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Earls Road
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17 February 2009

ELECTROSTATIC HAZARDS: PRODUCTS – FORKLIFT SUMOGLOVE (HT09/002)

Please find enclosed the test report for the above item.

If you have any queries or if we can be of any further assistance, please do not hesitate to contact us again.

Sincerely,

PJ Caine

SYNGENTA

GLOBAL TECHNOLOGY AND PROJECTS

PROCESS HAZARDS SECTION

DETERMINATION OF
THE ELECTRICAL RESISTANCE AND AMOUNT OF CHARGE TRANSFERRED FROM AN INDUSTRIAL PRODUCT:

FORKLIFT SUMOGLOVE

GLP Compliant Laboratories

Report of measurements carried out for Iain Robertson, Grangemouth

1. TEST REPORT SUMMARY

The electrical resistance measurements performed on the test sample show it is constructed from an electrically non-conducting material (polyurethane composite). However, in the charge transfer tests where the sample was tribocharged it was not possible to draw an electrostatic discharge from the charged surface. Furthermore, a maximum discharge of only 13nC was obtained when the sample was charged via a high voltage corona source, and a discharge of this magnitude is unlikely to ignite a typical group IIA gas / vapour. Therefore, this product is regarded as suitable for use in areas where such a flammable atmosphere may be present.

2. TEST SAMPLE DETAILS

Sponsor	Iain Robertson	
Address	Manufacturing Technician Syngenta Earls Road Grangemouth	
Site	Grangemouth	
Process	General Plant / Warehouse Usage	
Product Name	**FORK LIFT SUMOGLOVE**	
Supplier Details	Sumo Glove www.sumoglove.com	
Test Sample Physical Description	Attachment for lift truck forks to provide cushioning. Constructed from yellow polyurethane composite.	
Sample Received	December 2008	
Syngenta Process Hazards Reference Number	**HT09/002**	
Assessor	PJ Caine	
SYPOS Allocation	T011257-04	
IDS Document Reference Number	10379064	

3. RESULTS

3.1 Electrical Surface and Volume Resistance

Determination of the electrical resistivity of an industrial product in order to predict its ability to generate and retain electrostatic charge.

Relevant Standards	BS2050:1978 Electrical resistance of conducting and antistatic products made from flexible polymeric material. CENELEC Technical Report PD CLC/TR 50404:2003 **-** Code of Practice for the Avoidance of Hazards due to Static Electricity Syngenta Static Electricity Guidance (HSE/GL/020/02)
Work Instruction	HQ6610 (Draft Version)
Test Apparatus	2 x 25mm square metal electrodes Resistance meter (IEL 20 Million Megohmmeter)
Test Potential	500V
Test Method – BS2050, A.4.1 and A.4.2	**Surface resistance** – 2 square metal electrodes of side 25mm were positioned on the same surface of the test sample such that the distance between the facing edges was 50mm. The meter was connected across the metal contacts and the resistance measured. **Through (volume) resistance –** the same square electrodes were positioned between opposing surfaces of the test sample such that the result represents the discharge path during operation. In both tests a conducting liquid agent was applied to the electrodes to afford better surface contact with the test sample.
Sample Preparation	Conditioned for >24 hours at <30% RH and 20 ± 5°C
Test Conditions	Relative Humidity 20%, Temperature 22°C
<u>**Results**</u>	
Maximum Resistance Ω	
Surface	Outer and Inner 1 x 10^{12} Ω (ρ_S 5 x 10^{11}Ω)
Volume	4 x 10^{11} Ω
Specification Criteria	Electrically conducting: $\rho_S \le 10^8\Omega$, $\rho_V \le 10^6\ \Omega$.m Electrically dissipative: $10^8\Omega < \rho_S \le 10^{11}\Omega$ Electrically non-conducting: $\rho_S > 10^{11}\Omega$ HSE/GL/020/02 PD CLC/TR 50404:2003

3.2 Surface Charge Density

Determination of the surface charge density on an electrically non-conducting industrial product.

Work Instruction	HQ6615
Test Apparatus	Imitation mohair cloth Faraday Pail and plastic block Electrostatic voltmeter (ESV) and connecting leads Capacitance meter
Test Method	The principle of this test is to introduce an electrostatically charged sample of known surface area into an insulated container (Faraday Pail), whereupon the potential induced on the container is measured. The quantity of charge on the sample is equal to that repelled towards earth from the container, which can be calculated from the measured potential and the capacitance of the container and measuring system. Division of the calculated charge by the surface area of the material known to be electrostatically charged yields the surface charge density. In this particular study the test procedure was performed 20 times.
Surface Area Of Test Piece, cm^2	~200
Surface Tested	Outer
Sample Preparation	Conditioned for >24 hrs at <30% RH, 20±5°C
Test Conditions	Relative Humidity 20% Temperature 22°C
ESV Capacitance	500 – 600pF
Range of ESV readings	40 – 142V
Mean Calculated Charge Density, σ	2.3×10^{-6} C.m^{-2}
Maximum Calculated Charge Density, σ	**3.6×10^{-6} C.m^{-2}**

3.3 Charge Transfer

Determination of the amount of charge transferred in a discrete electrostatic discharge from the surface of an electrically non-conducting industrial product.

Relevant Standards	CENELEC Technical Report PD CLC/TR 50404:2003 - Code of Practice for the Avoidance of Hazards due to Static Electricity BS EN 13463-1:2001: Non-electrical equipment for potentially explosive atmospheres
Work Instruction	HQ6616
Test Apparatus	Imitation mohair cloth Electrostatic voltmeter (ESV) and connecting leads 20mm diameter brass hemispherical electrode Capacitance meter
Test Method 1	The principle of this test is to draw an electrostatic discharge from the surface of an electrostatically charged (tribocharged) non-conducting test sample. The quantity of charge transferred is equal to the product of the measured potential of the discharge and the capacitance of the measuring system. In this particular study the test procedure was performed 20 times.
Test Method 2	The principle of this test is the same as that for method 1, but in this case the sample is charged via a high voltage corona source (25kV). In this particular study the test procedure was performed 10 times.
Surface Tested	Outer Surface
Surface Area Of Test Piece, cm^2	~200
Sample Preparation	Conditioned for >24 hrs at <30% RH, 20±5°C
Test Conditions	Relative Humidity 20 - 22% Temperature 22°C
ESV Capacitance	250pF

<u>Results</u>

	Method 1 Tribocharged	**Method 2** High Voltage
Mean Charge Transferred Qt (nC)	No discharges were obtained	10nC
Maximum Charge Transferred Qt (nC)	No discharges were obtained	13nC

4. AUTHORISATION

Written and authorised by:	**PJ Caine**		**Date: 17 February 2009**

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Note: The results given in this report apply to the sample tested. Changes in the composition or moisture content, etc may affect the results.

Process Hazards Section Website
http://global8.pro.intra/ptdhazards/welcomepage.htm