PIP (3:1) Update & Global Emerging Supply Chain Declaration Requirements

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Agenda

- Introduction
- Update on U.S. TSCA PIP (3:1) Restrictions
- Global Emerging Supply Chain Declaration Requirements
  - drivers for additional information
  - more substance information and material information
  - product lifetime characteristics
  - regulations and standards that are driving declarations
    - CRMs, Digital product passport and Product circularity data sheet
    - dual-logo ISO/IEC material declaration standard for all industries
  - harmonization of material classifications/categories
- Summary

About ECD Compliance

- Consulting and technical support on global environmental regulations
  - Global regulatory requirements/changes
  - Impact on products and markets
  - Education and training seminars
  - Development of compliance programs
- Environmental standards
  - Representation, consulting, and implementation of standards
  - IEC/TC111 – Environmental Standardization
    - IEC 62474, IEC 63000
  - IPC E-31 Supplier Declaration Subcommittee (IPC-175x standards)
  - ISO/IEC JTC1/SC39 – Sustainability, IT & Data Centres
  - Ecolabel standards: IEEE 1680.X, NSF, UL
  - ISO/TC323 – Circular Economy
- Eco-labels and sustainability programs
  - EPEAT and Voluntary programs
- Environmentally Conscious Design (ECD) and Circular Economy
  - Ecodesign , energy efficiency, LCA

Background on TSCA Restriction of PIP (3:1)

- On January 6, 2021, the U.S. EPA published final rules for the restriction of five chemicals that are persistent, bioaccumulative and toxic (PBT)
  - Decabromodiphenyl ether (DecaBDE)
  - Phenol, isopropylated phosphate (3:1) (PIP (3:1))
  - 2,4,6-Tris(tert-butyl)phenol (2,4,6-TTBP)
  - Hexachlorobutadiene (HCBD)
  - Pentachlorothiophenol (PCTP)

- The rules include restriction of PIP (3:1), including in articles starting March 8, 2021
  - Temporary exemptions for certain applications (e.g. automotive spare parts, adhesive)
  - Key challenge of restriction is lack of supply chain awareness

- After concerns raised by industry, the EPA issued a "No Action Assurance" memorandum on March 8, 2021 to delay enforcement by 180-days (ending on September 4, 2021)
  - 60-day consultation for stakeholders to provide additional information on PIP (3:1)

Applications of PIP 3:1 (1)

- EPA identified uses:
  - PIP (3:1) is used as a plasticizer, a flame retardant, an anti-wear additive, or an anti-compressibility additive in hydraulic fluid, lubricating oils, lubricants and greases, various industrial coatings, adhesives, sealants, and plastic articles. As a chemical that can perform several functions simultaneously, sometimes under extreme conditions, it has several distinctive applications.

- Typical EEE applications / uses (from IEC 62474 DSL):
  - Flame retardant and/or plasticizer in polymers such as flexible polyurethane foam and PVC, lubricant, hydraulic fluid, adhesives and sealants. Examples: gasket, wire sleeve, tape.

- In response to the EPA request for information on the use of PIP (3:1), three industry associations (Consumer Technology Association (CTA), IPC, and ITI) compiled a list of applications of the PIP 3:1 substance in electronics
  - see next slide

Component Applications of PIP 3:1 (2)

- Insulation covers / sleeves and other components used in conjunction with internal and external cables (e.g., PVC cables, ground cables, and switch intel cables) and wirings. Includes:
  - Terminal covers
  - Fuse covers
  - Cable sleeves
  - Tubes
  - Casings
  - Harnesses
  - Clamps used with cables
  - Float switch
  - Connectors (housing)
- Internal and external cables including but not limited to power cables, HDMI cables, connection cables, USB cables, etc.
- Components used to shield / protect from electromagnetic waves in conjunction with circuit boards and other components inside electronic devices. Includes:
  - Condenser covers
  - Internal tapes
  - Gaskets
  - Sheets
- Components used for the electronic designs of semiconductors
- Electronic drive units
- Adhesives / Sealants (e.g. epoxy used for encapsulation of capacitors)

compiled by: CTA, IPC, and ITI

EPA Delays PIP (3:1) Restriction

- On September 3, 2021, U.S. EPA posted a pre-publication notice:

