Extending Bioprocess Development with Nexxys™

High-throughput experimentation for CHO media optimization and AAV9 process robustness

Nexxys extends the bioprocess development lab with on-demand capacity, embedded scientific expertise, integrated analytics, and real-time cloud connectivity through Console.

20,000+	100+	300+	40+	1600+
Bioreactor Runs	Programs	250mL & 5L bioreactors	Species/ Organisms	Unique Strains

Introduction

Bioprocess development teams often face a practical constraint: the scientific question demands more experimental breadth than the internal laboratory can execute within the required timeline. Nexxys is designed to remove that constraint by combining parallel bioreactor capacity, experienced bioprocess scientists, integrated analytics, and cloud-connected execution.

What is Nexxys?

Nexxys gives bioprocess teams on-demand access to the capacity, expertise, and data infrastructure needed to move programs forward faster. Drawing on experience from 20,000+ bioreactor runs spanning 100+ programs, Nexxys combines parallel 250 mL and 5 L bioreactors, comprehensive analytics, and experienced bioprocess scientists to accelerate screening, process optimization, characterization, and scale-up. Cloud based Culture Console Software keeps teams connected to every experiment in real time, extending laboratory capabilities without additional equipment, staffing, or lab space.

Experience Across Diverse Biological Systems

Culture Biosciences has generated experimental data spanning 40+ species and organisms and more than 1,600 unique strains. That accumulated experience gives the Nexxys team deep knowledge of a broad range of biological systems, process behaviors, control strategies, and development challenges. The objective is not simply to add reactor capacity; it is to enable teams to run the experiments the science requires and convert those experiments into decisions with greater confidence.

Two customer collaborations illustrate the model

Collaboration	Application	Experimental approach	Outcome / learning
MilliporeSigma	CHOZN® media/feed optimization	Five full-factorial studies using 24 parallel 250 mL reactors per block	Statistically significant titer gains for two cell lines; selected conditions reproduced at 3 L.
Thermo Fisher Scientific	AAV9 process robustness	24-run JMP D-optimal DOE across DO, agitation, pH, and transfection VCD	Robust viral genome titer and percent-full performance across tested ranges; identified sensitivity and optimization signals.

Nexxys: extending the lab without expanding infrastructure

Traditional process development is often shaped by equipment availability rather than experimental need. When reactor capacity is constrained, teams may reduce replicate counts, narrow factor ranges, postpone robustness work, or sequence studies over multiple weeks. Each compromise can reduce statistical power or delay learning.

Nexxys addresses this bottleneck through a managed development model that combines four elements:

Parallel Capacity	Scientific Expertise	Integrated Analytics	Console Control
250 mL and 5 L bioreactors for screening, DOE, characterization, and scale-up.	Embedded bioprocess scientists support translation, execution, troubleshooting, and interpretation.	Sampling and analytical workflows link process behavior to performance and product quality.	Remote monitoring and data access keep customer teams connected to experiments in real time.

The benefit: preserve experimental ambition

The practical value of scalable execution is the ability to preserve the experimental design needed to answer the question. A higher-throughput DOE can evaluate interaction effects that are invisible in one-factor-at-a-time studies. A robustness study can explore operating ranges before technology transfer. Parallel execution can also shorten the time between hypothesis, result, and follow-on experiment.

Capacity-constrained development	Nexxys-enabled development
Reduce conditions or replicates	Run statistically meaningful parallel studies
Wait for internal equipment availability	Add capacity without installing new infrastructure
Move external data through static reports	Monitor and analyze data through Console
Optimize first, characterize later	Build optimization and robustness into the development strategy

Case study 1 | MilliporeSigma

Full-factorial media and feed optimization across multiple CHOZN® cell lines

Media and feed optimization can have a major impact on mammalian cell culture performance, but fully exploring those interactions is reactor-intensive. MilliporeSigma partnered with Culture Biosciences to expand the scope of its experimental program without adding internal infrastructure.

