Bioreactor Simulation Report: 8bc3c1c4

Run Information

Timestamp	Final Titer [mg/mL]	Final Biomass [g/L]
2025-10-02 18:55:51	0.07581830333644404	2.9574726377912803

Input Parameters

SIMULATION_PARAMS:

dt	total_time	random_seed
0.5	100.0	42.0

INITIAL_STATE:

X	S_glc	P	DO	pH
0.1	20.0	0.0	100.0	7.2

Kinetics:

- **mu_max**: 0.04
- **Ks_glc**: 0.5
- **Y_xs**: 0.5
- **alpha**: 0.01
- **beta**: 0.0005
- **kd**: 0.005
- **kLa**: 10.0
- **o2_uptake_coeff**: 0.02
- **acid_prod_coeff**: 0.0001
- **acid_from_substrate**: 1e-05
- **buffer_capacity**: 0.025
- **base_dose_mol**: 0.0002
- **pH_setpoint**: 7.2
- **pH_deadband**: 0.05
- **temp_factor**: 1.0
- **agitation_factor**: 1.0

REACTOR_PARAMS:

V0	feed_start_h	feed_rate_g_L_h	feed_glc_conc
2.0	24.0	0.05	400.0

SENSOR_PARAMS:

sensor_noise_sigma	sensor_drift_rate	sensor_dropout_prob
0.001	0.0005	0.0

Faults Injected

type	description	start_h	duration_h	magnitude_multiplier	severity
overfeed	Glucose overfeed causing substrate accumulation	20.0	2.0	1.5	3

AI Summary / Troubleshooting

The bioreactor telemetry data indicates a decrease in dissolved oxygen levels and an increase in lactate production, which are statistically detected anomalies that may be related to inadequate oxygen supply or metabolic byproduct accumulation. Root cause analysis suggests that the primary issue is likely related to an imbalance in oxygen supply and demand, potentially due to increased cell density or agitation issues, categorizing the root cause as a "Process

Control" issue. To address these anomalies, it is recommended to adjust the oxygen flow rate, assess and optimize agitation parameters, and consider implementing a pH control strategy to mitigate lactate accumulation. The high-level categorization of the root cause is "Process Control", and immediate action is necessary to prevent further deviations from ideal conditions and ensure the health and productivity of the CHO cell culture.

Telemetry Sample (first 10 rows)

X	S_glc	P	DO	pH	time
2.417675684371354	24.877913938029366	0.17167108919547516	99.7895654115913	7.217032658418881	0.0
2.0123153548705246	24.55538340880699	0.1676291917023964	99.76407860696749	7.228953680209898	0.5
1.6881380509377728	24.266987617333747	0.15476379005766522	100.0	7.23778723561248	1.0
1.4237664275518065	24.023983016533897	0.15244340462392392	100.0	7.241717210804032	1.5
1.1960316199518404	23.803132794710464	0.1457653292516826	100.0	7.247257905929995	2.0
1.018728923375657	23.602433910014774	0.1397780276577608	100.0	7.251371899413043	2.5
0.8721428691440924	23.424846659960025	0.13673071428627845	99.79112306154886	7.257050233806614	3.0
0.7527862961743766	23.273062948061742	0.13171094828261928	100.0	7.258648102839764	3.5
0.6486219982010913	23.1160577651456	0.12722319688127542	99.96885262047893	7.259846398154689	4.0
0.5643426451175605	22.98778250273664	0.1278473496772007	100.0	7.258130268416519	4.5

Telemetry & Anomaly Plots