

Composting Operating Cost Estimate

Assumptions

Blended Labor rate (loaded) per hour	\$35.00	per hour
Loader, screen machine rate (fuel + insurance + maintenance)	\$55.00	per hour
Grinder machine rate	\$110.00	per hour
Mixer machine rate	\$65.00	per hour
Facility is open 5 days/week, 52 weeks/yr	260	days/yr

Neglects any overlap of labor functions between tasks

Processing Volumes

	Avg Annual Vol.	Average Daily Volume
Carbon Amendments	57,475 CY/yr	221.1 CY/day
Nitrogenous wastes - solid	19,257	74.1
Nitrogenous wastes - liquids	2,288	8.8
Overs from screen	18,517	71.2
Totals	97,536 CY/yr	375.1 CY/day

Materials Handling Assumptions

- Assume wastes & products handled by loader with separate buckets
- Bucket capacity of loaders 6 CY
- Grinding done by horizontal grinder
- Mixing done by mechanical mixer
- Materials moved to composting and curing with loaders
- Materials moved to storage (overs and compost) by loaders

Scalehouse operations

- Assume scalehouse open 8 hrs/day, 5 days/week
- Time spent managing scalehouse 8 hrs/day
- Labor cost/year \$ 72,800
- Machine cost/year \$ -

Materials Handling - Waste Receipt & Storage

- Daily volumes coming into facility - non-liquids 295.1 CY/day
- Number of loader "bucket-movements" to keep waste receipt area managed
- Daily volume / capacity of loader bucket 49 buckets/day
- Assume time spent per loader movement 2 minutes
- Time spent handling feedstocks 98 minutes/day
- Convert to hours 1.6 hours/day
- Labor cost/year \$ 14,920
- Machine cost/year \$ 23,446

Materials Handling - Grinding

- Assume all carbon-rich feedstocks and overs go through grinder 292 CY/day
- Assume use of Rotochopper B66 horizontal grinder 50 CY/hr
- Assume grinder used 12 hrs/week (avg. of 2.4 hrs/day) 5.8 hr/day
- Labor cost/year \$ 53,194
- Machine cost/year \$ 167,181

Materials Handling - Liquids in Mixing Pits

- Average daily liquid volumes coming in 8,887.7 gallons/day
- Average daily compost absorbent (50 CY/ 6,000-gal tanker) 74 CY/day
- Number of loader "bucket-movements" to cover/mix liquids + compost
- Daily volume / capacity of loader bucket 12 buckets/day
- Assume time spent per loader movement 2 minutes
- Time spent handling feedstocks 25 minutes/day
- Average daily wetted compost/liquids mix (80% moisture) 74 CY/day
- Number of loader "bucket-movements" to extract mix and move to mixing
- Daily volume / capacity of loader bucket 12 buckets/day
- Assume time spent per loader movement 5 minutes
- Time spent handling feedstocks 62 minutes/day
- All time spent handling liquids + compost 86 minutes/day
- Convert to hours 1.4 hours/day
- Labor cost/year \$ 13,105
- Machine cost/year \$ 20,594
- Compost needed until on-site compost ready (74 CY/d *30 d) 2,220 CY
- Cost of SMSC compost \$ 25.00 per CY
- Consumables cost \$ 55,500

Materials Handling - Mixing

- Assume all feedstocks go through mixer, loader used to load and remove 375 CY/day
- Assume use of Rotomix Mixer 920-18
- Rotomix capacity per mixing event 38 CY/event
- Mixing events per day 10 mix events/day
- Assumed length of mix event 15 minutes/event
- Mixer and loader time needed 2.4 hr/day
- Labor cost/year \$ 22,264
- Machine cost/year \$ 76,333
- Cardboard purchased for carbon content 5,000 tons/year
- \$ 130 \$/ton
- Consumables cost \$ 650,000

