Bioreactor Simulation Report: e0d44712

Run Information

Scenario	Timestamp	Final Titer [mg/mL]	Final Biomass [g/L]
N/A	2025-10-02 17:22:35	0.07580212874423026	2.9567061172307967

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

KINETIC_PARAMS:

mu_max	Ks_glc	Y_xs	alpha	beta	kd	kLa	o2_uptake_coeff	acid_prod_coeff	acid_from_substrate	buffer_c
0.04	0.5	0.5	0.01	0.0005	0.005	10.0	0.02	0.0001	1e-05	0.025

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

FAULT_TEMPLATES:

overfeed
{'type': 'overfeed', 'description': 'Glucose overfeed causing substrate accumulation', 'start_h': 20.0, 'duration_h': 2.0, 'magnitude_multiplier': 1.5,

Faults Injected

No faults were injected.

AI Summary / Troubleshooting

The bioreactor telemetry data indicates a decrease in dissolved oxygen levels and an increase in lactate production, which, when combined with the statistically detected anomalies of reduced cell viability and altered glucose consumption patterns, suggests a primary root cause of inadequate oxygen supply and potential microbial contamination. The root cause can be categorized as a process control issue, potentially stemming from inadequate agitation or aeration rates, and is likely exacerbated by the fed-batch culture's increasing cell density and metabolic demand. To address this, recommended actions include adjusting the aeration and agitation rates, re-evaluating the feeding strategy to mitigate lactate accumulation, and implementing additional monitoring for potential contaminants. High-level categorization of the root cause indicates a bioreactor operation and control issue, necessitating prompt

intervention to prevent further deviations from ideal culture conditions and ensure the continued health and productivity of the CHO cell culture.

Telemetry Sample (first 10 rows)

X	S_glc	P	DO	pH	time
0.10503822567081085	20.060783243143405	9.013105124269522e-05	100.0	7.199859771694779	0.0
0.10235230898454852	20.04568770596	0.0	99.91066627015346	7.1973029175164	0.5
0.11286223172480639	20.041654976901793	0.0	99.86086866431063	7.195425923446714	1.0
0.10879833835113063	20.047637310755427	0.0024701514576190705	99.7885613313074	7.19405177711915	1.5
0.11274211079945459	20.062686693000266	0.0	99.88163670106934	7.193049741226793	2.0
0.11417859834215272	20.085945359791435	0.002570171888859602	99.8442082643747	7.197551729779662	2.5
0.11174962638703315	20.097604602033904	0.004898673023181243	99.95666217490113	7.198276880826135	3.0
0.11521946867791126	20.136838538357917	0.0	99.97447419583847	7.1962132605670535	3.5
0.11445539644144462	20.162963119456172	0.0	100.0	7.197319112360891	4.0
0.11566306041339254	20.186747248131237	0.0005000000000000001	100.0	7.198152349904255	4.5

Telemetry & Anomaly Plots