> To ensure that supply chains continue uninterrupted, EPA has issued a final rule providing a short-term extension of the specified compliance dates for PIP (3:1) articles until March 8, 2022. (EPA release)

- Summary from pre-publication notice:
  - The Environmental Protection Agency (EPA) is amending the regulations applicable to phenol, isopropylated phosphate (3:1) (PIP (3:1)) promulgated under the Toxic Substances Control Act (TSCA). Specifically, EPA is extending the compliance date applicable to the processing and distribution in commerce of certain PIP (3:1)-containing articles, and the PIP (3:1) used to make those articles from March 8, 2021, to March 8, 2022. For such articles, EPA is also extending the compliance date for the recordkeeping requirements applicable to manufacturers, processors, and distributors from March 8, 2021, to March 8, 2022. The articles covered by this amendment include a wide range of key consumer and commercial goods such as cellular telephones, laptop computers, and other electronic and electrical devices and industrial and commercial equipment used in various sectors including transportation, life sciences, and semiconductor production.

PIP (3:1) Restriction – What's Next?

- The EPA also indicated that they will consider further extensions when justified
  - "*a notice of proposed rulemaking (NPRM) seeking comment on a further extension of the PIP (3:1) compliance deadlines, and describing specific information that the Agency would need to justify any further compliance deadline extensions*."

- The 1 year extension is helpful but challenges remain with collecting information from supply chains and redesigning products containing PIP (3:1) – especially products with long design cycles or qualification times.
  - the EEE industry had request a four-year extension

PIP (3:1) Restriction – What's Next?

- Manufacturers should continue to investigate PIP 3:1 use in their products and consider justification for extension

> excerpt from EPA post:
> *EPA will expect industry commenters to provide documentation of the specific uses of PIP (3:1) in articles throughout their supply chains, documentation of concrete steps taken to identify, test, and qualify substitutes for those uses, documentation of specific certifications that would require updating and an estimate of the time that would be required. Without this more specific information from suppliers, EPA will be unlikely to extend the compliance dates again.*

- EPA will also undertake rulemaking to propose revised rules for all five PBT chemicals in the Spring of 2023.
  - The current rules remain in effect while EPA is working on this new rulemaking effort

Upcoming TSCA Risk Evaluations

- The U.S. EPA has started restricting substance in articles under TSCA;
- It is likely they will continue this trend

- Several additional batches of substances are under risk evaluation (including PFAS substances)
  - product manufacturers should closely monitor results from the risk evaluations and proposed risk management measures for possible impacts to their products and manufacturing process.

Emerging Supply Chain Declaration Requirements

Business Opportunities and Challenges

Eco-Design and Material Circularity

- Eco-Design has become important for regulatory and customer requirements
- Consideration for all life cycle stages: extracting materials, transportation, manufacturing, product use, end of life
- Some Eco-Design opportunities are low-hanging fruit and can easily justified while others present challenges
- Challenges in Eco-Design
  - Conflicts in Eco-Design opportunities and priorities
  - Governments will sometimes drive specific priorities that may not align with customer priorities or with other governments
  - Reducing environmental impact without compromising quality of product or customer satisfaction
  - Availability of suitable materials

