

Fuel Analysis and Logistics



Lantmännens
Renewable Fuels

Producers and Suppliers of Solid Biofuels

Fuel Analysis – 6mm and 8mm wood pellets

Our Grade 1 pellets are produced in factories with stringent quality control and conform to Swedish Standard SS 187120

Table One

Lantmännen Renewable Fuels Wood Pellets As Received basis	Specification
Diameter	6 mm and 8 mm
Length	Max 4 times the pellet diameter
% Moisture Content (Total)	< 10%
% Ash	< 0.5%
% Total Sulphur	< 0.08%
% Chlorine	< 0.03%
Net Calorific Value MJ/kg	> 17.0MJ/kg
Fines in % < 3mm	< 0.8%
Bulk Density	ca 650kg/m ³



Table Two

Typical as received and limits on other trace elements:

Substance	Unit	Typical As received	EA Limits
Arsenic	Mg/kg	0.2	5
Cadmium		0.01	3
Chromium		0.6	30
Copper		0.4	50
Lead		0.1	20
Mercury		< 0.1	0.1
Nickel		0.7	30
Vanadium		<0.1	20
Zinc		5.3	200

The product is shipped in bulk 28 tonne containers from Sweden and filled direct from the silos at the pellet mill. This avoids excessive handling and degradation during the transfer from Sweden to storage facilities in the UK.

Delivery Logistics

Delivery is by:

- 1.0 Bulk pellets by the tonne
- 2.0 Bulk Bags of 650 kg
- 3.0 16 kg Domestic Bags on pallet

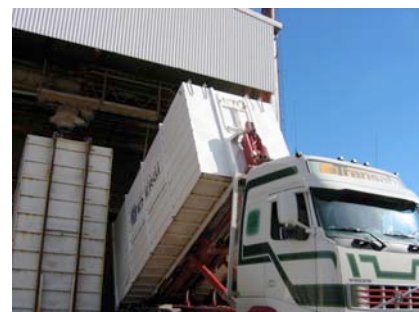
1.0 Bulk tonnage using mechanical / pneumatic delivery vehicles:

- The vehicles can discharge horizontally up to about 5 metres and over 20 metres vertically.
- To minimise pellet damage ideally horizontal discharge should be kept below 10 metres.
- Discharge is about 8/9lbs per square inch of pressure (just over half a bar).
- There is little difference in either discharge time or pressure between 6 & 8mm diameter pellets

Our hauliers have significant experience in the delivery of animal feed in the agricultural sector which transfers well into fuel delivery where care has to be taken during transfer to retain the products integrity and keep dust generation to a minimum.

Lorry Dimensions	Rigid Vehicles	Articulated Vehicles
Load carrying capacity	18 tonnes	24 tonnes
Wheelbase	6.8m	11.4m
Overall length	8.9m	12.9m
Overall height	3.78m	3.85m
Overall width	2.6m	2.6m
Turning circle	28.5m*	12.3m

* The turning circle of 8 wheelers is really academic as to manoeuvre in restricted areas these vehicles shunt to gain access so this reduces the "manoeuvrable" circle to approximately 20 meters.



Delivery Considerations for Bulk Supply

Connections – Delivery by pneumatic blower requires the hose from the lorry to be connected to the hopper by an inlet pipe. Our contractors can connect to a variety of inlet pipes but it is helpful prior to delivery to advice on the inlet pipe diameter and/or type of bayonet connection. Typical hose couplings are Stortz or Bauer couplings.



Outlet for air

Inlet for pellets

110mm Stortz Couplings c/w blanking caps installed on a new build hopper.

Noise – During the filling operation noise levels can reach 80dB within 1 metre of the wagon. Whilst this level is not a hazard in itself for the local community consideration should be given particularly to schools, libraries, hospitals etc. and an appropriate location given for the fill location and an appropriate time of delivery agreed.

2.0 Bulk bags of 650 kg using HIAB crane delivery.

3.0 Domestic Bags: 16 kg bags on pallets

Delivered direct to customers and appointed distributors throughout the UK. Delivery is by a 'carrier' type 7.5 tonne vehicle with tail lift and a pallet pump truck. Pallet delivery includes off loading pallet by tail-lift; removing product off the pallet by method of hand-balling and disposing of pallet and shrink-wrapping. Our drivers are guided by best code of practice for hand-balling which specifies that the dispatch area for products must be 'a safe and secure location within close entry to the premises'.



