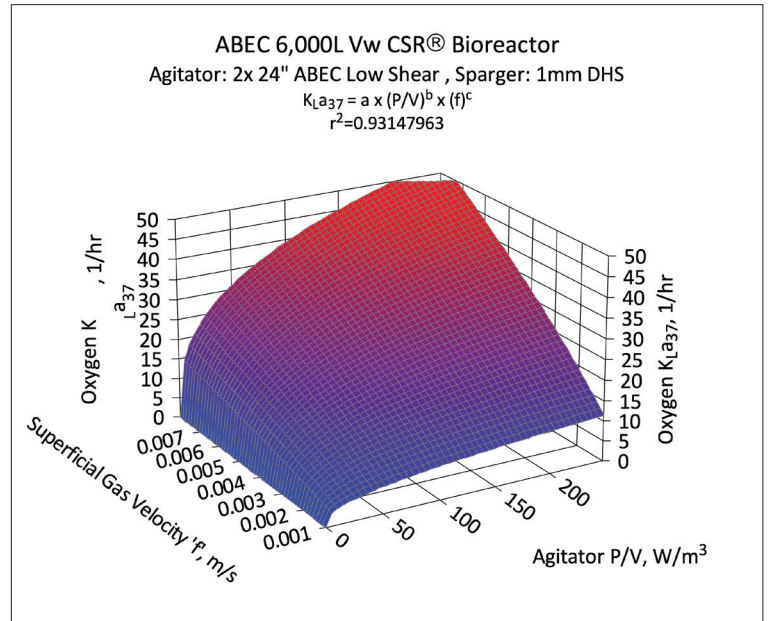


6,000L V_n CSR Bioreactor

PRODUCT BRIEF CSR SINGLE-USE BIOREACTORS & FERMENTERS



1,000L Vw CSR Fermenter



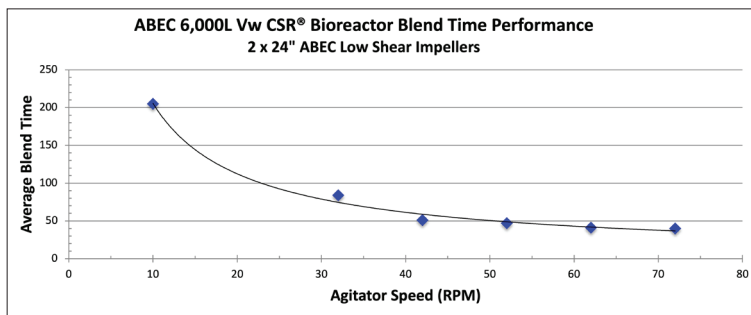
The ABEC 6,000L Bioreactor can achieve high oxygen mass transfer rates up to and exceeding 45 1/hr. Mass Transfer rates are shown above across a range of gas sparge rates and agitation power inputs.

UNIQUE FEATURES

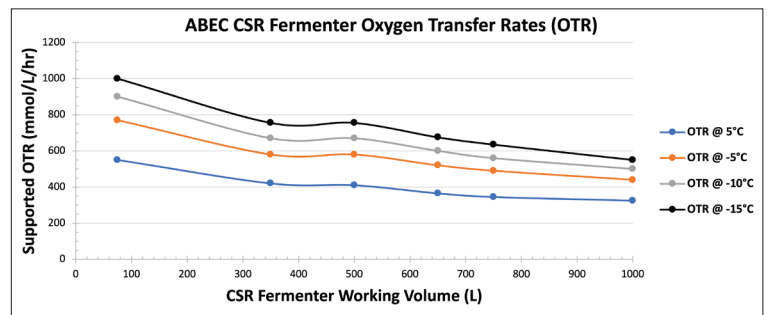
- Largest production volumes available
- Process performance comparable to stainless steel systems
- Customizable to meet specific process requirements
- Stable, flexible instrument and component supply chain with multiple qualified suppliers
- Complete in-house multi-site equipment and single-use disposable container manufacturing
- Ergonomic single-use disposable container loading and unloading
- Robust single-use disposable container packaging for safe, secure, shipping and storage



750L Vw CSR Dual Purpose System (750L Fermenter / 500L Bioreactor)



The ABEC 6,000L Bioreactor maintains excellent blend time performance of <60 seconds utilizing a center-line mounted agitation system and baffles. Blend time performance is shown below across a range of agitator speeds, demonstrating blend times of <60 seconds at traditional operating speeds.



The ABEC CSR Fermenter product line is uniquely able to support high oxygen transfer rates (OTR) similar to stainless steel systems due to superior power input and gas handling. Supported OTR performance is shown above across a range of working volumes. Higher OTR can be supported with lower temperature Chilled Water/Glycol Supply at all scales.