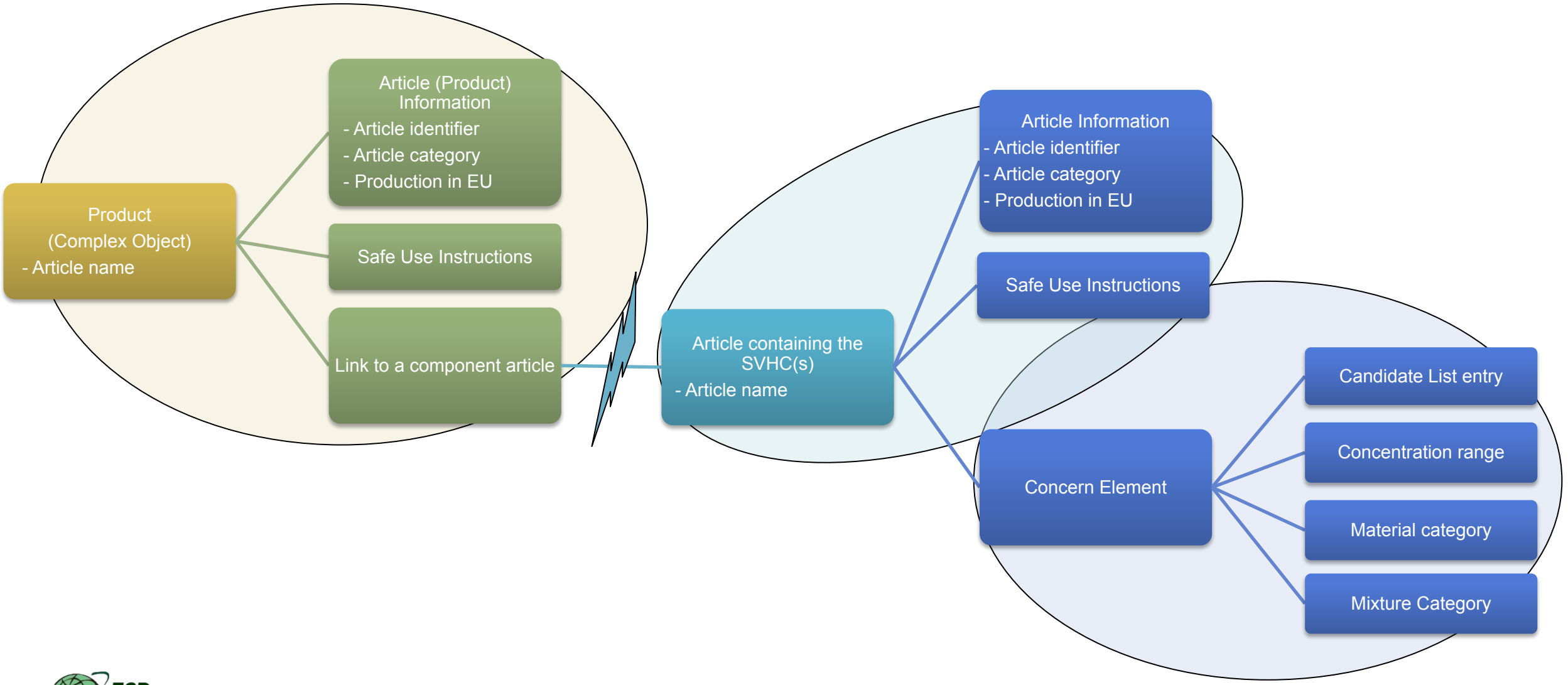
Drivers Behind the Supply Chain Declaration Requirements

- Emerging environmental requirements
  - beyond substance restrictions ☐ material circularity and efficiency
  - consideration for all life cycle stages: extracting materials, transportation, manufacturing, product use, end of life
- What is driving these new requirements:
  - regulations,
    - Substance restrictions: REACH, RoHS, TSCA, CEPA
    - Substance Reporting: Prop 65, REACH Article 33 SVHCs, SCIP (expanded set of information)
    - Ecodesign requirements: critical raw materials (CRM), Halogens
    - Circular Economy Action Plan ☐ enhanced ecodesign and circularity requirements
      - Sustainable Products Initiative (SPI) and Digital Product Passport
      - Durability requirements (France repairability index)
  - procurement requirements, ecolabels, and voluntary initiatives
- Broad range of new methods and standards
  - need for consistent and reliable information flows through supply and distribution chains.
  - standards and tools to help organizations cope with the new requirements.

Information from Supply Chain

- Substance content
  - hazardous substances and safe use
  - alternatives assessment for substitution with less hazardous materials and chemicals
  - drive towards Full Material Declaration (FMD)
- Materials and use of preferable materials
  - sourcing of materials and chain of custody
    - e.g. conflict materials, circular materials
- Design for end of life - ease of disassembly / recyclability
- Product longevity
  - Durability: reliability, reparability, maintainability, upgradability
    - includes life-cycle extension (repair/maintenance/upgrade)
- Energy consumption during the use phase of the product
- Emissions during all life-cycle stages
- Product packaging
- Results of life cycle assessment and product carbon footprint.

