MONITORING REPORT FOR MOISTURE METER

HA FOOTE HAULAGE LTD

WOOD CHIP DELIVERY

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Prepared by

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MONITORING REPORT FOR MOISTURE METER

Consultant

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A	Draft	2/06/09	Mika Miettinen
B	Final	5/06/09	Mika Miettinen

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1 COMMISSIONING CHECK

1.1 GENERAL DESCRIPTION

HA Foote Haulage, a trucking and landscaping supplies company, supplies wood chips from 22 Bridgman Street, Dunedin to Tahuna Intermediate School in Dunedin. To define the energy content of wood chips HA Foote Haulage uses a specialist wood chip moisture metering device (Figure 1).

Figure 1 Specialist wood chip moisture metering device

This moisture meter is based on a capacitive method. The capacitive method is based on the dielectric properties of water. The dielectric constant of water is very high compared to that of wood. Therefore, differences in water concentration can be determined by capacity changes of a compensator.[1] The moisture meter express the water content (= moisture content in the wet basis). The inside of the moisture meter is shown in Figure 2.

Figure 2 Inside of the moisture meter

A schematic of the inside construction of the moisture meter is shown in Figure 3. The principle of the moisture meter is that one plate of the capacitor is the metal housing of the vessel and the other plate of the capacitor is the red tube that is isolated from the other parts of the capacitor. The measurement is based on the frequency-change of an oscillator through the moist wood chips. Wood chips containing a lot of water transfer more electricity between capacitors than low water content wood chips.

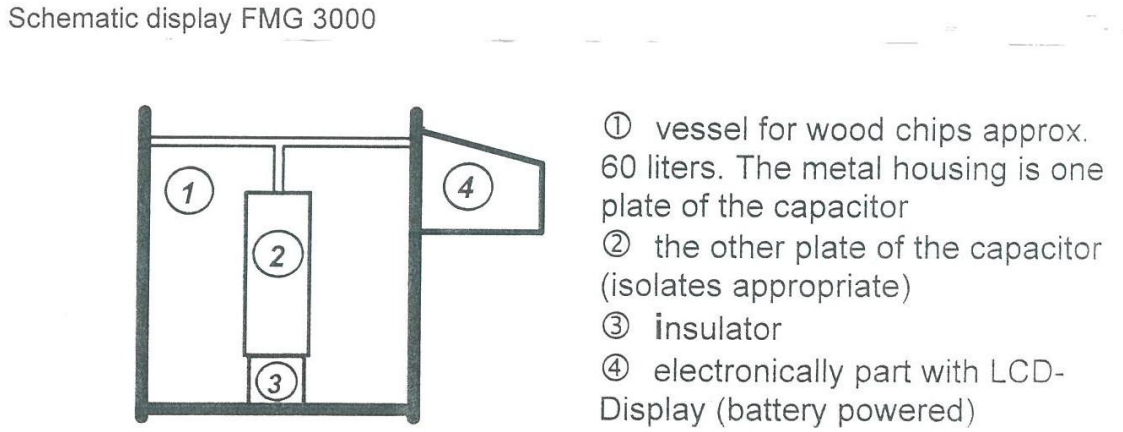

Figure 3 Schematic of the inside construction of the moisture meter (from manufacturer's material)

1.2 SPECIFICATIONS

The moisture meter is a Pandis FMG 3000.

1.3 INVOICES

HA Foote Haulage applied for funding towards the purchase of the moisture meter. The estimated and actual (invoiced) costs of the moisture meter are shown in Table 1 (excluding GST). The total cost of the moisture meter was more than the estimated cost because of variations in the exchange rate.

Table 1 Estimated and actual (invoiced) costs of the blower, accessories and modification

Item	*Description*	*Supplier*	*Estimated cost*	*Actual cost*	*Invoicing date*
1	FMG 3000 moisture meter	Spark Biomass Energy	$6,250.00	$6,663.29	13/01/2009
	TOTAL		$6,250.00	$6,663.29	

All items in Table 1 have been verified.

1.4 OPERATIONAL

A grant was obtained by HA Foote Haulage from EECA to purchase a moisture meter. The commissioning check was performed on 22.5.09, and the moisture meter was as described in paragraph 1.1. The moisture meter is very simple to use, housing only two buttons and clear on-screen instruction texts. The calibration of the moisture meter is also simple. Before calibration, the meter should be placed in a dry place with the cover open. Once the container is dry and clean the cover is closed and calibration performed (water content (= moisture content in the wet basis) will show 0 % if calibration is successful).

1.5 DELIVERY AND INSTALLATION

There were no problems with the delivery. There were no specific requirements for the installation.

1.6 GOOD NEWS

The moisture meter works well. The moisture meter is very simple to use with clear instructions.

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2 MONITORING REPORT

2.1 FINANCIAL

HA Foote Haulage applied for funding towards the purchase of the moisture meter. The estimated and actual (invoiced) costs of the moisture meter are shown in Table 1 (excluding GST). The total cost of the moisture meter was more than the estimated cost because of variations in the exchange rate.

Table 2 Estimated and actual (invoiced) costs of the blower, accessories and modification

Item	*Description*	*Supplier*	*Estimated cost*	*Actual cost*	*Invoicing date*
1	FMG 3000 moisture meter	Spark Biomass Energy	$6,250.00	$6,663.29	13/01/2009
	TOTAL		$6,250.00	$6,663.29	

The payback for the moisture meter is related to the wood chip delivery and invoicing based on the energy content of the wood chips. A method of measuring moisture content is a requirement of the delivery contract so this equipment was purchased out of necessity rather than on payback potential.

2.2 EMPLOYMENT

New people are not employed as a result of this project, however it has meant that existing staff can be retained during the economic down turn.

2.3 ENVIRONMENTAL

Carbon dioxide emissions have been reduced as indicated in Table 3.

Table 3 Reduction of annual CO_2 emissions for Tahuna Intermediate School in Dunedin when compared to coal

Description	Unit	Wood chips	Coal
Annual delivered volume	[m^3/y]	200	
Annual delivered mass	[kg/y]	43,600	
Annual fuel consumption	[MWh/y]	153	153
Specific emissions	[tonneCO_2/MWh]	0	0.336
Annual CO_2 emissions	[tonneCO_2/y]	0	51

2.4 WOOD FUEL QUALITY

The type of wood chips delivered is as shown in Table 4.

Table 4 Delivered wood chip specifications

Size	S50
Moisture % by weight as received	M30
Ash % by weight as received	A1
Bulk density	218 kg/m³
Energy density	12.6 MJ/kg

2.5 PLANT PERFORMANCE

The study by H. Hartmann and T. Böhm shows that the measurement error of the moisture meter is approximately +3 % and -2 % [1].

Reference

1. H. Hartmann and T. Böhm. *Rapid moisture content determination of wood chips - results from comparitive trials*. in *Proceedings from 1st World Conference on Biomass for Energy and Industry*. 2000. Sevilla, James and James Ltd, London, UK.