Wood for Good Lifecycle Database

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Wood Adhesive Mix

Key Information

General Process Description	1 kg of wood adhesive including urea formaldehyde (UF), polyvinyl acetate (PVA), phenol formaldehyde (PF), phenol resorcinol formaldehyde (PRF), melamine urea formaldehyde (MUF), polyurethane (PUR) and emulsion polymer isocyanate (EPI).
Reference Flow	1 kg of mixed wood adhesives
Reference Year	2013

Modelling & Assumptions

A wide range of wood adhesives are available on the market, each with different characteristics and areas of application. This dataset provides indicative results for wood adhesive based on a representative mix of widely-used adhesive types, including: Polyvinyl acetate (PVA), Urea formaldehyde (UF), Phenol formaldehyde (PF), Phenol resorcinol formaldehyde (PRF), Melamine urea formaldehyde (MUF), Polyurethane (PUR) and Emulsion polymer isocyanate (EPI)

No robust statistics on the market share of these adhesives could be found, however, UF, PVA, PF, PRF, MUF have traditionally been the most common adhesives for wood applications [Pizzi 2011], with PUR and EPI adhesives also used as alternatives in certain applications. Further anecdotal evidence suggests that PVA and UF are the most widely used of the seven adhesives modelled, so these two are assumed to contribute 60% of the overall mix. Using the information described above, the mix shown in the table below has been modelled:

Adhesive type	Estimated Percentage of Mix
Polyvinyl acetate (PVA)	*30%*
Urea formaldehyde (UF)	*30%*
Phenol formaldehyde (PF)	*10%*
Phenol resorcinol formaldehyde (PRF)	*10%*
Melamine urea formaldehyde (MUF)	*10%*
Polyurethane	*5%*
Emulsion polymer isocyanate (EPI)	*5%*

The exact country of origin of wood adhesives used in the UK is also unknown, so all have been modelled as originating from the EU-27. Information from PE International's GaBi database has been used to model the production of each of the individual adhesive systems [PE International

2013].

In the absence of more precise information, adhesives have been assumed to be transported from a plant in the Ruhr region (where a number of large chemical/adhesive companies are based) to the UK. Transport to port is assumed to be 260km, transport by sea from Rotterdam to Felixstowe is assumed to be 250km and onward transport in the UK is assumed to be 154 km based upon Department for Transport statistics for "Other chemical products" [DfT 2005].

Wood adhesives cannot be recycled at end-of-life, so only two end-of-life scenarios are presented: 100% incineration with energy recovery and 100% landfill. The impact of each of these is based on the characteristics of adhesive waste in municipal waste incinerators and landfills (where adhesives are classed as inert waste).

The reference flow is 1 kg of adhesive; users of this data should scale the impacts to the relevant quantity required for their particular application.

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Environmental Parameters Derived from the LCA

Production & Distribution (Cradle-to-Site)

Parameters describing environmental impacts	Units	Production *(A1-A3)*	Distribution and Installation *(A4-A5)*
Global Warming Potential	kg CO2 eq.	1.62	0.031
Ozone Depletion Potential	kg CFC11 eq.	6.94E-11	1.02E-13
Acidification Potential	kg SO2 eq.	0.0036	0.000234
Eutrophication Potential	kg PO4 eq.	0.000869	4.01E-05
Photochemical Ozone Creation Potential	kg Ethene eq.	0.000931	-4.1E-05
Abiotic Depletion Potential (Elements)	kg Sb eq.	1.71E-06	8.56E-10
Abiotic Depletion Potential (Fossil)	MJ	33.6	0.418

Parameters describing primary energy	Units	Production *(A1-A3)*	Distribution and Installation *(A4-A5)*
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	0.864	0.00972
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0	0
Total use of renewable primary energy resources	MJ, net calorific value	0.864	0.00972
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value	35.0	0.419
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	0	0
Total use of non-renewable primary energy resources	MJ, net calorific value	35.0	0.419
Use of secondary material	kg	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0
Net use of fresh water	m^3	0.0118	7.60E-06

Other environmental information describing waste categories	Units	Production *(A1-A3)*	Distribution and Installation *(A4-A5)*
Hazardous waste disposed	kg	0.00113	7.26E-07
Non-hazardous waste disposed	kg	0.0170	3.11E-05
Radioactive waste disposed	kg	0.000541	4.91E-07

Other environmental information describing output flows	Units	Production *(A1-A3)*	Distribution and Installation *(A4-A5)*
Components for re-use	kg	0	0
Materials for recycling	kg	0	0
Materials for energy recovery	kg	0	0
Exported energy	MJ per energy carrier	0	0

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Environmental Parameters Derived from the LCA

End-of-Life

Parameters describing environmental impacts	Units	100% Energy Recovery		100% Landfill	
		End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)
Global Warming Potential	kg CO2 eq.	2.53	-1.56	0.0430	0
Ozone Depletion Potential	kg CFC11 eq.	7.54E-12	-4.5E-11	2.05E-13	0
Acidification Potential	kg SO2 eq.	0.000706	-0.00296	0.000148	0
Eutrophication Potential	kg PO4 eq.	6.24E-05	-0.000290	2.43E-05	0
Photochemical Ozone Creation Potential	kg Ethene eq.	2.92E-05	-0.000210	9.41E-06	0
Abiotic Depletion Potential (Elements)	kg Sb eq.	1.65E-07	-3.20E-08	5.42E-09	0
Abiotic Depletion Potential (Fossil)	MJ	1.50	-23.2	0.584	0

Parameters describing environmental impacts	Units	100% Energy Recovery		100% Landfill	
		End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	0.0778	-0.691	0.0157	0
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0
Total use of renewable primary energy resources	MJ, net calorific value	0.0778	-0.691	0.0157	0
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value	1.62	-25.7	0.593	0
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	0	0	0	0
Total use of non-renewable primary energy resources	MJ, net calorific value	1.62	-25.7	0.593	0
Use of secondary material	kg	0	0	0	0
Use of renewable secondary fuels	MJ, net calorific value	0	0	0	0
Use of non-renewable secondary fuels	MJ, net calorific value	0	0	0	0
Net use of fresh water	m^3	0.00610	-0.00288	-0.00056	0

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Parameters describing environmental impacts	Units	100% Energy Recovery		100% Landfill	
		End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)
Hazardous waste disposed	kg	8.25E-05	-0.00109	8.76E-06	0
Non-hazardous waste disposed	kg	0.233	-0.00524	1.00	0
Radioactive waste disposed	kg	4.72E-05	-0.00105	3.63E-06	0

Parameters describing environmental impacts	Units	100% Energy Recovery		100% Landfill	
		End-of-Life Processing (C1-C4)	Material and Energy Credits (D)	End-of-Life Processing (C1-C4)	Material and Energy Credits (D)
Components for re-use	kg	0	0	0	0
Materials for recycling	kg	0	0	0	0
Materials for energy recovery	kg	0	0	0	0
Exported energy from Electricity	MJ	4.78	0	0	0
Exported energy from Thermal Energy	MJ	13.1	0	0	0

References

DfT 2005	Department for Transport, 2005. Continuous Survey of Road Goods Transport. Department for Transport, London, UK.
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Pizzi 2011	Pizzi, A., Mittal, K. L., 2011. *Wood Adhesives.* CRC Press, Boca Raton, FL, USA

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