SCIP - Simplified Mandatory Information Requirements?



Material Circularity - Critical Raw Materials (CRM)

- Servers and data storage products (Regulation (EU) 2019/424)
  - cobalt and neodymium

Added to IEC 62474 Declarable Substances List (DSL) in July 2021
- Cobalt/Cobalt compounds
- Neodymium/Neodymium compounds

- Mobile phones
  - cobalt, tantalum, neodymium and gold

- Batteries
  - cobalt, lead, lithium, nickel

(a) indicative weight range (less than 5 g, between 5 g and 25 g, above 25 g) at component level, of the following critical raw materials:

(a) Cobalt in the batteries;

(b) Neodymium in the HDDs;

(b) instructions on the disassembly operations referred to in point 1.2.1 of this Annex, including, for each necessary operation and component:

(a) the type of operation;

(b) the type and number of fastening technique(s) to be unlocked;

(c) the tool(s) required.

Digital Product Passport (DPP)

Some of the information that may be included in DPP

- identification
- environmental characteristics
- hazardous chemicals / safe use
- recycled material content
- durability, including repair and upgrade instructions
- reusability
- recycling and/or disposal instructions

from presentation at European Commission workshop

- How digital Product Passports could work
  - Every product receives a unique identifier ("birth certificate") with basic information (e.g. producer, model, date); this is kept on a centralised registry.
  - An address is created similar to a URL (Uniform Resource Locator) for the product. When combined with a tag (QR code, RFID, Bluetooth tag) the company, consumer or public authority can connect directly to access the product's unique digital profile with quantitative and qualitative, static and dynamic, standardised and machine readable data.
  - Most data can stay in the place of origin. There is no need to mirror and copy the data in centralised databases. The registries with links to the distributed data can be managed by third trusted partners ensuring reduced cost or administrative burden. One example is the GS1 model.
  - Distributed ledger technologies, including blockchain , can enable secure or encrypted decentralised data where needed and a dependable information trail.
  - Agreed standards and protocols streamline the delivery of the product information and systems interoperability based on common ontologies and classifications, and agreed protocols.
  - For specific value chains or product groups stakeholders are convened to identify relevant data and agree on access.
  - Data can be encrypted where justified and agreed (for example on grounds of intellectual property, commercial sensitivity or privacy);
  - Verification possible by regulatory and market surveillance authorities. Other approaches could also be explored

Standards and Tools for Assessment and Supply Chain Communication

- European Commission mandate for material efficiency standards
- ISO/TC323 – Circular Economy
- Joint ISO/IEC standard on material declaration (ISO/IEC 82474-1)
  - applicable to all industries
  - based on IEC 62474
- Potential harmonization of material classifications

EU Material Efficiency Mandate M/543 (2015)

- Standardization mandate from European Commission to CEN/CENELEC/ETSI
- JTC10 established to develop 9 standards documents on material efficiency
- Scope: Energy related products within scope of the EU Eco-design Directive 2009/125/EC

- Objectives:
  - Extending product lifetime
  - Ability to re use components or recycle materials from products at end of life
  - Use of re-used components and/or recycled materials in products

JTC10 Standards under EU Mandate M/543

Number	Title	Status
EN TR 45550	Terms & Definitions on Material Efficiency	Development
EN 45552:2020	General method for the assessment of the durability of energy-related products	Published
EN 45553	Ability to remanufacture ErP	
EN 45554:2020	General methods for the assessment of the ability to repair, reuse and upgrade energy-related products	Published
EN 45555:2019	General methods for assessing the recyclability and recoverability of energy-related products	Published
EN 45556:2019	General method for assessing the proportion of reused components in energy-related products	Published
EN 45557:2020	General method for assessing the proportion of recycled material content in energy-related products	Published
EN 45558:2019	General method to declare the use of critical raw materials in energy-related products	Published
EN 45559:2019	Methods for providing information relating to material efficiency aspects of energy-related products	Published

