HD Pug PVC Free Project Phase 2: Halogen Free Proposed Scope

12/19/2013

Background

HDP completed the first PVC Free Cable study in 2011
Five cable types were manufactured and tested to the current PVC criteria. The results were mixed…

Depending on the equipment used and the level of understanding of these LSZH materials selected, processing difficulties were encountered. We believe that the poor physical properties reported can be improved in Phase II of this project as equipment modifications are made and the nature of these materials are better understood.

There are no North American industry accepted specifications for cables made with LSZH, additionally OEM's are facing new criteria like "Low Smoke" that is not a current safety requirement for cables manufactured with PVC

Cable specifications, especially LSZH requirements vary significantly between different geographic areas.

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Backround Continued

In Phase I we tried to include cables that where difficult to process with the existing LSZH materials or could not meet the existing Flame Test Requirements.

In Phase II we will focus our efforts on Flexible Cords and Appliance Wiring Material that has lower Flame Test Requirements and will be easier to process with the existing industry LSZH materials.

It should also be noted that the material performance of the LSZH materials have been improved since Phase I to overcome some of the previous shortcomings that we experienced

Additionally we will use our previous manufacturing experience with these materials to obtain the best physical properties to comply with current UL and CSA standards for these categories.

It will be our objective to manufacture cables that will meet the current UL and CSA standards in each category and also get the funding to test these products for smoke and halogen content by the IEC standards used in practice for defining LSZH cables today in Europe.

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Project Participants Phase 2

		Generic Performance Specification /Requirement Providers	Raw Material Suppliers	Cable Mfgs	Testing and Characterization Providers
AWM Style 2463, 2 C, 18 AWG (internal)		Lorom Lake Cable	AlphaGary Teknor Apex Sacopolymers Polyone	Lorom Lake Cable	Lorom Lake Cable UL
HDMI Cable (external)		Lorom Lake Cable	AlphaGary Teknor Apex Sacopolymers Polyone	Lorom Lake Cable	Lorom Lake Cable UL
Desktop Power Cord Set		Lorom Lake Cable	AlphaGary, Teknor Apex Sacopolymers Polyone	Lorom Lake Cable	Lorom Lake Cable UL
Notebook Power Cord Set		Lorom Lake Cable	AlphaGary Teknor Apex Sacopolymers Polyone	Lorom Lake Cable	Lorom, Lake Cable UL

Halogen Free Cables 2 Project

Project Task	Orig	Actual	Anticipated
Plan Project			
Define Scope		3Q13	
Define Halogen Free Specifications		4Q13	
Transition to Implementation		1Q14	
Complete Admin Activities (e.g. NDAs, tech. Specs.)			
Define test matrix		4Q13	
All Raw material received by cable manufacturers		4/14	
Fabricate test samples		6/14	
Complete electrical and mechanical tests		7/14	
Draft report		8/14	
Review data to determine whether to complete smoke density testing (UL)		9/14	
Final Project report		12/14	
Publish report		1/15	

Industry Terms and Definitions

- Low smoke zero halogen LSZH is a material classification typically used for cable jacketing. LSZH cable jacketing is composed of thermoplastic or thermoset compounds that emit lower smoke and acid gas levels when exposed to high sources of heat
- Appliance Wiring Material – is defined as internal and external electrical wiring used by a Device or Appliance for it's electrical wiring requirements
- Flexible Cords – is defined as multi-conductor cordage used for bringing electrical power to a device
- Communication Cables – are defined as network cables that are used to transmit analog or digital communication within a structured wiring environment
- Data Cables – are defined as cables that bring point to point communication between two discrete locations

Project Overview

In phase one five cable types were identified for development as PVC and Bromine free –

a. Ribbon Cable (UL Appliance Wire; VW-1)

b. Power Cord for notebook (UL Flexible Cord - North America style; VW-1)

c. Power Cord for desktop (UL Flexible Cord - European style; VW-1)

d. HDMI Cable (UL Appliance Wire; VW-1)

e. Mini SAS Cable (UL Communication Cable; FT-4)

Various problems were encountered with non-PVC compounds used to manufacture these cables, processing difficulties, inadequate mechanical properties and failure to comply with flame test requirements. None of the cable samples produced complied with all performance and safety requirements.

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Specifications

Current OEM priority for PVC and Bromine free cables is focused on data centers, office products and consumer products. The cables and their requirements for these segments are significantly different. *OEM's that are OP and Consumer focused may have different perspectives than OEM's that are data center focused.*

Cables for data centers in North America must conform to Communication Cable Standard and typically meet Type CMG and the FT-4 flame test, a severe vertical tray flame test. This project will initially focus on flexible cords and Appliance Wiring Material with the possibility to address communications cables in the future.