Materials Handling - Transport To Composting Pad

- Avg. daily volume going to composting (assume 10% shrink in mixing) 338 CY/day

Number of loader bucket movements	56 buckets/day
Time to tear down, pick up, transport to ASP bunker, return	4 min/bucket
Total time needed to move compost to bunker	225.1 minutes/day
Convert to hours	3.8 hours/day
Labor cost/year	\$ 34,138
Machine cost/year	\$ 53,645

Building ASPs

Assume all ASPs built with loader	6 CY/bucket
Daily volume coming to composting bunkers	338 CY/day
Number of buckets per day	56 buckets/day
Time needed to install plenum, load bunker, install cover	5 minutes/bucket
Time needed to build ASPs	281.4 minutes/day
Convert to hours	4.7 hours/day
Labor cost/year	\$ 42,672
Machine cost/year	\$ 67,056

Aerated Static Pile Composting Cost

Size of blowers (2 - one for primary & one for secondary)	60 hp	Assume central blower
Assume blower controlled by VFD to keep temps at 145 deg. F	24 hrs/day	variable frequency; on 24/7
Assumed electrical consumption at 0.74 kW = 1 hp, assume 50% usage	22.2 kilowatts	will not be running at full speed at all times; need average hourly electrical usage
kWh per day	533 kWh/day	
Cost of electricity	\$ 0.10 per kWh	
Annual cost of blower motor	\$ 19,447	
Annual electricity cost for blower	\$ 19,447	

Contact Water Tank Management

Assume contact water tank pumped out to discharge to WWTF weekly	
Tank volume	25,000 gal
Pumping rate	50 gal/minute
Time needed to pump tank down	500 minutes/week
Convert to hours	1.7 hours/day
Labor cost/year	\$ -
Assume machine rate for pump is 5% capex	
Machine cost/year	\$ 3,750

Materials Handling - Moving Compost to Secondary Aerated Composting

Avg. daily volume going to secondary composting (assume 20% shrink)	270 CY/day
Number of loader bucket movements	45 buckets/day
Time to tear down, pick up, and transport	3 min/bucket
Total time needed to move compost to secondary composting	135 minutes/day
Convert to hours	2.3 hours/day
Labor cost/year	\$ 20,483
Machine cost/year	\$ 32,187

Materials Handling - Moving Compost to Curing

Avg. daily volume going to curing (assume 20% shrink)	216 CY/day
Number of loader bucket movements	36 buckets/day
Time to tear down, pick up, and transport	5 min/bucket
Total time needed to move compost to curing	180 minutes/day
Convert to hours	3.0 hours/day
Labor cost/year	\$ 27,310
Machine cost/year	\$ 42,916

Managing Curing Piles

Assume curing piles built with loader	6 CY/bucket
Number of curing piles	2 piles
Average daily volume coming to curing	251.9 CY/day
Number of buckets per day	42 buckets/day
Time needed to move feedstocks from secondary composting to curing	2 minutes/bucket
Time needed to build piles	84 minutes/day
Assume loader used to turn piles once during curing	1 turns/cycle
Total curing piles volume	5457 CY/cure cycle
Bucket movements needed to turn cure piles	910 buckets/cycle
Time to turn one bucket	0.5 minutes/bucket
Time to turn all piles/cure cycle	454.8 minutes/cycle
Total time spent building/turning piles	874.5 minutes
Convert to hours	14.6 hours
Convert to per day equiv	2.9 hours/day _{equiv}
Labor cost/year	\$ 26,528
Machine cost/year	\$ 41,687

Screening Compost

Avg. daily volume going to screening (assume 10% shrink in curing)	227 CY/day
Number of loader bucket movements daily	38 buckets/day
Time to move compost from curing to screening	2 min/bucket
Total time needed to move compost	76 min/day
Convert to hours	1.3 hrs/day
Assume screen throughput rate	50 CY/hr
Screen run time per day (assume no add'l labor needed)	4.5 hrs/day