Agrol Wood Pellets in 650 kg bulk bag

16 kg bags of 6mm and 8 mm Grade 1 pellets		
Full Pallet	52 bags	Total Weight 832 KG
Half Pallet	26 bags	Total Weight 416 KG
Quarter Pallet	13 bags	Total Weight 224 KG



Agrol wood pellets in 16 kg bags – stacked on pallets

In order to service the developing market in the UK we are committed to the development of a national distribution network. These will be strategically placed to serve growing markets throughout the UK.

MATERIAL SAFETY DATA SHEET: WOOD PELLETS
ISSUED 1st MARCH 2005

STATEMENT OF HAZARDOUS NATURE

PRODUCT NAMES:	Wood Pellet Fuel
OTHER NAMES:	Nil
UN NUMBER:	No UN Number allocated
HAZCHEM CODE:	No Hazchem Code allocated
USE	For Use in Pellet Burning Appliances

PHYSICAL DESCRIPTION / PROPERTIES

APPEARANCE / FORM:	Pelletised cellulose material
COLOUR:	Tan
ODOUR:	Slight wood scent
BOILING / MELTING POINT:	Not applicable
VAPOUR PRESSURE:	Not applicable
SPECIFIC GRAVITY:	Variable (<0.6)
FLASH POINT:	Not relevant
FLAMMABILITY LIMITS:	Not determined
SOLUBILITY IN WATER:	Insoluble

OTHER PROPERTIES

SHOCK SENSITIVITY:	Nil
OXIDIZING PROPERTIES:	Nil
CORROSIVENESS:	Nil
REACTIVITY WITH COMMON SUBSTANCES:	None known
AUTOIGNITION PROPERTIES:	None known
EVAPORATION RATE:	Not applicable
ODOUR THRESHOLD:	Not determined
pH AT 100%:	Neutral (pH7)
BIO DEGRADABILITY:	100%
PERCENTAGE VOLATILES:	Nil
VOLATILE ORGANIC COMPOUNDS:	Nil

HEALTH HAZARD INFORMATION

Acute Effects.

Injury in the form of mechanical abrasion to the skin, eyes or respiratory system is possible.

Swallowed: No evidence for humans of any acute effects should the product be swallowed.

Inhaled: Nominal exposure to dust represents very little danger to healthy individuals however best practise is to prevent airborne dust wherever possible. Dust particles may compromise the respiratory system in individuals who have respiratory conditions. The likely danger is mechanical abrasion or blockages to mucous membranes.

Skin contact: May cause mild irritation to sensitive or damaged skin through mechanical abrasion.

Eye contact: May cause mild irritation & redness through mechanical abrasion.

FIRST AID

Swallowed: Rinse mouth thoroughly with water. Do not induce vomiting.

Inhaled: Remove to fresh air or ventilated area if required.

Skin contact: Remove contaminated clothes and rinse thoroughly with water.

Eye contact: Flush with copious quantities of water for at least 15 minutes. Seek medical attention if required.

PRECAUTIONS FOR USE

Ventilation: Local exhaust or normal room ventilation.

Engineering / processing controls: Ensure adequate ventilation is provided.

Personal Protection: Gloves not required.

Eye contact: Goggles recommended in areas where dust may be a problem (for example high wind).

Respirator type: Recommended in areas where dust may be a problem or in cases in which the user may be asthmatic or have a respiratory condition. Dust mask (EN 149FFP2 or above).

Flammability Precautions: This product is combustible but is difficult to ignite. It will only sustain combustion in instances of continuous thermal attack. Extinguish using media appropriate to the cause of the surrounding fire.

PRECAUTIONS FOR SAFE HANDLING

Reactivity: None known. This product is not suitable for use on products that are considered strong oxidisers, alkalis or acids.

Other: Protection from weather. Store in temperatures of between 0-45 degrees Celsius. Keep dry.

Transport: No special transport requirements.

Spillage and leakage procedures: Material is biodegradable and may be incinerated. Sweep up spilled material.

Waste Disposal: This material must be disposed of in accordance with local regulations taking into consideration any absorbed material it may contain.

Fire / Explosive Hazard: Treat in the same manner as any combustible cellulose material. Extinguish by Water, spray or foam.

Tripping hazard: Loose pellets and dust accumulation can present a trip or slip hazard.