Currently the project team has decided to test these products to the current IEC LSZH standards which will require them to pass the following IEC Standards for smoke density, acidity and corrosivity that are commonly used to define the these materials in the industry today.

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Smoke Density Measurement

- IEC 61034-2 - Measurement of smoke density of cables burning under defined conditions

A minimum light transmission value, expressed as a percentage light transmittance, is recorded

during a fire in a 3 meter cube area. The recommended minimum light transmission value is greater than 60%.

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Acid Gas Emissions

IEC 60754 Tests gases evolved during combustion of materials from cables –

Part 1: Determination of emission of halogens,

Part 2: Determination of acidity (by pH measurement) and conductivity (Corrosivity)

(60754 is an indirect measure of halogens, In 60754, you are measuring acidity and conductivity that may allow one to estimate halogen content, but it may also provide false readings)

(The pH of a sample is the logarithm of hydrogen ion concentration of that sample. As halogens have no hydrogen ion they don't have a pH value)

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Objectives/Scope

- 1. To determine the gaps in UL Standards for compliance , between PVC compounds and non-PVC or LSZH alternatives for like applications

- 2. Co-ordinate with UL the establishment of acceptable requirements for non-PVC or LSZH alternatives

- 3. Establish performance requirements for low smoke, halogen free characteristics of non-PVC alternatives. These requirements could be incorporated in UL Standards as optional requirements with appropriate designations or indicated on OEM cable specifications as requirements

- 4. It is the intention of this Project to provide the basis of unifying the current Global Standards into one comprehensive document that will serve as the definition for PVC free or LSZH cables. The outcome will be environmentally friendly cables that will be universally accepted and specified by OEM,s for use in their associated products.

Sequence

- Address each cable type individually and start with Flexible Cords UL 62 and UL 758 Appliance Wiring Material as our first objectives
- Determine which materials that will meet current UL Standards, UL 62 and UL 758
- Have the material suppliers to commit to materials that will meet UL 62 for Flexible Cords and UL 758 for AWM
- Manufacture cables with LSZH Jackets and test the physical properties to meet UL 62 and UL 758
- Conduct UL 1581 /VW-1 Flame Test and as an alternative test conduct IEC 60332-1 to verify Flame performance
- Have UL measure Smoke Generation IEC 61034 and Acid Gas Generation, IEC 60754-1 and Conductivity IEC 60754-2
- Determine if funding of project is possible by HDP User Group for additional testing and the continuation of the Project
- Select the second round of products for product safety compliance and discuss related specifications

Other Applicable Standards

- Cord Sets
  - UL 817 for cord sets; UL 62 for cordage in the USA
  - CSA 22.2 NO 21 for cord sets; CSA C22.2 No. 49 for cordage
  - IEC 60799 for cord sets in EU countries
  - IEC 60227 or 60245 series or National Standards for Cables
- Appliance Wiring Material
  - UL 758 Appliance Wiring Material Standard
  - CSA 22.2 NO 210.2 Appliance Wiring Material

Deliverables

- Clearly defined and documented standards for Halogen Free and Low Smoke materials that are PVC and Bromine Free
- State the differences in performance characteristics between PVC cables and LSZH alternative cables
- Produce products with supporting test data for HDP Members so that one product can be shipped to multiple geographic regions without safety issues or concerns
- Drive the current cable LSZH material technology and test requirements to meet all current safety and performance criteria
- Multinational compliance with the applicable safety standards as defined by UL, CSA and IEC for the regions of North America and Europe