5	5	24	3 L
CHOZN® Cell Lines	Full-Factorial Studies	250 mL Reactors / Block	Bench-Scale Confirmation

Experimental design

- Five CHOZN® cell lines, each producing a different recombinant therapeutic protein.
- Two blinded batch media and three blinded feed solutions formed a full-factorial media/feed design for each cell line.
- Twenty-four 250 mL bioreactors were used to execute experimental blocks, with the control process run in quadruplicate and treatment reactors randomized.
- Process data were available through Console for real-time comparison of online and offline measurements and cross-experiment analysis.

Results and scale-up confirmation

Least-squares models showed significant effects from both feed medium and batch medium across all five cell lines. Significant feed-by-batch interaction effects were observed for Cell Lines A, B, and C, demonstrating the value of a factorial design for identifying combinations that would be difficult to detect through sequential one-factor-at-a-time screening.

Statistically significant titer improvements were identified for two cell lines. Cell Line A improved by 37% under one tested condition, while Cell Line C improved by 37% and 31% under two tested conditions. MilliporeSigma then reproduced similar cell-growth behavior and titer results in 3 L Applikon® glass bioreactors at its own site.

What this demonstrates for Nexxys

The value of external capacity is not simply more reactor slots. It is the ability to execute a statistically meaningful design, preserve replicates, identify interaction effects, access the data remotely, and then translate the learning into larger-scale development decisions.

See the full study: MilliporeSigma & Culture Biosciences white paper

Case study 2 | Thermo Fisher Scientific

AAV9 process robustness evaluation in 24 cloud-connected 250 mL bioreactors

As viral vector processes mature, the development objective shifts from demonstrating that a process works to understanding how it behaves across an acceptable operating range. In collaboration with Thermo Fisher Scientific, Culture Biosciences evaluated AAV9 production using the Gibco™ AAV-MAX Helper-Free AAV Production System in a high-throughput robustness study.

24	4	2	250mL
DOE Runs	Process Parameters	Key Outputs	Cloud Connected Scale

- JMP® D-optimal design optimized for a response-surface model.
- Process parameters: dissolved oxygen (30%, 40%, 50%), agitation (260, 330, 378 RPM), pH at transfection (6.8, 7.0, 7.2), and transfection viable cell density across the tested design range.
- AAV9 performance was evaluated through viral genome titer and percent full capsids.
- The study used the Gibco™ AAV-MAX workflow and Thermo Fisher Scientific cell culture, transfection, lysis, and associated production materials.

Results and process understanding

Across the tested ranges, viral genome titer and percent full capsid results were comparable to the control process, supporting robustness of the AAV-MAX workflow at laboratory scale. Dissolved oxygen adjustments around the center point had minimal effect on titer. Agitation between 330 and 378 RPM had limited impact, while the lower 260 RPM condition reduced viral genome titer.

Increasing pH and viable cell density showed trends toward higher viral genome titer, suggesting potential opportunities for additional optimization. Changes in percent full capsids were not statistically significant over the tested ranges. Together, the study illustrates how a parallel DOE can distinguish robust regions from process sensitivities while preserving internal viral-vector capacity.

What this demonstrates for Nexxys

High-throughput characterization can generate more than an optimized setpoint. It can establish operating-range knowledge, identify sensitivity, and create a stronger technical basis for subsequent development and scale-up decisions.

See the full study: Thermo Fisher Scientific / Culture Biosciences AAV9 poster

From reactor capacity to decision quality

The MilliporeSigma and Thermo Fisher Scientific collaborations address different modalities and development questions, but they point to the same underlying benefit: greater experimental capacity is most valuable when it produces more complete process understanding.

