Thermo Scientific DynaDrive Single-Use Bioreactor (5,000 L)

Figure 1. Thermo Scientific™ DynaDrive™ S.U.B.

Introduction

We are committed to designing our products with the environment in mind. This fact sheet provides the rationale behind the environmental claim that the Thermo Scientific™ DynaDrive™ Single-Use Bioreactor (S.U.B.) generates up to 27% less product and packaging waste for a 5,000 L run relative to a 2,000 L S.U.B. traditional workflow, when normalized to a 10,000 L volume.

Product description

The Thermo Scientific™ DynaDrive™ Single-Use Bioreactor is our latest advancement in S.U.B. technology; it offers better performance and is scalable to larger volumes than previous bioreactors. The complete DynaDrive S.U.B. system consists of a 3,000 L or 5,000 L bioreactor tank and a Thermo Scientific™ BioProcess Container (BPC). The unique stirred-tank design utilizes a novel drive train with multiple impellers. The bioreactor's superior mixing capability enables optimal mixing and mass transfer performance. The tank's newly designed cube shape allows for mixing at very low volumes and has a turndown ratio of 12:1 for 3,000 L systems and 20:1 for 5,000 L systems.

Green features

Less waste

The DynaDrive S.U.B. system allows for scaling to a larger volume by reducing seed vessel requirements and maximizing process vessel usage. Processes can be started at 5% volume in a 5,000 L unit and then feed up to full volume. This reduces cell transfers and associated adaptation, requiring fewer single-use BPCs compared to a traditional process in a 2,000 L S.U.B.

Comparing an average 5,000 L process with the DynaDrive S.U.B. against a traditional 2,000 L workflow shows the traditional process generates approximately 90 kg of product and packaging waste, compared to approximately 163 kg of waste with the 5,000 L DynaDrive S.U.B. (Table 1). When normalized to a 10,000 L equivalent volume workflow, this results in a 27% reduction in product and packaging waste when using the DynaDrive S.U.B. As shown in Table 1, performing a 10,000 L volume for each workflow once every month over the course of one year would translate to a total of approximately 1,445 kg of product and packaging waste avoided annually by choosing the DynaDrive S.U.B. over the traditional workflow.

Table 1. Comparison of product and packaging waste generated using a DynaDrive S.U.B. 5,000 L workflow versus a traditional 2,000 L S.U.B. workflow with the same equivalent final volume of 10,000 L.

DynaDrive S.U.B. 5,000 L workflow		
Steps in procedure and materials used	Quantity	Total weight of product and packaging (kg)
Scale up:		
125 mL flask	1	0.05
1,000 mL flask	1	0.14
2,000 mL Fernbach flask	3	1.06
N-2 stage (50 L reactor):		
50 L S.U.B.	1	4.50
50 L BPC	1	0.73
Media filter	1	0.12
N-1 stage (low volume in the 5,000 L DynaDrive S.U.B.):		
5,000 L DynaDrive BPC	1	76.60
500 L Single Use Mixer (S.U.M.) BPC	1	8.50
50 L BPC (for cell transfer)	1	0.73
Media filter	1	0.26
N stage (full volume in the 5,000 L DynaDrive S.U.B.):		
2,000 L S.U.M. BPC	2	24.63
Media filter	1	1.19
Feeds		
~1,250 L feed		
Mixing BPC, 500 L S.U.M.	1	4.90
500 L storage BPC	3	16.74
~200 L glucose		
Mixing BPC, 200 L S.U.M.	1	5.80
200 L storage BPC	1	3.99
~100 L base		
100 L S.U.M.	1	6.08
100 L storage BPC	1	3.58
~10 L antifoam		
10 L BPC	1	1.98
Filters for Feeds	3	1.13
Total product and packaging waste generated for 5,000 L volume (kg):		162.69
Total product and packaging waste generated for 10,000 L volume(kg):		325.39

S.U.B. 2,000 L workflow		
Steps in procedure and materials used	Quantity	Total weight of product and packaging (kg)
Scale up:		
125 mL flask	1	0.05
1,000 mL flask	1	0.14
2,000 mL Fernbach flask	1	0.35
50 L Rocker	1	4.34
N-2 Stage (50 L reactor):		
50 L S.U.B.	1	4.50
50 L BPC	1	0.73
Media filter	1	0.12
N-1 stage (low volume in the 2,000 L S.U.B.)		
2,000 L 5:1 S.U.B.	1	27.81
500 L Single-Use Mixer (S.U.M.)	1	8.50
50 L BPC (for cell transfer)	1	0.73
Media filter	1	0.26
N stage (full volume in 2,000 L S.U.B.)		
2,000 L S.U.M.	1	12.32
Media filter	1	1.19
Feeds		
~500 L feed		
Mixing BPC, 500 L S.U.M.	1	8.50
500 L storage BPC	1	5.58
~80 L glucose		
Mixing BPC, 100 L S.U.M.	1	6.08
100 L storage BPC	1	3.58
~40 L base		
50 L storage BPC	1	3.13
~4 L antifoam		
5 L BPC	1	0.56
Filters for Feeds	3	0.70
Total product and packaging waste generated for 2,000 L volume (kg):		89.16
Total product and packaging waste generated for 10,000 L volume (kg):		445.78
Waste reduction		27%

Designing the DynaDrive S.U.B. to generate significantly less product and packaging waste is a win for our customers, our company and the planet.

Find out more at **thermofisher.com/dynadrive**