INGREDIENTS

Chemical Name: Contains cellulose materials.

Cas No: Nil.

OTHER NOTES

Information contained in this Material Safety Data Sheet is based on currently available information. Every care has been taken to ensure its completeness on the information presented.

Any material may present health hazards that are not known at the time of preparation of this advice. As such the final determination of a product's suitability, for a given purpose, is the sole responsibility of the end user.

Quality standards for pellets in European countries

Austria: ÖNORM M1735 (briquettes and pellets)
 Sweden: SS 187120 (pellets) and SS 187121 (briquettes)
 Germany: DIN 51731 (briquettes and pellets)

Specification	Austria ÖNORM M1735		Sweden SS 18 71 20			Germany DIN 51731 / DIN plus			CEN CEN/TS 14961:2005 Annex A
	Wood pellets	Bark pellets	Group 1	Group 2	Group 3	5 size classes [cm]			
Origin									Chemically untreated wood without bark
Size	- Pellets : 4 - 20 mm Ø max. 100 mm lg.	-Briketts: 20 -120 mm Ø max. 400 mm lg.	max. 4 Ø**)	max. 5 Ø	max. 6 Ø		Length	Ø	D06 ≤ 6 mm ± 0,5 mm and L ≤ 5 × Diameter D08 ≤ 8 mm ± 0,5 mm and L ≤ 4 × Diameter
						HP1	>30	>10	
						HP2	15-30	6-10	
						HP3	10-15	3-7	
						HP4	<10	1-4	
HP5	≤5	0,4-1							
Bulk density			≥ 600 kg/m ³ **)	≥ 500 kg/m ³	≥ 500 kg/m ³				Recommended to be stated if traded by volume basis
Fines in % <3mm			≤ 0,8	≤ 1,5	≤ 1,5				F1.0 ≤ 1,0 % F2.0 ≤ 2,0 %
Unit density	≥ 1,0 kg/dm ³	≥ 1,0 kg/dm ³						1-1,4 g/cm ³	
Moisture content	≤ 12 %	≤ 18 %	≤ 10 %	≤ 10 %	≤ 12 %			<12 %	M10 ≤ 10 %
Ash content	≤ 0,5 % *)	≤ 6,0%*)	≤ 0,7 %	≤ 1,5 %	>1,5 %			< 1,5 %	A0.7 ≤ 0,7 %
Calorific value	≥ 18,0 MJ/kg*)	≥ 18,0 MJ/kg*)	≥ 16,9MJ/kg ≥ 4,7 kWh/kg	≥ 16,9MJ/kg 4,7 kWh/kg	≥ 16,9MJ/kg 4,7 kWh/kg			17,5 - 19,5 MJ/kg ***)	16,9 MJ/kg 4,7 kWh/kg
Sulphur	≤ 0,04 %*)	≤ 0,08 %*)	≤ 0,08 %	≤ 0,08 %	anges			< 0,08	S0.05 ≤ 0,05 %
Nitrogen	≤ 0,3 %*)	≤ 0,6%*)						< 0,3	N0.3 ≤ 0,3 % N0.5 ≤ 0,5 % N1.0 ≤ 1,0 % N3.0 ≤ 3,0 % N3.0+ > 3,0 % (actual value to be stated)
Chlorine	≤ 0,02%*)	≤ 0,04%*)	≤ 0,03%	≤ 0,03%	anges			< 0,03	Recommended to be stated in category: CL 0.03 CL 0.07 CL 0.10 CL 0.10+ (if CL>0.10 % the actual value to be stated)
Arsenic								<0,8 mg/kg	
Cadmium								<0,5 mg/kg	
Chromium								<8 mg/kg	
Copper								<5 mg/kg	
Mercury								<0,05 mg/kg	
Lead								<10 mg/kg	
Zinc								<100 mg/kg	
EOX, extractabl.org. halogens								<3 mg/kg	
Fines. bevor delivery to costumer	max. 1 %							max. 1 %	
Additives	max. 2 % only natural				to be stated				< 2w-% of dry basis. Only products from the primarily agricultural and forest biomass that are not chemically modified are approved to be added as a pressing aids. Type and amount of additive has to be stated.
Ash melting point					temperatur to be stated				
Durability									DU97.5 ≥ 97,5

*) of dry basis **) at factory ***) without ash and water