Achieve at least a Cca S1 D1 A1 classification on FP200 Gold when tested to BS EN 50399 by means of compound development

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What is EN 50399

- EU Construction Products Regulation (EU 305/2011) performance of construction products
- Cables tests include EN 50399 *Applying a flame to several cables vertically mounting on a ladder*
- Classification is given F to A based on the Following;

Flame Spread **Heat Release** **Droplets** **Smoke** **Acidity**

- FP200 Gold Flagship Prysmian product → Current Class Dca → Loss of Market Share?

Scope: Redevelop existing Compound Objective: Achieve at least a Cca S1 D1 A1

Phase 1 – Initial Thermal Analysis

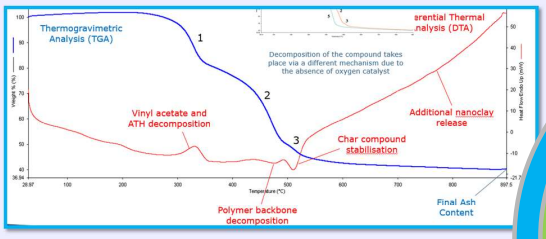
. Two techniques Simultaneous Thermal Analysis and Dynamic Mechanical Analysis

. STA; Differential Thermal Analysis (DTA), Thermogravimetric Analysis (TGA) ,Derivative thermogravimetry (DTG)

. 16 recipes investigating the three Flame Retardant ingredients within the existing compound

. Looking at Thermal Stability, Final Ash Content, Final Ash Strength

#	Description	Observation		
1	Mineral Fire-Retardant Filler	ATH		MDH
2	Mineral Fire-Retardant Filler Ratio pphr	145	160	180
3	FR additive Char promoter	Nanoclay		CNT
4	FR additive Char promoter Ratio pphr	17	9	25
5	FR additive Afterglow suppressant	HGM		ZB
6	FR additive Afterglow suppressant Ratio pphr	5		10



Phase 2 – Focused Analysis

. Phase two builds on the learnings of the first, to produce 4 complete recipes that are representative of the final compound which could be used for final cable production.

Recipe	Std	17	18	19	20
	%	% Var	% Var	% Var	% Var
ATH	#	2%	-53%	-53%	-53%
MGH	-	-	58%	55%	53%
HGMS	-	3%	3%	3%	-
ZINC	#	-3%	-3%	-3%	-3%
NANO	#	-0.4%	-1%	-0.4%	3%

. Several techniques/tests such as Mechanicals, Melt Flow Index & Oxygen Index

. Oxygen Index— The Limiting Oxygen Index represents the minimum level of oxygen in the atmosphere that can sustain flame on a thermoplastic material. The higher the OI value, the higher the non-flammability

Recipe 18 was chosen due to 10% increase in OI, Despite possible processing issues due to lower MFI

#	Standard	UK0003U 18
OI %	37.2<37.5	40.4=<41
UTS	15.8	11.2
EB	175	125
MFI	6.6	3.7

Objective

Cca S1,D1,A1

Result

Cca S1,D1,A1

Phase 3 – Compound & Cable Manufacture

. Compounded 750Kg of chosen recipe

. Extruded 2Km 2c1.5mm² & 4c1.5mm² FP200 Gold

. Slightly Higher RPM during Compounding

. Slightly Higher Head Pressure & Motor Amps during Extrusion

Set Point [Kg/h]	Massflow [Kg/h]	Drive Command [%]	Motor Speed [RPM]
Standard Compound			
199	198.1	16	319
Development Compound			
209	210.8	17.18	344

SCREW SPEED (RPM)	MOTOR LOAD (AMPS %)	HEAD PRESSURE (PSI)	GRAV OUTPUT (KG/HR)
Standard Compound			
11	65.5	6150	126.6
Development compound			
10.7	66	6270	142.7

Phase 4 – Final Cable Testing

. The final phase of the project was testing the manufactured cables

. Fire Test including EN50399 as well as Mechanical Cable Test

Fire / Additional Tests	2 x 1.5	4 x 1.5
EN 50399	Cca S1,D1,A1	Cca S1,D0,A1
BS 6387:2013 Cat C	3 Pass	3 Pass
BS 6387:2013 Cat W	3 Pass	3 Pass
BS 6387:2013 Cat Z	3 Pass	3 Pass
BS EN 50200 : 2006	3 Pass	3 Pass
BS EN 50200 : Annex E	3 Pass	3 Pass
BS EN 60332-1-2 : 2004	5 Pass	3 Pass
Smoke Emission	Pass	Pass
Unaged Mechanicals	Pass	Pass
Aged Mechanicals	Pass	Pass
Hot Pressure	Pass	Pass

Future Work

- Verify Fire Test Results
- Manufacture & Test Full size range
- Manufacture Full Production Quantity of Compound & Cable
- Manufacture Cables on Other Extruders