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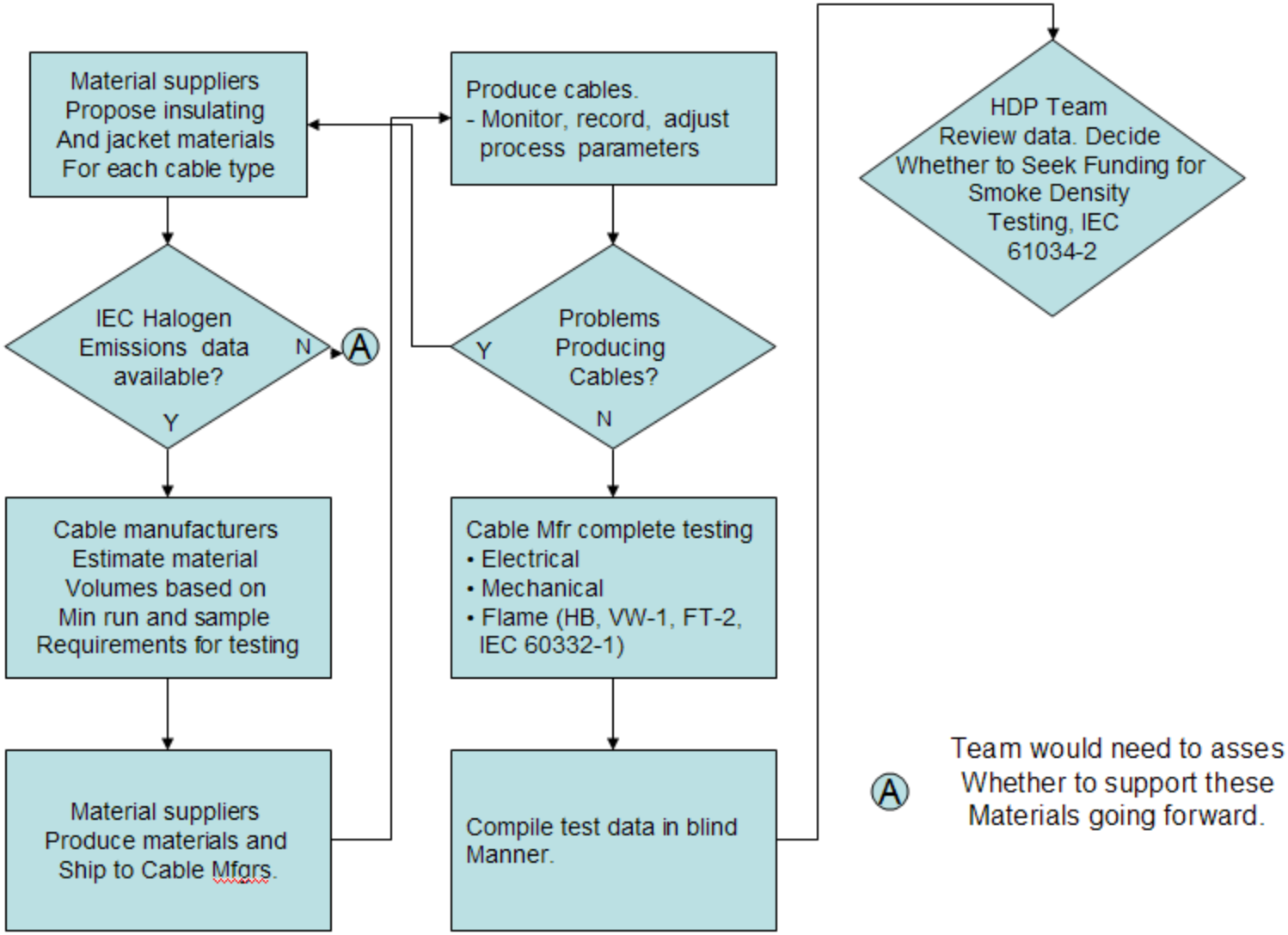
Project material and testing flowchart



Program Costs

Testing Agency	IEC 61034-2	IEC 60754 Part 1	IEC 60754 Part 2
Underwriters Lab	$1250.00/Test	$700.00/Test	$700.00/Test
ETL/Intertek	$1200.00/Test	$800.00/Test	$800.00/Test

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Project Cable Types

Cable Types	Raw Material Suppliers	Cable Manufacturers	IEC Tests	Number of Tests	Cost (Number of Samples x Test Cost)
AWM Style 2463 2C 18AWG	Alpha Gary Teknor Apex Sacopolymers Polyone	Lake Cable Lorom	IEC 61034-2 IEC 60754 Part 1 IEC 60754 Part 2	8 4 4	$10,000.00 $2,800.00 $2,800.00
HDMI Cable external	Alpha Gary Teknor Apex Sacopolymers Polyone	Lake Cable Lorom	IEC 61034-2 IEC 60754 Part 1 IEC 60754 Part 2	8 4 4	$10,000.00 $2,800.00 $2,800.00
Desktop Power Cord	Alpha Gary Teknor Apex Sacopolymers Polyone	Lake Cable Lorom	IEC 61034-2 IEC 60754 Part 1 IEC 60754 Part 2	8 4 4	$10,000.00 $2,800.00 $2,800.00
Notebook Power Cord Set	Alpha Gary Teknor Apex Sacopolymers Polyone	Lake Cable Lorom	IEC 61034-2 IEC 60754 Part 1 IEC 60754 Part 2	8 4 4	$10,000.00 $2,800.00 $2,800.00
Total Best Case	4	2	3	64 48	$62,400.00 $45,600.00

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