



## APPLICATION NOTE | DDS CALORIMETERS

### CALORIFIC MEASUREMENT OF FOOD: PULSES

#### INTRODUCTION

Many institutions are doing research and development on food. The aim is to improve the nutritional value of the food and check for quality control. The Quality control is a major concern for food production when a dried product is sold. The moisture in the food product shows up as a low CV. The determination with a combustion calorimeter is fast and convenient.

#### SAMPLE PREPARATION

A calorimeter is used to determine the calorific value of any substance that can be ignited.

The sample to be measured must be a representative sample and homogeneous. The sample can be a solid form, or it can be ground into a powder, or pressed into tablet form. Powdery substances are bad news because they burn violently and scatter the material. This results in low results.

Powdery substances can be burned when put in to a gelatin capsule, which slows the burning process down. 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.

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

#### 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.

If a gelatin capsule is used to prevent violent burning, then the spiking (correction) is used. The Capsule is the Spike material.

The spiking procedure, Method and operation is well documented somewhere else!

#### 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 or the spike.





**RESULTS**

1. Lentils



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
16.554	0.8010	1	7/22/2005	123	-0.0011	18.8	16.8	OK	3.1
16.708	0.8001	2	7/22/2005	4	0.0014	16.9	17.1	OK	3.1
16.477	0.8000	3	7/22/2005	123	-0.0018	21.5	17.4	OK	3.1
16.502	0.8025	4	7/22/2005	4	-0.0001	20.3	17.6	OK	3.1
16.560	0.8008	5	7/22/2005	123	-0.0019	23.7	18.1	OK	3.1
16.694	0.8001	6	7/22/2005	4	0.0010	21.0	18.3	OK	3.1
<b>Average MJ/Kg= 16.583</b>									

2. Corn Dried Distillers Grain Composite



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
21.011	0.3000	3	09/2009	123	0.0015	21.5	22.2	OK	3.1
19.589	0.3000	3	09/2009	4	0.0011	22.5	23.0	OK	3.1
19.969	0.3000	3	09/2009	4	0.0019	21.4	23.5	OK	3.1
21.237	0.5000	3	09/2009	123	0.0009	23.0	23.5	OK	3.1





Manufacturers of CAL2K/CAL3K Oxygen Bomb Calorimeters

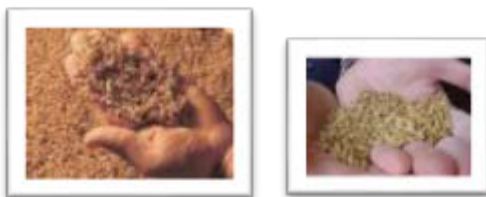
<b>21.092</b>	0.5000	3	09/2009	4	0.0019	21.4	23.6	OK	3.1
<b>Average MJ/Kg = 20.580</b>									

3. Maize Meal



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
<b>15.878</b>	0.4593	125	4/25/2005	1	-0.0008	19.8	19.7	OK	3.1
<b>15.870</b>	0.4382	126	4/25/2005	2	-0.0001	20.3	19.8	OK	3.1
<b>16.173</b>	0.4504	127	4/25/2005	1	0.0008	20.6	19.9	OK	3.1
<b>15.882</b>	0.5037	128	4/25/2005	2	-0.0009	21.2	20.2	OK	3.1
<b>16.034</b>	0.4966	129	4/25/2005	1	-0.0008	21.3	20.4	OK	3.1
<b>15.677</b>	0.5438	130	4/25/2005	2	0.0009	21.2	20.6	OK	3.1
<b>16.111</b>	0.5775	131	4/25/2005	1	0.0001	22.0	20.8	OK	3.1
<b>Average MJ/Kg: 15.95</b>									

4. Malt



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
<b>19.537</b>	0.2551	32	3/22/2005	3	-0.0006	23.3	22.9	OK	3.1
<b>19.629</b>	0.2433	33	3/22/2005	3	-0.0001	21.7	23.3	OK	3.1





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<b>19.667</b>	0.2266	34	3/22/2005	3	0.0015	22.2	23.5	OK	3.1
<b>19.522</b>	0.2473	35	3/22/2005	3	0.0014	21.6	23.8	OK	3.1
<b>19.590</b>	0.2533	36	3/22/2005	3	0.0007	22.3	24.2	OK	3.1
<b>Average : 19.589</b>									

5. Sunflower Kernels (Whole)



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
<b>28.689</b>	0.1118	298	04/05/2005	1	0.0005	18.6	17.4	OK	3.1
<b>27.477</b>	0.1169	300	04/05/2005	1	0.0003	18.3	17.8	OK	3.1
<b>28.856</b>	0.1098	308	04/05/2005	1	0.0002	18.5	18.3	OK	3.1
<b>27.797</b>	0.1044	309	04/05/2005	3	0.0009	18.4	18.4	OK	3.1
<b>28.407</b>	0.1001	310	04/05/2005	3	-0.0012	20.4	18.7	OK	3.1
<b>Average MJ/Kg = 28.245</b>									





## 6. Wheat



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
17.672	0.2558	37	3/22/2005	3	0.0002	24.8	25.9	OK	3.1
17.622	0.2434	38	3/22/2005	3	0.0011	25.2	26.0	OK	3.1
17.534	0.259	39	3/22/2005	3	0.0001	24.3	26.1	OK	3.1
17.551	0.2324	40	3/22/2005	3	0.0012	23.8	26.2	OK	3.1
17.626	0.2503	41	3/22/2005	3	0.0017	23.4	26.3	OK	3.1
<b>Average : 17.601</b>									

## 7. Sunflower Kernels (Crushed &amp; in Gelatin Capsules)

RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
28.3788	0.5041	291	03/05/2005	3	-0.0002	23.2	23.1	OK	3.1
28.8876	0.4611	292	03/05/2005	1	0.0003	23.2	23.1	OK	3.1
29.3843	0.4867	293	03/05/2005	3	0.0015	24.1	23.1	OK	3.1
28.7641	0.4809	294	03/05/2005	1	0.0011	24.1	23.1	OK	3.1
28.7042	0.4607	295	03/05/2005	3	0.0015	24.2	23.2	OK	3.1
29.4436	0.4497	296	03/05/2005	1	0.0015	24.3	23.3	OK	3.1
<b>Average MJ/Kg = 28.927</b>									

**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 for labeling or quality check.

