

Operations in fungal bioreactor train

Unit number	Type	Unit description	Overall Mass Balance (In) – (Out) = 0
4.0	Holding Tank for Solids Bioreactor	Mixing Supplementary Feed and providing buffer capacity to average flows and compositions	$(U1 + U2 + U3 + U4 + U5 + U6 + U7 + U8) - (U) = 0$
4.1	Solids Bioreactor	Solids Bioreactor	$(U + H4 + H5) - (H1) = 0$
4.2	Separator	Separates crust-associated (surface) products from rest of growth matrix	$(H1) - (H2 + Y1) = 0$
4.3	Separator	Solid/Liquid separation, e.g. Press to separate liquid medium from support matrix	$(H2) - (H3 + Y2) = 0$
4.4	Separator	Cake-related product recovery from residual compost	$((H3) - (Y3 + Y4) = 0$

Streams in fungal bioreactor train

Stream number	Stream description	Relation to process units	Relation to other streams Equations refer to mass balance (kg/day)
H1	Solids Matrix	From Unit 4.1 Solids Bioreactor Into Unit 4.2: Separator	$H1 = U + H4 + H5$ Composition complex.
H2	Wet Subsurface Matrix	From Unit 4.2: Separator Into Unit 4.3: Separator	Composition different from H1,H3
H3	Pressed Cake	From Unit 4.3: Separator Into Unit 4.4: Separator	$H3 = H2 - Y2$ Low volume, less wet. Composition: Similar to solids fraction of H2
H4	CO ₂	From Unit 4.1: Solids Bioreactor To Atmosphere	CO ₂ only
H5	H ₂ O	Between atmosphere and Unit 4.1: Solids Bioreactor	H ₂ O only
U1	Biosolids (Main Fraction)	From Unit 0.1: Separator Into Unit 4.0: Holding Tank for Solids Bioreactor	Volume and composition set by user. Dependent on PST efficiency set by user.
U2	Bacterial biomass	From Unit 1.4: Splitter Into Unit 4.0: Holding Tank for Solids Bioreactor	$U2 = C1 - (D + V1 + C4)$ Composition based on bacterial biomass as set by user
U3	Algal biomass not to product streams	From Unit 2.5: Splitter Into Unit 4.0: Holding Tank for Solids Bioreactor	Total algal biomass = $U3 + W3$ $U3 = E1 - (F1 + W1 + W2 + W3)$ Composition same as L
U4	Macrophyte Bottoms: Cellulosic biomass	From Unit 3.5: Splitter Into Unit 4.0: Holding tank for Solids Bioreactor	$U4 = G5 - X2$ Composition same as X2
U5	Macrophyte Bottoms: N,P rich sediment	From Unit 3.6: Splitter Into Unit 4.0: Holding tank for Solids Bioreactor	$U5 = G4 - X3$ Composition same as X3
U6	Supplementary Feed	Into Unit 4.0: Holding tank for Solids Bioreactor	Incoming stream, volume and composition set by user. (Optional stream)
U7	Supplementary Feed	Into Unit 4.0: Holding tank for Solids Bioreactor	Incoming stream, volume and composition set by user. (Optional stream)
U8	Supplementary Feed	Into Unit 4.0: Holding tank for Solids Bioreactor	Incoming stream, volume and composition set by user. (Optional stream)
Y1	Crust-Surface Related Product Stream	From Unit 4.2: Separator Exit system	$H1 * \text{Crust related product yield} * \text{Separation efficiencies}$
Y2	Liquor -Related Product Stream	From Unit 4.3: Separator Exit system	$Y2 = H1 - H2$ $Y2 = H1 * (\text{e.g.}) \text{Organic acid yield coefficient} * \text{Separation efficiencies}$ Composition: Similar to dissolved fraction of H2
Y3	Cake-Related Product Stream	From Unit 4.4: Separator Exit stream	$Y3 = H1 * \text{Cake-related Product Yield} * \text{Separation efficiencies}$
Y4	Compost	From Unit 4.4: Separator Exit stream	$Y4 = H3 - Y3$