Nexxys benefit	MilliporeSigma example	Thermo Fisher example
Run broader studies	Five factorial studies across multiple CHOZN® cell lines	Twenty-four-run robustness DOE across four parameters
Preserve statistical insight	Interaction effects between batch and feed media	Response-surface design to evaluate operating ranges
Stay connected to data	Remote Console monitoring and cross-experiment analysis	Real-time access while externalizing experimental execution
Support scale decisions	Selected conditions reproduced at 3 L	Lab-scale robustness data to inform subsequent scale-up

Where Nexxys can add leverage

- Feasibility and process translation when moving from shake flasks or an existing bench process into controlled bioreactors.
- High-throughput screening of strains, clones, media, feeds, constructs, or process conditions.
- Process optimization using statistically designed experiments and rapid follow-on learning cycles.
- Process characterization and robustness assessment before downstream technology transfer or PPQ activities.
- Scale-up studies using connected 250 mL and 5 L bioreactor capacity.

A useful shift in the development question

Instead of asking “How many experiments can our current lab fit?”, teams can ask “What experiments do we need to answer the scientific question?” Nexxys is designed to make the second question practical.

Nexxys service packages

Nexxys engagements can be matched to the maturity of the program and the depth of process understanding required. Across packages, customers receive fast-track onboarding, live Console access, embedded scientific expertise, and sampling and analytical plans tailored to the process.

The Launchpad

Process Feasibility & Baseline Data

4
Parallel Bioreactors

- ✓ On-Demand Scale-Out
- ✓ Process Translation Check
- ✓Baseline Establishment

You Get: High-quality data without expanding lab space, or de-risking new processes off-site.

Validation of process feasibility and performances

The Sprint

Process Development Accelerated

12-24+
Parallel Bioreactors

- ✓ 12–24+ Parallel Bioreactors
- ✓Rapid Learning Cycles
- ✓Validated Confirmation
- ✓Accelerated 20× Scale-Up

You Get: Move quickly from early feasibility to a scalable, optimized process

Accelerated development of a scalable optimized process

The Insight

Deep Process Collaboration

24+
Parallel Bioreactors

- ✓ Comprehensive Bioreactor DoE (24+ Runs)
- ✓Interaction & Sensitivity Mapping
- ✓Robustness & Risk Assessment

You Get: Deep characterization and defined operating limits.

Complete, defensible process understanding

View the full Nexxys Service Packages.
Interested in starting a Nexxys Project: Speak to one of our Bioprocess Experts
Visit the: Nexxys Webpage for the most up to date information

Nexxys Lab South San Francisco


Nexxys Bioproces Experts

Conclusion

Nexxys is built around a simple premise: bioprocess development should be constrained by the scientific question, not by the number of available reactors. By combining scalable capacity with embedded scientific support, analytics, and real-time cloud connectivity, teams can expand experimental scope without expanding internal infrastructure.

The MilliporeSigma program demonstrates how high-throughput factorial studies can uncover meaningful media/feed interactions and translate selected conditions to 3 L. The Thermo Fisher Scientific collaboration demonstrates how a 24-run DOE can map AAV process robustness across multiple parameters. Together, they show how Nexxys can help teams generate the data needed to optimize, characterize, and scale with greater confidence.

Run the experiments the science requires.

From 4-reactor feasibility work to 24+ reactor characterization studies, Nexxys provides a flexible path to add capacity, accelerate learning, and stay connected to every experiment through Console.

References

1. Culture Biosciences. “Significant CHOZN® Titer Gains: How MilliporeSigma Leveraged Nexxys and Culture’s Cloud Bioreactor Platform.”
2. Culture Biosciences & Thermo Fisher Scientific. “AAV9 Process Robustness Evaluation in Cloud-native 250mL Bioreactors.” Poster, 2024.
3. Culture Biosciences. Nexxys™ Services.

Company aggregate metrics (20,000+ runs, 100+ customers, 300+ bioreactors, 40+ species/organisms, and 1,600+ unique strains) are Culture Biosciences internal aggregate data supplied for this technical note, 2026.