ISO TC323 – Circular Economy

- ISO TC323 – Circular Economy
  - SCOPE: Standardization in the field of Circular Economy to develop frameworks, guidance, supporting tools and requirements for the implementation of activities of all involved organizations, to maximize the contribution to Sustainable Development…

- Four International Standards and several studies are under development:
  - ISO 59004 Circular economy — Framework and principles for implementation
  - ISO 59010 Circular economy — Guidelines on business models and value chains
    - circular design, circular use, circular recovery
  - ISO 59020 Circular economy — Measuring circularity framework
    - Circularity indicators for measurement and assessment of circularity
  - ISO 59040 Circular economy – Product Circularity Data Sheet

Product Circularity Data Sheet (PCDS)

- Methodology and format for reporting and exchanging information about the circular economy aspects of products
- The standard is to include:
  - data template for reporting circularity information about products;
  - audit process;
  - data exchange protocol/format.
- PCDS Template based on true/false statements – Example statement:

Index ID	Statement
2503	The product contains >25-50 % post-consumer recycled content by weight.
2601	The product contains >0-10 % renewable content by weight.
4104	>50-75 % of the product (weight in kg) is designed to be cleanly removed from the product.
5033	>25-50% of the product content is designed for recycling at the same level of quality. The remainder of the materials is foreseen by the manufacturer to be recycled at a lower quality than the original content.
6201	The supply chain is audited up to the 2nd level.

PCDS Information from manufacturers

Note: the sections and specific statements are based on latest published template and may be modified as ISO standard is developed.

1. Product and Supplier Identification
   - Product Identifiers
   - Manufacturer Identification
   - Production Site Information
   - PCDS issuance
   - PCDS revision
2. Composition/Information on Product constituents
   - Chemical substance threshold
   - Product composition disclosure
   - Chemical composition
   - Hazard Statements
   - Pre-consumer recycled content
   - Post-consumer recycled content
   - Sourcing statements
3. Design for better use
   - Designed for maintenance & repair
   - Designed for safe operation
   - Designed for actively positive impacts
4. Design for disassembly
   - Demounting
   - Disassembling
   - Dismantling
5. Design for re-use
   - Circularity pathways/scenarios – Product designed for
6. Third-party verification
   - TBD

Product Circularity Data Sheet (PCDS)

- Opportunities and Challenges with this approach
  - The use of ranges is intended to allow manufacturers to avoid revealing details that may be consider confidential
    - But the ranges may not be precise enough for roll-up by downstream manufacturers
  - The approach is based on information flowing down the supply chain
  - Does not envisage a specification driven product
    - e.g. specifications driven up the supply chain
  - Credibility and accuracy of data
    - Details are needed on definitions for each product characteristic and how to assess and calculate
      - needs to reference detailed standards to be effective
    - Third party audit?

What Is a Substance and Material Declaration?

Chemical Manufacturer → Material Supplier → Component Manufacturer → Assembly Manufacturer → Final Product Manufacturer

Information flows down the manufacturing chain:

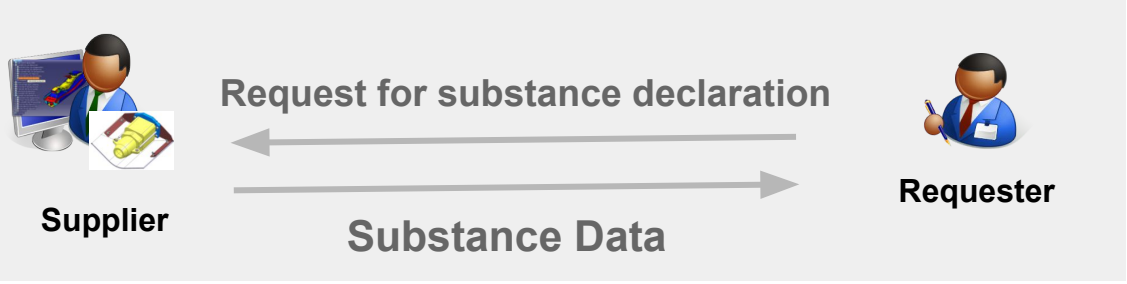
- Substance content
- Materials
- Parts
- Compliance data (potentially)

Data may be Mapped

Final Product Manufacturer ⇄ Customers, Regulators, Recyclers, etc.

