

Chipping of whole stem harvested Willow 27th September 2007



Nordic Biomass had on the 27th of September 2007 invited to a demonstration of wood chippers working in whole stem harvested Willow.

The purpose was to test some of the wood chippers that are available on the market today, to find out if they can produce a quality of willow chips that can be used in both large and small stoker fed boilers.

As this was the “first attempt” Nordic Biomass had not invited to an “Open Field Day”. Only producers and importers of wood chippers were invited together with a couple of Nordic Biomass’s R & D contacts from AgroTech A/S and Danish Technological Institute.

TP Linddana came with two chippers: TP 150 Mobile (with own engine) and TP 250 PTO (tractor mounted).

The Danish import company RETEC came with two different brands: A tractor mounted Vandaele FC 400 with crane, and a JENZ HEM 560 Z trailer model (PTO driven), also with crane.

Nordic Biomass A/S

Villerup Hovedgård, Villerupvej 78, 9800 Hjørring, Denmark

Ph. +45 9896 2073 Fax. +45 9896 2373 E-mail: info@nordicbiomass.dk

Web: www.nordicbiomass.dk VAT: DK-3069 3558

Two other companies were invited, one did not want to participate, the other had to cancel because of technical problems.

Nordic Biomass had planned to test a new machine (a modified forage harvester), but unfortunately, it was not ready.

The Willow available for the tests was harvested in March 2007 with the Nordic Biomass self propelled whole stem harvester.

The harvested Willow was three year old, planted in the spring of 2004.

The harvested stems were unloaded in the headland in approx. 180 - 200 cm high piles.

All the chippers were tested with different set up to produce different sizes of chips.

All the chippers were able to produce chips that can be used in large boilers, like the district heating plants.

The chips produced with the JENZ chipper, is mainly suited for the larger boilers. It has a very high capacity!



Figur 1 JENZ HEM 560 Z

The Danish importer (RETEC) has given the following information about JENZ wood chippers:

The JENZ wood chipper HEM 560 Z used for the test, has a feed opening of 560 x 990 mm. The HEM 560 Z is a drum type chipper. 10 knives are mounted on the rotor. To have a more aggressive feeding of material, it is mounted with a feeding drum with small spikes.

The German company JENZ produces wood chippers capable of chipping logs from 36 cm to 100 cm in diameter and with engines up to 612 HP. The machines are available with a range of accessories for different applications. See more at: www.jenz.de

The Vandaele chipper can produce smaller chips suitable for smaller boilers. Making very small chips reduces the capacity.



Figur 2 Vandaele

The Danish importer (RETEC) has given the following information about Vandaele wood chippers:

The Vandaele FC 400 used for the test, has a feeding opening of 400 x 280 mm, this means that it can take logs up to 28 cm in diameter.

The Belgium company Vandaele produces wood chippers capable of chipping logs from 12 cm to 40 cm in diameter. Knives and anvils are made of tungsten carbide, a very hard material which gives good wear resistance. This means that you can have up to 1000

hours of operation before the knives must be replaced, there is no sharpening of the knives. The knives are divided in sections which means you can easily change a section if it is damaged. To have a more aggressiv feeding of material, it is mounted with a feeding drum with small spikes. The FC 400 is PTO driven, and needs a tractor with minimum 130 HP. See more at www.vandaele.biz

Both machines from TP Linddana are from what the company calls the Park Range, this indicates that these machines are smaller than the machine from Vandaele.

TP 150 can take logs up to max. 15 cm diameter, the TP 250 can take logs up to max. 25 cm.

Both machines could produce chips of good quality, ofcourse with different capacities.

The two machines from TP Linddana were without crane, a direct comparison of capacity with the other machines were therefore not possible.

For use of the chips in a smaller boiler, it can be a problem if the thin tops of the willow are not cut, this was not so big a problem as we had feared.



