September 20, 2023

Explanation of Difficulties in Obtaining Information on Chemical Substances Contained in EEE (Electrical and Electronic Equipment)

1. Framework on Investigating Chemical Substances Contained in Products within the EEE Industry

The EEE industry has developed an international standard, IEC62474, and conducts surveys of chemical substances used throughout the supply chain based on this standard. The standard utilizes a Declarable Substance List (DSL), which lists substances of concern that are subject to restrictions based on global chemical substance regulations and that may be contained in EEE (based on the knowledge of experts in each country). Substances that have not been found to be hazardous and are not restricted by the regulations in various countries are generally not added to the DSL.

Even if the CASRNs are identified, it would take at least months (or potentially years) if EEE manufacturers need to survey the supply chain for the presence of numerous chemical substances. This is due to the fact that EEE manufacturers are placed towards the bottom of the supply chain, and the inquiry on the presence of chemical substances may need to be transmitted to the top of the supply chain (the chemical manufacturers), and the results must then be transmitted back to the EEE manufacturers.

2. Adding PFASs to the DSL

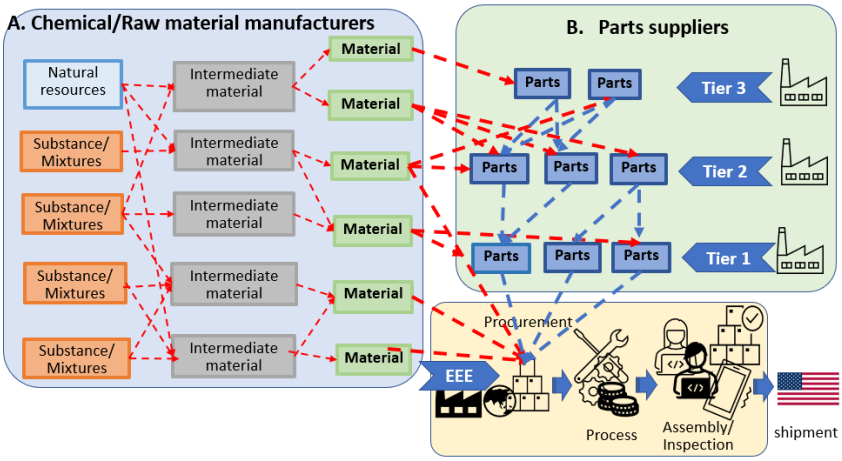
With the promulgation of the PFAS Law in the State of Maine, the EEE industry has begun to take certain actions. Although most PFASs have not been found to be hazardous, due to PFAS Law in Maine, "PFAS" was recently added to the DSL on January 17, 2023. Nevertheless, since the Maine PFAS Law does not specify the CAS numbers of the specific PFAS substances, the DSL does not identify the specific PFAS substances. Instead, a non-exhaustive list of 629 PFAS substances (selected based on expert knowledge) was added to the Reference Substance List (RSL).

This will enable the future survey of the listed PFASs across the supply chain, but there are many obstacles to conducting such surveys, as described below.

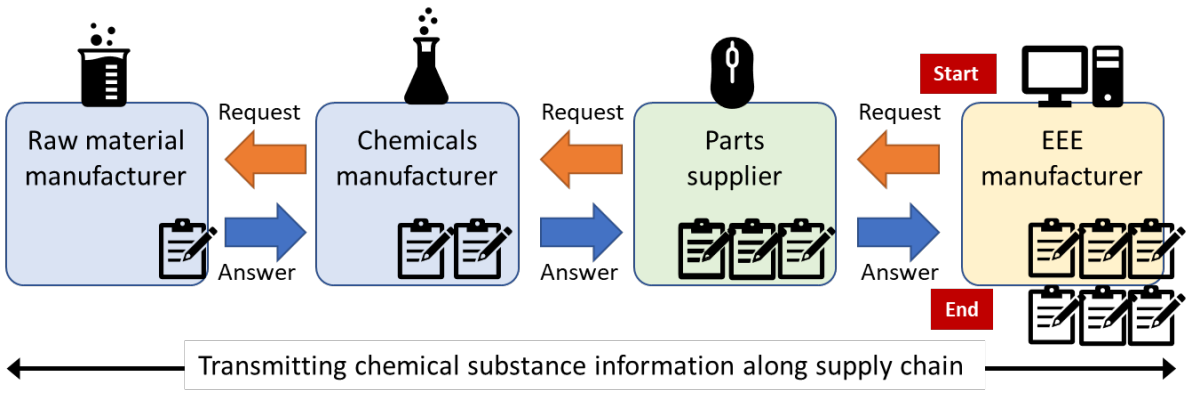
3. Conducting Surveys

For complex articles such as EEE, the supply chain is multi-layered and complex, and operates on a global scale.

