



Properties of Shredded Wood Pallets

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Abstract

An estimated 2.9 billion board feet of wood waste was generated from discarded pallets in 1987, most of which was disposed of in landfills. However, available landfill space is decreasing, landfill costs are increasing, and solid waste reduction has the nation's attention. Problems and costs associated with the disposal of discarded pallets are beginning to alarm the pallet producing and pallet consuming industries. Fortunately, there are potential uses for discarded pallets. The objective of this research was to characterize the physical and chemical properties of wood particles produced from mechanically ground discarded wood pallets. These characteristics include moisture content (MC), ash content, higher heating value, moisture holding capacity, particle size distribution, and level of chemical contamination. This information was used to determine the suitability of the material for marketing as poultry litter, livestock bedding, and fuels. The wood particles were found to be low in MC and ash content and had a relatively high net heating value, rendering the material an excellent industrial fuel. The wood particles were also found to have good moisture holding capacity, an acceptable level of fines, and low levels of chemical contamination, rendering the material an excellent poultry litter or animal bedding.

Materials and Methods

Samples of wood particles from a pallet grinding operation in Illinois were taken on every other operating day between May 5 and June 25, 1986. A total of 23 samples were collected. Samples of wood particles from a pallet grinding operation in Florida were also taken on a periodic basis from May 5 to July 7, 1986. A total of 27 samples were collected. An additional nine samples were taken, twice daily between April 20 to 24, 1987, at a pallet recycling operation in Virginia.

For comparative purposes, samples of **poultry litters** were also taken from the Illinois and Virginia regions. This litter consisted of pine shavings and sawdust, as well as hardwood planer shavings. All samples were field collected, sealed in plastic bags at the collection point, and shipped to the **Sardo Laboratory at Virginia Polytechnic Institute and State Univ.**, Blacksburg, Va. (VPI&SU).

The following tests were performed on the samples:

- **Moisture Content (MC):** oven-dry method.
- **Ash content:** according to ASTM D 1102-56, "Standard Methods for Ash in Wood."
- **Higher Heating Value (HHV):** according to ASTM D 2015-66, "Standard Methods for the Gross Calorific Value of Solid Fuel by the Adiabatic Bomb Calorimeter."
- **Moisture holding capacity:** find more information in the full paper.
- **Particle size distribution:** find more information in the full paper.
- **Concentration of organo-phosphate, organochlorine, and pentachlorophenol contaminants:** determined by the Pesticide Research Laboratory, Department of Biochemistry and Nutrition, VPI&SU, using gas chromatographic techniques. A Tracor 540 and a Micro-Tek 220 GC equipped with ECNi 63, FPD, and FID detectors were used. The column packing was as follows: 1.5/1.95 percent, OC-17/QF-1, 170 to 225°C and 10 percent, SP-2100, 170° to 225°C column temperatures. The procedures used are described in Fullerton et al. (4) and the Environmental Protection Agency's manual (3).

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Results:

Table 1 Summary table of moisture content, moisture holding capacity, and particle size.

Source of Wood Particles	No. of Samples	Moisture Content (%)	Moisture Holding Capacity (g H ₂ O/10g wood)	Particle Size Distribution (%)			
				x > 2.36mm	2mm < x < 2.36mm	1.7mm < x < 2mm	x < 1.7mm
Shredded pallets (1/4 in screen)	13	11.6 (10.6)	43.6 (10.8)	19.1 (41.0)	14.5 (22.5)	13.3 (15.1)	53.1 (20.8)
Shredded pallets (1/2 in screen)	10	10.4 (6.6)	39.4 (15.0)	40.2 (23.9)	14.5 (23.9)	10.2 (11.1)	35.0 (28.2)
Shredded pallets (1-1/4 in screen)	9	11.7 (19.0)	24.0 (11.5)	67.0 (19.8)	8.2 (21.0)	6.1 (10.5)	18.7 (8.8)
Duck litter	7	9.8 (3.7)	46.4 (3.3)	9.1 (25.6)	15.3 (12.4)	16.7 (14.5)	58.0 (7.7)
Turkey litter	7	12.4 (9.8)	24.0 (11.5)	86.0 (15.5)	4.0 (24.8)	2.0 (18.1)	8.0 (9.2)

Table 2 Summary table of ash content.

Source of Sample	No. of Samples	Ash Content (%)	Higher Heating Value (kcal/kg)	Estimated Net Heating Value (kcal/kg)
Illinois	23	0.44 (17.5)	4,425 (3.1)	3,814
Florida	10	0.45 (37.1)	4,562 (2.3)	3,934

Table 3 Summary table of chemical contaminants detected in shredded pallets, pallet parts, and poultry litter.

Source of Wood Particles	No. of Samples	Pesticides Detected	Highest Level of Concentration (ppm)	No. of Contaminated Samples
Illinois (pallets)	23	Heptachlor	0.046	1
		pp-DDT	0.232	1
		Phorate	0.225	2
		Malathion	0.482	1
		Lindane	0.163	7
		Phoedrin	0.132	1
		Methyl Parathion	0.167	3
		Aplha Chlordens	0.036	1
		Pentachlorophenol	7.180	12
		Endrin	0.448	1
Florida (pallets)	27	Lindane	13.647	7
		Dual	0.186	1
		Ethly Parathion	0.166	6
		Lasso	2.157	2
		Lexone	0.781	1
		Duraban	0.149	2
		Methyl Parathion	0.907	1
Virginia (pallets)	9	Pentachlorophenol	23.160	10
		Peroxom	3.100	2
		Dimethyl Phthalate	31.550	1
		Diethyl Phthalate	4.250	3
		Diocetyl Phthalate	5.720	3
		Vapona	0.380	2
		Phoedrin	0.250	1
Duck litter	7	Endrin	0.199	2
		Lasso	0.420	3
		Pentachlorophenol	0.840	2
		Alpha BHC	0.110	1
Turkey litter	7	Alpha BHC	0.110	2

More information can be found in the White and McLeod (1989) Properties of shredded wood pallets. Forest Product Journal. 39(6):50-54.

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