



APPLICATION NOTE | DDS CALORIMETERS

CALORIFIC MEASUREMENT OF FEED

INTRODUCTION

Many institutions are doing research and development on animal feed. The aim is to improve the nutritional value of the feed. Other aspects may be to improve the digestion and energy absorption of animal feeds.

SAMPLE PREPARATION

Feces in general burn very easy when the moisture is very low. If the moisture is high then the spiking method should be used to ignite the sample.

If the sample has been ground into a powder it will not easily press into tablets using a pellet press, because the fibers will not adhere to each other irrespective of the pressure exerted during the pelleting process. Igniting a fine powder is not advised.



An alternative method to ignite the fine sample powder without it splattering during the burning process is to place the powder inside a gelatin capsule. This is called

Spiking: The sample is burned together with a known substance,

There are two spiking methods:

- | | |
|----------------------|-------------------------------------|
| Traditional Spiking: | Spike mass and Spike CV are needed |
| Easy Spiking: | Temperature rise of spike is needed |

MEASURING THE SPIKE MATERIAL

The Spike material (Gelatin Capsule) must be measured ONCE and then either method can be used.

- Disable the 'MISFIRE LIMIT'=0
- Disable easy spiking by 'SET CAPSULE EN'=NO
- Tare the balance with the crucible
- Put ONE empty capsule into the crucible and weight it (automatic or manual entry)
- Prepare the bomb and run a normal sample
- Once done enter the result in 'SPIKE VALUE'
- Read the temperature rise by 'READ LAST N_RISE'
- Enter the temperature rise in to 'CAPSULE RISE C'
- Enable the misfire limit 'MISFIRE LIMIT'=0.33

The above measures the spike CV (step f) and the spike rise (step h). Now either spiking method can be used!



EASY SPIKE METHOD

This method assumes that all capsules have the same CV (Mass and Material). Then:

- a) Enable Easy spiking by 'SET CAPSULE EN'=YES
- b) Tare the balance with an empty crucible
- c) Fill the capsule with the powdery sample and weigh the crucible with the filled capsule
- d) Enter weight as sample mass either manual or automatically
- e) Prepare the bomb and run a standard determination
- f) The displayed result is the CV of the powder less the temperature rise of the capsule.

TRADITIONAL SPIKE METHOD

- g) Disable Easy spiking by 'SET CAPSULE EN'=NO
- h) Tare the balance with crucible
- i) Weigh the capsule and enter mass in 'SPIKE MASS'. This must be done manually!
- j) Tare the balance
- k) Fill the capsule with the powdery sample and weigh the crucible with the filled capsule
- l) Enter weight as sample mass either manual or automatically
- m) Prepare the bomb and run a standard determination
- n) The displayed result is the CV of the powder less the SPIKE MASS x SPIKE VALUE

RESULTS

- 1. Code C22 Feed White Maize



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
16.692	0.4939	244	5/17/2005	1	0.0016	22.4	22.0	OK	3.1
16.762	0.4732	248	5/17/2005	1	0.0016	22.1	22.1	OK	3.1
16.783	0.4776	262	5/17/2005	1	0.0002	20.4	22.4	OK	3.1
16.833	0.5172	261	5/17/2005	2	0.0016	20.2	22.7	OK	3.1
16.759	0.4738	272	5/17/2005	2	0.0018	21.2	23.5	OK	3.1





Average MJ/Kg = 16.776

2. Code B47 Feed Low Protein



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
18.414	0.4349	238	5/17/2005	1	0.0015	22.1	21.0	OK	3.1
18.373	0.4289	239	5/17/2005	2	0.0015	22.0	21.2	OK	3.1
18.323	0.3852	240	5/17/2005	1	0.0017	21.8	21.2	OK	3.1
18.664	0.4011	241	5/17/2005	2	0.0019	21.7	21.3	OK	3.1
18.411	0.3826	242	5/17/2005	1	0.0018	21.8	21.2	OK	3.1
18.762	0.3537	243	5/17/2005	2	0.0019	20.6	21.0	OK	3.1
Average MJ/Kg = 18.491									

3. Code A67 Feed





Manufacturers of CAL2K/CAL3K Oxygen Bomb Calorimeters

RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
18.463	0.4045	222	5/16/2005	1	0.0011	21.6	24.8	OK	3.1
18.301	0.4080	226	5/16/2005	1	0.0008	21.7	25.0	OK	3.1
18.552	0.4049	227	5/16/2005	2	0.0009	22.2	25.0	OK	3.1
18.343	0.4159	229	5/16/2005	1	0.0020	21.8	25.1	OK	3.1
Average MJ/Kg = 18.414									

4. Code A40 Feed Wheat Bran



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
17.495	0.3280	212	5/16/2005	2	0.0009	20.2	22.8	OK	3.1
17.287	0.2819	213	5/16/2005	1	-0.0011	22.5	23.0	OK	3.1
17.929	0.2588	214	5/16/2005	2	0.0012	20.7	23.2	OK	3.1
17.215	0.2773	215	5/16/2005	1	0.0009	21.5	23.3	OK	3.1
17.274	0.2627	217	5/16/2005	1	0.0009	21.4	24.0	OK	3.1
17.295	0.2790	218	5/16/2005	2	-0.0007	24.0	24.1	OK	3.1
17.732	0.2665	221	5/16/2005	2	0.0003	22.1	24.6	OK	3.1
Average MJ/Kg = 17.461									

