

Supplementary Materials

Techno-Economic Feasibility of Winged Bean Seed Oil and Protein Meal Production

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Table S1: List of equipment and purchase cost (PC)

Quantity	Name	Description	Unit Cost (USD)	Cost (USD)
1	GR-101	Cracking Rated Throughput = 9.78 MT/h	133,000	133,000
1	HP-101	Hopper Vessel Volume = 7.84 m ³	25,000	25,000
3	SP-101	Screw Press Throughput = 3.23 MT/h	102,000	306,000
3	BE-101	Bucket Elevator Elevator Length = 8.00 m	8,000	24,000
3	HP-102	Hopper Vessel Volume = 2.75 m ³	20,000	60,000
1	VSCR-101	Seed cleaning Rated Throughput = 10.00 MT/h	16,000	16,000
1	GBX-101	Tumbling-cooling Rated Throughput = 10.00 MT/h	50,000	50,000
3	GR-102	Extruder Rated Throughput = 3.29 MT/h	102,000	306,000
1	VSCR-102	Vibrating Screen Rated Throughput = 835.88 kg/h	7,000	7,000
1	V-101	Flat Bottom Tank Vessel Volume = 6.15 m ³	33,000	33,000
1	PFF-101	Plate & Frame Filter Filter Area = 4.50 m ²	29,000	29,000
1	V-102	Flat Bottom Tank Vessel Volume = 24.00 m ³	75,000	75,000
1	RDR-101	Rotary Dryer Drying Area = 30.01 m ²	231,000	231,000

Quantity	Name	Description	Unit Cost (USD)	Cost (USD)
1	EH-101	Electric Heater Electric Power = 400 kW (max)	25,000	25,000
1	FL-101	Filler (1 MT/bag) Discrete Throughput = 0.14 entity/min	20,000	20,000
1	EH-102	Electric Heater Electric Power = 400 kW (max)	15,000	15,000
1	MX-101	High shear mixer Rated Throughput = 819.18 kg/h	13,000	13,000
1	R-101	Stirred Tank (degumming) Vessel Volume = 0.34 m ³	7,000	7,000
1	R-102	Stirred tank (bleaching) Vessel Volume = 0.68 m ³	12,000	12,000
1	V-103	Vertical-on-legs tank (holding) Vessel Volume = 4.72 m ³	28,000	28,000
1	EH-103	Electric Heater Electric Power = 400 kW (max)	15,000	15,000
1	HX-101	Heat Exchanger (plate & frame) Heat Exchange Area = 6.07 m ²	26,000	26,000
1	EH-104	Electric Heater Electric Power = 400 kW (max)	15,000	15,000
1	V-104	Flat Bottom Tank Vessel Volume = 21.90 m ³	71,000	71,000
1	EC-101	Electric Cooler Electric Power = 50 kW (max)	5,000	5,000
1	GBX-104	Deodorization Rated Throughput = 764 kg/h	92,000	92,000
1	GBX-105	Scrubber Rated Throughput = 50 kg/h	10,000	10,000
1	HX-102	Heat Exchanger (plate & frame) Heat Exchange Area = 0.7 m ²	7,000	7,000
1	HX-103	Heat Exchanger (plate & frame) Heat Exchange Area = 1.18 m ²	9,000	9,000
2	FL-103	Bottling (1 L each) Discrete Throughput = 6.15 entities/min	20,000	40,000
1	BX-101	Packaging (15 bottles/box) Discrete Throughput = 0.82 entities/min	15,000	15,000

Quantity	Name	Description	Unit Cost (USD)	Cost (USD)
1	MF-101	Bleaching earth (BE) filter Membrane Area = 16.98 m ²	62,000	62,000
1	DS-101	Disk-Stack Centrifuge Throughput = 0.91 m ³ /h	55,000	55,000
		Unlisted Equipment (20% PC)		459,000
		TOTAL		2,296,000

Table S2: Direct fixed capital (DFC) summary for 10 MT/h WBS capacity

DFC summary	USD
Total plant direct cost (TPDC)	
Equipment purchases cost (PC)	2,296,000
Installation (A) ($0.47 \times \text{PC}$)	1,079,000
Process piping (B) ($0.68 \times \text{PC}$)	1,561,000
Instrumentation (C) ($0.36 \times \text{PC}$)	827,000
Electrical (D) ($0.11 \times \text{PC}$)	253,000
Buildings (E) ($0.18 \times \text{PC}$)	413,000
Yard improvement (F) ($0.10 \times \text{PC}$)	230,000
Auxiliary facilities (G) ($0.70 \times \text{PC}$)	1,607,000
TPDC = PC + A + B + C + D + E + F + G	8,266,000
Total plant indirect cost (TPIC) USD	
Engineering (H) ($0.25 \times \text{TPDC}$)	2,066,000
Construction (I) ($0.35 \times \text{TPDC}$)	2,893,000
TPIC = H + I	4,959,000
Total plant cost (TPC) USD	
TPC = TPDC + TPIC	13,225,000
Contractor's fee & contingency (CFC) USD	
Contractor's fee (J) ($0.05 \times \text{TPC}$)	661,000
Contingency (K) ($0.10 \times \text{TPC}$)	1,322,000
CFC = J + K	1,983,000
Direct fixed capital (DFC) USD	
DFC = TPC + CFC	15,208,000



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