Total time for screening compost and making soil blends 4.5 hrs/day
 Labor cost/year \$ 11,460
 Machine cost/year \$ 27,429

Materials Handling - Screened Compost to Storage

Assume fines yield off screen 60 %
 Avg. daily volume coming off screen 136 CY/day
 Number of loader bucket movements 23 buckets/day
 Time to tear down, pick up, transport 2 minutes/bucket
 Total time needed to move compost to storage 45.3 minutes/day
 Total time needed to load and move compost 45 minutes/day
 Convert to hours 0.8 hours/day
 Labor cost/year \$ 6,876
 Machine cost/year \$ 10,805

Materials Handling - Overs to Storage

Assume overs yield off screen 40 %
 Avg. daily volume coming off screen 90.7 CY/day
 Number of loader bucket movements 15 buckets/day
 Time to tear down, pick up, transport to woody wastes storage 2 minutes/bucket
 Total time needed to move overs 30.2 minutes/day
 Total time needed to load and move overs 30 minutes/day
 Convert to hours 0.50 hours/day
 Labor cost/year \$ 4,584
 Machine cost/year \$ 7,203

Process Management and Recordkeeping

Time needed to monitor temperatures, moisture, maintain operations log 1.5 hours/day
 Convert to hours 1.5 hours/day
 Labor cost/year \$ 13,650
 Machine cost/year \$ -

Product Outload

Annual compost production volume	48,539	CY/yr
Average daily production volume	187	CY/day

Wholesale distribution via tractor-trailer
 Tractor trailer truck capacity 40 CY
 Number of truckloads needed daily 5 per day
 Time needed to load each truck 0.5 hrs/truck
 Labor cost/year \$ 21,236
 Machine cost/year \$ 33,371

Annual Operating Expenses Summary

Labor Summary		ASP Composting				Total
Process	Hrs/Day	Labor Cost	Machine Costs	Consumables		
Scalehouse operations	8	\$ 72,800	\$ -			\$ 72,800
Waste Receipt	1.6	\$ 14,920	\$ 23,446			\$ 38,366
Grinding/shredding	1.6	\$ 53,194	\$ 167,181			\$ 220,374
Liquids in mixing pits	1.4	\$ 13,105	\$ 20,594	\$ 55,500		\$ 89,199
Mixing feedstocks	2.4	\$ 22,264	\$ 76,333	\$ 650,000		\$ 748,596
Transport to pad	3.8	\$ 34,138	\$ 53,645			\$ 87,783
Building ASPs	4.7	\$ 42,672	\$ 67,056			\$ 109,728
Electricity for ASPs	--	--	--	\$ 19,447		\$ 19,447
Leachate tank management	1.7	\$ -	\$ 3,750			\$ 3,750
Moving Compost to Secondary Aeration	2.3	\$ 20,483	\$ 32,187			\$ 52,670
Moving Compost to Curing	2.3	\$ 20,483	\$ 32,187			\$ 52,670
Managing Curing Piles	2.9	\$ 26,528	\$ 41,687			\$ 68,215
Screening Compost	1.3	\$ 11,460	\$ 27,429			\$ 38,889
Moving Screened Compost to Storage	0.8	\$ 6,876	\$ 10,805			\$ 17,681
Move Overs to Storage	0.5	\$ 4,584	\$ 7,203			\$ 11,788
Process Management and Recordkeeping	1.5	\$ 13,650	\$ -			\$ 13,650
Product Outload	0.5	\$ 21,236	\$ 33,371			\$ 54,606
TOTALS	37.2	Subtotals \$ 445,166	\$ 596,872	\$ 724,947		\$ 1,766,986
Assume 85% efficiency of site workers			Total \$ 1,766,986			
Number of work-hours needed	43.8 hrs/day	Annual Tons	41,479			
FTE's in a 8-hour day	5.47 FTEs	Per Ton	\$ 42.60			