5. Code 214E Poultry Feed

RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
16.355	0.8003	6	12/09/2005	19	0.0002	27.1	26.9	OK	3.1
16.441	0.8003	7	12/09/2005	19	0.0003	27.4	27.3	OK	3.1
16.455	0.8006	8	12/09/2005	19	-0.0010	27.8	27.9	OK	3.1
16.624	0.8001	9	12/09/2005	19	0.0000	27.9	28.2	OK	3.1
16.445	0.8003	10	12/09/2005	19	-0.0012	27.9	28.3	OK	3.1
Average MJ/Kg= 16.464									

6. Code 214D Poultry Feed





Manufacturers of CAL2K/CAL3K Oxygen Bomb Calorimeters

RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
16.658	0.8006	16	14/09/2005	19	-0.0002	23.6	24.2	OK	3.1
16.571	0.8003	18	14/09/2005	19	0.0000	24.5	24.9	OK	3.1
16.681	0.8004	19	14/09/2005	19	-0.0002	25.3	25.3	OK	3.1
16.588	0.8008	20	14/09/2005	19	-0.0007	25.0	25.7	OK	3.1
16.547	0.8007	21	14/09/2005	19	-0.0004	26.0	25.9	OK	3.1
Average MJ/Kg= 16.609									

7. Code 214C Poultry Feed

RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
16.350	0.8001	1	12/09/2005	19	0.0008	22.4	23.2	OK	3.1
16.196	0.8008	2	12/09/2005	19	-0.0001	24.6	23.9	OK	3.1
16.358	0.801	3	12/09/2005	19	-0.0007	24.7	24.6	OK	3.1
16.314	0.8001	4	12/09/2005	19	-0.0007	25.5	25.3	OK	3.1
16.524	0.8003	5	12/09/2005	19	0.0003	25.1	26.5	OK	3.1
Average MJ/Kg= 16.349									

8. Code C23 Feed (Breeder)



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
14.688	0.4670	303	5/19/2005	2	-0.0009	21.9	22.1	OK	3.1
14.961	0.5114	305	5/19/2005	2	0.0004	21.2	22.6	OK	3.1
14.714	0.5370	307	5/19/2005	2	0.0004	21.5	23.2	OK	3.1
14.698	0.5342	306	5/19/2005	1	0.0009	21.0	23.5	OK	3.1
14.865	0.5492	308	5/19/2005	1	0.0008	21.7	24.0	OK	3.1
14.735	0.4594	309	5/19/2005	1	0.0017	21.5	24.3	OK	3.1



Manufacturers of CAL2K/CAL3K Oxygen Bomb Calorimeters

Average MJ/Kg = 14.777

9. Code 214B Poultry Feed

RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
16.961	0.8006	53	14/09/2005	18	-0.0006	23.0	23.4	OK	3.1
16.814	0.8007	54	14/09/2005	18	-0.0003	24.8	23.9	OK	3.1
16.753	0.8004	55	14/09/2005	18	-0.0008	25.4	24.4	OK	3.1
16.729	0.8000	56	14/09/2005	18	-0.0016	25.5	24.8	OK	3.1
16.739	0.8004	57	14/09/2005	18	-0.0008	25.9	25.1	OK	3.1

Average MJ/Kg = 16.799

10. Code Y4 Feed Pre-Breeder



RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
16.364	0.4143	182	5/12/2005	1	0.0017	21.3	22.7	OK	3.1
16.558	0.4445	183	5/12/2005	2	0.0012	21.2	22.9	OK	3.1
16.332	0.4493	184	5/12/2005	1	0.0014	21.6	23.1	OK	3.1





Manufacturers of CAL2K/CAL3K Oxygen Bomb Calorimeters

16.554	0.4286	185	5/12/2005	2	0.0015	21.5	23.3	OK	3.1
16.528	0.4478	186	5/12/2005	1	0.0016	21.8	23.4	OK	3.1
16.423	0.4828	187	5/12/2005	2	0.0010	22.2	23.6	OK	3.1
Average MJ/Kg = 16.460									

11. Code DVK324 Sheep Feed

RESULT	MASS	SID	DATE	BN	INIT DRIFT	FIRING TEMP	AMBIENT TEMP	RS	FINAL TIME
15.781	0.1745	15	12/09/2005	18	0.0004	19.9	19.8	OK	3.1
15.774	0.1343	16	12/09/2005	18	-0.0013	21.2	20.4	OK	3.1
15.695	0.1534	17	12/09/2005	18	-0.0013	21.7	21.1	OK	3.1
15.470	0.1623	18	12/09/2005	18	-0.0011	22.4	21.5	OK	3.1
15.395	0.1491	19	12/09/2005	18	0.0004	22.6	22.8	OK	3.1
Average MJ/Kg = 15.623									

CONCLUSION

The above samples of animal feeds differ largely but are not a problem for measuring the calorific value.

