APPLICATION NOTE | DDS CALORIMETERS

C1.4 CALORIFIC MEASUREMENT OF FOOD

SAMPLE – STELLENBOSCH UNIVERSITY SAMPLE CODE : 321A FISH FOOD

INTRODUCTION

Many institutions are doing research and development on food. The aim is to improve the nutritional value of the food. The parameters may be to compare different foods or different manufactures or to generically improve the food. Other aspects may be to improve the digestion and energy absorption of animal feeds.

Part of the research involves determining the calorific value of the food. The calorific value of a particular food is the same as the energy content of that food.

The food can be for either human or animal consumption.

Institutions performing this type of research include:

- Animal and Dairy research
- Department of Agriculture
- Universities
- Technicons
- Government or private food industries

SAMPLE PREPARATION

A calorimeter is used to determine the calorific value of any substance that can be ignited. The substance must be in liquid or solid form. In the food industry most samples are in solid form as generally more energy is obtained from solid foods as opposed to liquid substances.

The sample to be measured must be a representative sample and homogeneous. The sample should either be measured as whole or should be ground into a powder, well mixed and then pressed into tablet form. Pressing the sample into a tablet prevents splattering when the sample burns. Splattering is when un-burnt sample is thrown out of the crucible during the combustion process, thus causing inaccurate results. In tablet form, food samples usually burn consistently and without splattering.

Some substances such as maize when ground into a powder will ignite easily and not splatter, but burns with a large open flame, which can easily destroy the o-rings in the vessel. Consequently maize should always be pressed into tablet form.

Certain items such as sugar can be analysed without pressing into tablets – weigh the sugar directly into the crucible.

All samples should have no moisture present before analysing. Freeze-drying the sample can remove the moisture.

FREEZE-DRYING PROCEDURE

The procedure for freeze drying is:

- Place a thin layer of the sample onto a flat plate - layer should not be more than 2-3 mm thick.
- Place the plate in a freezer for minimum of 24 hours.
- After 24 hours remove the plate and spoon the sample immediately into a glass bottle and seal.
- Allow the sample now to come to room temperature before use.
- Also keep the bottle sealed when not removing samples.

SPIKING

If a sample does not ignite easily or not at all, then the spiking method of ignition can be used. In this method a benzoic acid tablet is added to the crucible with the sample. The benzoic acid burns easily and ignites the sample; the energy of the benzoic acid is removed from the calculation of the calorific value.

ANALYSIS

Once the sample has been prepared the determination can be carried out in the normal method.

Ensure that the firing cotton touches the sample – with tablets lay the cotton on the bottom of the crucible and then move the tablet on top of the cotton. During the filling process do not knock the vessel, ensuring that the tablet does not move off the cotton.

When substances are being analysed for the first time always check after the determination for any residue on the walls of the vessel and check that the entire sample has burnt.

After a determination clean the inside of the vessel and the crucible before starting the next determination.

RESULTS

Stellenbosch University Code 321A Fish Food

RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
19.969	0.8012	5	09/09/2005	18	0.0002	21.1	20.8	OK	3.1
19.929	0.8014	6	09/09/2005	18	0.0006	22.1	22.2	OK	3.1
19.895	0.8010	7	09/09/2005	18	0.0005	23.4	23.0	OK	3.1
19.852	0.8019	8	09/09/2005	18	0.0001	24.0	24.0	OK	3.1
19.967	0.8000	9	09/09/2005	18	0.0010	24.4	25.6	OK	3.1
Average MJ/Kg = 19.922									

CONCLUSION

The calorific value of almost any food type can be determined. Calorific value analysis of a food type is one of many results required to determine the nutritional value of any food for either human or animal consumption.