Complexity of supply chain of EEE and related sectors

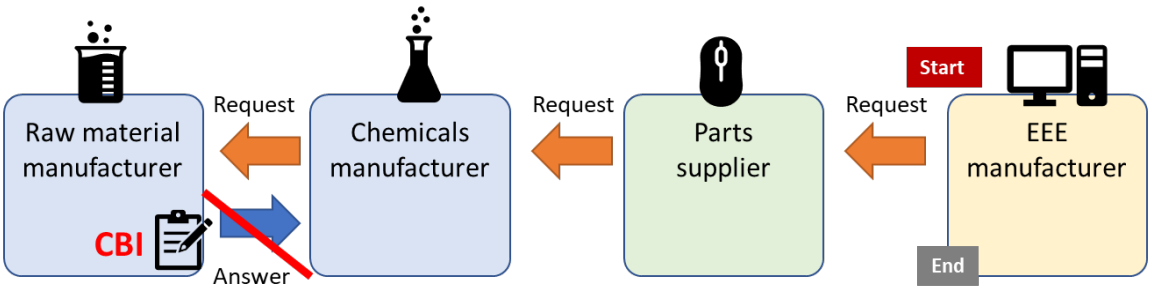


For the final EEE manufacturers (placed downstream in the supply chain) to obtain information about the chemicals contained in each part of component of the product, it is necessary to communicate the need for information upstream in the supply chain one tier at a time. Generally, the final EEE manufacturers are only capable of directly communicating with suppliers that are two-tiers upstream, at best.



The detailed chemical composition of the functional material (in which PFAS may be used) is often considered a trade secret and is not communicated to the downstream entity beyond the level required for safe use. Furthermore, in the case of impurities or by-products generated during the

manufacturing process, such information may not be communicated due to trade secret issues. In such cases, even the upstream chemicals manufacturer may not know the information unless a highly accurate analysis is conducted. For example, one of our members was unable to obtain from its suppliers the specific chemical names of PFOA-related substances covered under the PFOA exemptions under the Stockholm Convention.



CBI won't be transmitted to downstream → EEE manufacturer cannot obtain sufficient information

The more complex the supply chain and the larger the number of substances surveyed, the longer the time that is needed to obtain responses (ranging from months to years).

If the substances subject to the survey are not uniquely identified, the supplier who is asked to complete the survey has no means to verify whether or not their products, purchased parts, or materials contain PFAS (and consequentially, which specific PFAS and how much of them are contained), making it more difficult for the surveyor (e.g. EEE manufacturer) to receive a response.

Additionally, in our experience, even when an EEE manufacturer has information that certain fluorinated compounds (not necessarily PFAS) are used in certain applications, it was almost impossible for the EEE manufacturer to know whether or not they are PFAS.

EEE manufacturers have hundreds or thousands of tier 1 suppliers, and it is not possible to estimate how much time and effort it would take to obtain information on the use of potentially more than 10,000 PFAS substances throughout the entire supply chain.

The EEE manufacturer specifies the necessary specifications of the main material or finished product to its suppliers, but rarely specifies the use of each substance in each article (except for legally restricted substances). Also, in most cases, finished article manufacturers themselves rarely use PFAS substances or PFAS-containing mixtures. Furthermore, in the supply chain, the users of the PFAS chemicals themselves are not the "first or second tier" suppliers, but are often the material manufacturers that are further upstream.

Therefore, the EEE manufacturer has no choice but to rely on information communicated through their direct channels. The information that the EEE manufacturer ultimately receives from these direct channels may consist of information from suppliers further upstream.

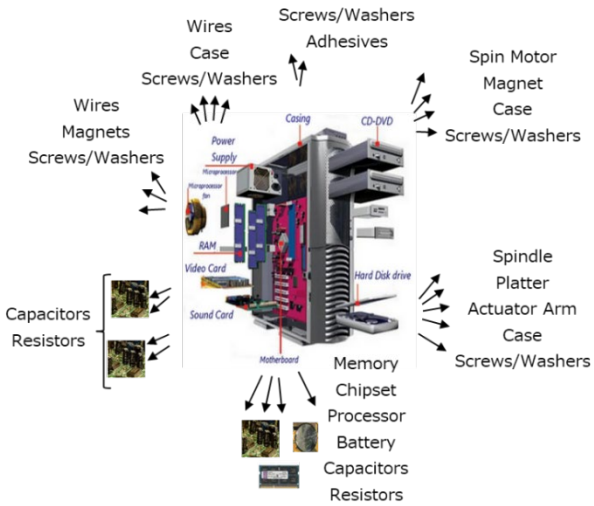
Although a list of certain PFAS substances were added to the DSL to initiative the investigation of their use in the supply chain, the information may be transmitted to EEE manufacturers years later. There is also no certainty that the EEE manufacturers would obtain information on all of the PFAS substances used in their articles even if substantial time is used to conduct these investigations.