Figur 3 TP Linddana 250



Figur 4 TP Linddana 150

The producer (Linddana) has given the following information about the TP wood chippers:

TP 150 and TP 250 are both available as PTO driven wood chippers, or on a trailer with own engine. Both chippers are from the Linddana Park Range that is characterized by a very uniform quality of chips. Both chippers have two hydraulic driven feed rollers with a heavy duty spring for compression of these.

The TP 150 chipper is a compact and efficient chipper with hydraulic driven feed rollers for logs up to 150 mm in diameter. The integrated hydraulic system, and the two horizontal feed rollers ensure a strong and trouble free feeding. The chip size can be adjusted with the hydraulic system from 0 – 8 mm, and the capacity is 3 – 4 m³ pr. hour at normal operation.

The TP 250 chipper is an aggressive and flexible chipper that produces a uniform quality of chips. It will take logs up to 250 mm in diameter. The chipper can be delivered with or without a crane. The TP 250 is equipped with 3 knives and 3 anvils. This ensures a powerful feeding, and a uniform chip size. The chipper has hydraulic control of the speed of the feed rollers, and by that the chip size. It can produce chips up to 13 mm, and the experience shows a capacity of 10 – 12 m³ pr. hour when fed manually, and 12 – 15 m³ pr. hour when fed by crane.

We expected that it would be an advantage to have a crane and a feeding table to ensure a good capacity, this was confirmed by the test.

It was difficult to have an optimum feed of the Vandaele chipper, because the root end of the willow tends to "spread out" when the crane grips around a bundle.

Feeding was possible, but it was difficult to get an optimum flow, and many stems were dropped on the ground.



Figur 5 Feeding table on the JENZ chipper

Vandaele makes a feeding table for their chippers, but this was not available for the test.

Feeding willows into the JENZ chipper was much easier, as the feeding table ensures a steady flow.

The TP 250 can also be delivered with a crane, but TP do not make feeding tables for their machines. The machine can be fed with a crane, but as the test showed, it will be difficult to achieve maximum capacity without a feeding table.

As described, the test was done with machines in different sizes. The main purpose of the test was not to test the exact capacity of the machines, but mainly to see if they could produce a quality chips that can be used in standard stoker boilers.

Our conclusion on the day is, that all tested machines can produce chips from Willow in an acceptable quality.

There is a big difference in the capacity of the tested machines, there is a clear relation between capacity and price!!

On the following pages you can see pictures of some of the chips. We must emphasize that this is not a scientific comparison! But it gives an idea of what the chips look like.

For more information about the tested machines, we refer to these webpages:

TP Linddana: www.linddana.dk

Retec: www.retec.dk (Danish importer of JENZ and Vandaele)

JENZ: www.jenz.de

Vandaele: www.vandaele.biz

Prices for wood chips in Denmark

The price calculation model for wood chips used by the district heating plants in Denmark for gives a better price for dry than for wet chips.

Examples from the calculation model with the following conditions:

- Heating value (dry matter content): 18,50 GJ/ton
- Agreed price: 35,00 kr./GJ

Chips with 50 % moisture:	281,05 Dkr./ton FW	594,11 Dkr./ton ODT
Chips with 30 % moisture:	427,63 Dkr./ton FW	543,63 Dkr./ton ODT

(1 Euro is approx. 7,45 Dkr.)

This means: Approx. 500 Dkr more/ha, this is without the dry matter loss that happens during storage of wet chips.

This clearly indicates the advantages by delivering a dry chip, which is possible if you use whole stem harvesting followed by chipping after a drying period.



Figur 6 JENZ "small chips"



Figur 7 JENZ "large chips"



Figur 8 Vandaele "smal chips"



Figur 9 Vandaele "medium chips"



Figur 10 Vandaele "large chips"



Figur 11 TP Linddana 150 "small chips"



Figur 12 TP Linddana 150 "large chips"



Figur 13 TP 250 (Only one sample was taken)