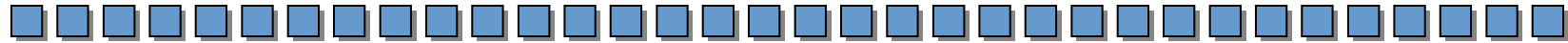


# HDP User Group International, Inc. Halogen Free (HF) Properties Project



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Dell Inc.  
April 25, 2007

# Example of Uses of Halogenated Materials in Electronics



- Brominated Flame Retardants (BFRs)

- Electrical - used in PCB laminates, component mold compounds, IC packages, solder masks, cable insulation, flex circuits, connectors
- Mechanical – used in mechanical plastic parts, laser printer fuser assemblies, fan housing/impeller
  - ABS, HIPS, PET, PBT resins are most compatible with BFRs

- Polyvinyl Chloride (PVC)

- Electrical - base resin for cable jackets, overmold & connectors, mylars, tapes
- Mechanical – not typically used

# Current Industry Halogen-Free Projects



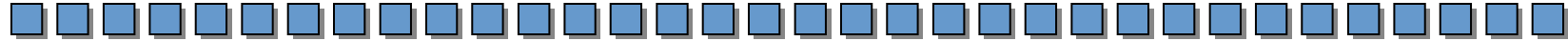
| Project Title  | Project Chair(s) | Key Objectives  | Expected Completion Date                          |
|--|------------------|---|---|
| <b>US EPA - Flame Retardants in Printed Circuit Boards</b> | EPA              | Identify and evaluate commercially available flame retardants and their environmental, human health and safety aspects.   | Finalize report – Spring 2008                     |
| <b>HDPUG - Halogen-Free Properties</b>                     | Dell             | Develop a comprehensive Halogen-Free Guideline and Halogen-free Materials Database.   | Guideline – late 2007<br>Database – mid-2008      |
| <b>iNEMI Halogen-Free PCB Project</b>                      | Intel / IBM      | <ul style="list-style-type: none"> <li>• Build on industry knowledge and capability</li> <li>• Identify HF PCB technology readiness and gaps</li> <li>• Stimulate supply capability</li> <li>• Recommend standards development opportunities</li> </ul> | Industry Report – APEX – February 2008            |
| <b>IPC – Halogen-Free Subcommittee</b>                     | Dell / Intel     | Develop a new halogen-free system level standard (define maximum concentration values for halogens across a variety of applications)  | Joint IPC / JEDEC Standard – February 2008 (APEX) |

4/20/2007

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Proprietary

# Why a Halogen-Free Project in HDPUG?



- **Halogens are used in a wide variety of applications, therefore holistic halogen-free solutions are needed**
- **It would be beneficial for all members and others in the industry to have easy access to key pieces of information regarding:**
  - Properties of halogen-free materials
  - Knowledge base of users of halogen-free materials
  - Reference to relevant environmental legislation and risk assessment data on halogenated and halogen-free materials
  - Reference to existing halogen-free standards (IPC, IEC, JPCA, etc)
- **Halogen-free PCBs and components have different properties and characteristics than halogenated PCB's and components. The properties of the HF materials are not readily available in a format and measurement method that is consistent.**
- **HDP User Group has had some previous projects in halogen free alternatives that can be leveraged.**

**An industry Halogen-Free Guideline and web-based database of current knowledge and product properties is needed.**

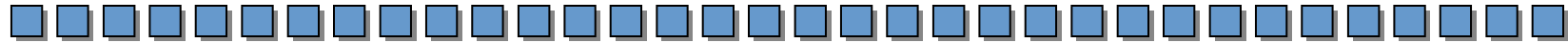
# HF Properties Project - Objective



This project will:

- Develop a comprehensive Halogen-free Guideline to include:
  - Description of halogen-free drivers
  - Definition of “halogen-free” electronics, referencing existing (and new) halogen-free standards
  - General listing of materials that contain halogens (PWB laminates, mold compounds, cables, mechanical plastics, etc)
  - Description of key mechanical and electrical properties to be considered with halogen-free materials
- Develop a Halogen-free Product database allowing suppliers to list their halogen-free product offerings and the properties of those offerings in a uniform, concise format that is easily accessible to product designers.