4. Difficulty of analyzing PFAS in EEE

Internationally-recognized analytical methods have been established for only some PFASs, including those already internationally regulated. The EPA provides PFAS analysis methods but it does not list the methods that can be used to analyze the PFAS content in articles.

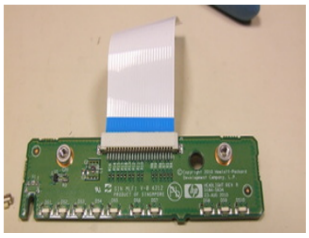
In addition, the Act allows companies to report the total organic fluorine when individual PFASs cannot be identified. However, Combustion-Ion Chromatography (CIC), the commonly known analytical method to detect fluorine, detects both organic and inorganic fluorine. Therefore, it is not possible to detect only total organic fluorine. Even if an EEE manufacturer were capable of conducting analytical testing, EEE consists of tens of thousands of parts. It would be impractical for companies to expend significant resources to analyze each of these parts to determine PFAS content.

Here is an example. A computer consists of many parts as shown in the figure.



Each part consists of many tiny components (a board unit is shown as an example).

Small circuit board unit



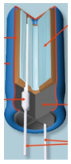
Simple BoM

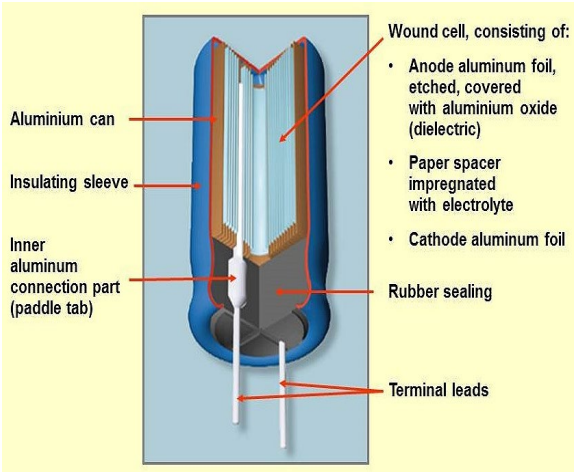
Qty	Component
1	PCB FR4 (88mm x 23mm x 2.5mm)
2	Ceramic Capacitor 0.1 uF (0603 size)
15	Ceramic Capacitor 100 pF (0402 size)
1	Ceramic Capacitor 2.2 uF (0603 size)
2	Al Electrolytic Capacitor (SMD)
4	Ceramic Resistor 0 ohm (0402 size)
24	22AWG wire (7cm)
15	Ceramic Resistor 82.5k ohm (0402 size)
2	Label 45mm x 6mm
1	Cermic Resistor 56k ohm (0603 size)
1	IC CMOS Inverter (SOT23 size)
1	IC PLD (64L TQFP)
2	Transistor MOSFET (SOT-23 size)
1	24 pin connector
1	Pushbutton switch 12 V
2	Clinch Nut (PEM Nut)
10	LED lamp Orange SMT

Parts of Al capacitor

Qty	Component	Sub-Component
2	Al Electrolytic Capacitor(SMD)	Aluminum can Insulating sleeve Al anode & cathode Paper spacer Electrolyte solution Seal ring Terminal leads

To be analyzed in this level





To conduct a PFAS analysis, it would be necessary to analyze at a material level of the tiny components. Even these components may consist of multiple material, making it difficult to estimate the time, effort, and cost to conduct analyses for each component of every EEE distributed to Maine.

Based on the above, it is not practical for an EEE manufacturer (as downstream entity of the supply chain) to analyze and identify the type and content of the PFASs contained in their products.

5. Conclusion

To the best extent possible, the EEE industry is conducting efforts to comply with the Maine PFAS requirements. However, the industry remains sincerely concerned about not being able to obtain the necessary information to fully satisfy the requirements by the deadlines posed under the Act.

If the DEP determines that it is necessary to obtain information on PFAS content in EEE, we believe following will be practical and effective.

1. Survey of the general use of PFAS within the chemical industry, considering how they are the upstream entities that manufacture PFAS in the supply chain.
2. Specifically identify PFAS substances that are determined to be hazardous, conduct assessments on exposure to human health and the environment, and identify high-risk products
3. Require reporting of PFAS for only the high-risk products identified above

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