APPLICATION NOTE | DDS CALORIMETERS

C1.7 CALORIFIC MEASUREMENT OF POLYMERS & COMPOSITES
SAMPLE – A

INTRODUCTION
Many institutions are doing research and development on polymers and composites. The research is being done mainly in the automotive industry, whereby dampening and sealing materials are manufactured at the plants. We are not entirely sure of the aim of the analysis of these materials but we can conclude that it can be related to the recycling of the materials after use or to determine the calorific value of these materials and the safety of these materials.

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.

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. With polymers and composites it is difficult to ground the material into a powder form and to press the sample into a tablet, so we have cut small sizes of each sample for analysis.

All samples should have no moisture present before analysing. Freeze-drying the sample can remove the moisture. With polymers and composites no moisture is present.

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. All the polymer and composite sample analysis were performed using the spiking method.

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

SID	SPIKE MASS	SAMPLE MASS	RESULT
A	0.2575	0.3204	1.877
A	0.3315	0.3774	1.215
A	0.3452	0.3882	0.971
A	0.3090	0.3485	1.196
A	0.3485	0.3819	3.825
A	0.3349	0.3349	3.595
A	0.3304	0.3735	2.685
A	0.3618	0.4077	5.825
A	0.3081	0.3511	0.863
Average MJ/Kg = 2.450			

CONCLUSION

The calorific value of almost any polymer or composite can be determined using this method.