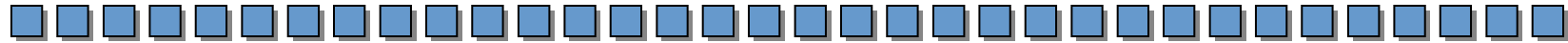
# HF Properties Project – Task Teams



The project is divided into 2 task teams (participants are welcome to join both!):

1. HF Guideline Team – Will determine the content and format of the HF Guideline, provide and solicit input, and produce the final document.
2. HF Database Team – Will define the format of the Supplier data, the specific properties to be reported, and the test method to be used to measure the data. Prepare a list of potential suppliers and contact them for inclusion, and monitor and adjust the database as it begins to form.
  - A HF Database Business Ops subteam will be formed to operate and fund the Database long-term.

# Transition Plan – HF Guideline to HF Database



## HF Guideline



## HF Database

- **The following sections of the Guideline must be completed to begin the Database work:**
  1. Summary of key legislation & standards - **complete**
  2. Listing of relevant flame retardants & properties - **complete**
  3. Listing of properties to be captured in the database for various HF materials (UL rating, ISO code, dielectric constant, dissipation factor, moisture absorption, thermal expansion, thermal conductivity, etc)- **in progress, complete by 8/1**

- **Take Guideline and develop a mock-up database template by end 2008**
  - Pilot in early 2008
  - Go live in mid-2008



# HF Guideline Schedule



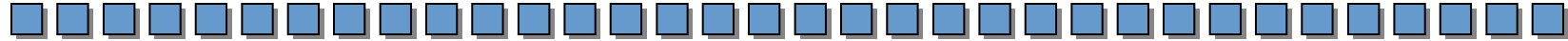
| Project Task  | When Complete | Actual<br>(Implementation Stage only) |
|---|---------------|---------------------------------------|
| Plan Project  | 3/1/07        | X                                     |
| Issue project press release/call to action            | 3/2/07        | X                                     |
| Editorial staff & core contributors identified        | 5/1/07        |                                       |
| Project moves into implementation stage               | 6/15/07       |                                       |
| Table of contents complete & chapter editors assigned | 6/15/07       |                                       |
| First Draft complete                                  | 8/1/07        |                                       |
| Second Draft complete                                 | 10/1/07       |                                       |
| Final Draft complete, posted on HDP website           | 12/1/07       |                                       |

# HF Database Schedule



| Project Task   | When Complete | Actual<br>(Implementation Stage only) |
|--|---------------|---------------------------------------|
| Plan Project   | 3/1/07        |                                       |
| Steering committee identified and roles defined          | June '07      |                                       |
| Project moves into implementation stage                  | Aug '07       |                                       |
| Categories & test methods identified and prioritized     | Oct '07       |                                       |
| Mock-up data format and layout complete                  | Dec '07       |                                       |
| Pilot database established with links to first Suppliers | Feb '08       |                                       |
| Letter of invitation prepared and sent to Suppliers      | Mar '08       |                                       |
| Final presentation page format established               | May '08       |                                       |
| Testing by HDP Members                                   | June '08      |                                       |
| Database open to industry (updated monthly)              | Aug '08       |                                       |

# Current Team Members – Any Others?



- Jack Fisher HDPUG staff
- Marshall Andrews HDPUG Staff
- Ruben Bergman HDPUG staff
- Laurence Schultz HDPUG staff
- Mike Loo AMD
- Donna Sadowy AMD
- Jerome DeBoysere Clariant
- Adrian Beard Clariant
- Scott O'Connell Dell
- Art Fong IBM
- Wayne Rothschild IBM
- Paris Dieker HP
- Hans Wendschlag HP
- Harry Witschas Fujitsu-Siemens
- Mark Buczek Supresta
- Sergei Levchik Supresta
- Susan Landry Albemarle
- Brian Carter Albemarle
- Louis Lin Nan Ya
- Bruce Sorenson Nan Ya
- Silvio Bertling Park Nelco
- Kathleen Vokes EPA
- Paul Collander Poltronic
- Doug Sober Kaneka Texas
- Erik Bergum Isola
- Ed Kelly Isola
- Fandy Wei Isola
- Gary Hoeppe Coretec
- Dave Bender Tyco
- Jeff Toran FCI
- Pete Elmgren Molex

4/30/2007



# Back-Up



# HF Product Database System Overview