For each transaction in the supply chain:

- A downstream manufacturer (requester) may request material declaration information from their upstream suppliers
- The suppliers provide the declaration to the requester



IEC 62474 - Material and Substance Declaration

International Electrotechnical Commission

- International standard for material and substance declaration
  - Initially published in 2012
  - Major revision IEC 62474:2018 was published November 2018
    - Includes additional features and harmonization requests from industry
    - Updated regulatory support –enhanced support for SCIP (March 2020)
- Supports regulations around the world
- Flexible material declaration capabilities and leverages industry best practices
- Continuous maintenance process for fast updates to market needs
- Adoption
  - ISO/IEC standards are recognized by WTO for harmonization
  - Adopted as EU Standard (EN IEC 62474) and as the National Standard in several other countries
    - basis for Japan National material declaration system
  - Referenced by growing number of standards / regulations
    - Used by IEC 63000 and EU Circular Economy Standards (e.g. EN 45558 – CRM reporting)

Development underway to convert IEC 62474 into a dual-logo ISO/IEC Standard (ISO/IEC 82474-1)

IEC 62474 – What's Included?

- IEC 62474 is implemented in two parts
  - IEC 62474 document (Pdf file)
  - Online database containing specifications that need regular updates

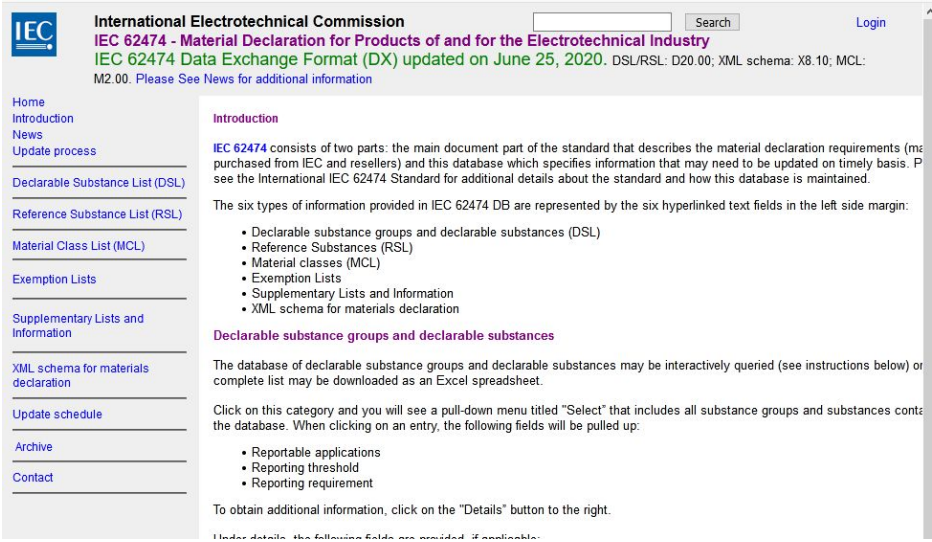
- IEC 62474 document includes:
  - Declaration procedure, high-level requirements, and rules for updating the parts of the standard in the online database

- The online database includes:
  - Data Exchange Format (DXF)
  - Lists
    - Declarable Substance List (DSL) with reference substances
    - Material Class List (MCL)
    - Exemption Lists (EL)
    - Supplementary Lists

- IEC 62474 standardizes
  - data requirements,
  - data exchange format, and
  - declaration reference lists.

- IEC 62474 is not a tool or a repository for material declaration data.

Updates to IEC 62474 Database



- IEC 62474 Database is accessible from the IEC website
  - http://std.iec.ch/iec62474/iec62474.nsf/index

- Validation Team (VT62474)
  - Global team responsible for maintaining the parts of the standard in the IEC 62474 Database
  - Typically, two to three updates per year (as needed)
    - Updates can be quick: 2-3 months for proposal -> publication
    - Proactive screening SVHCs (REACH Candidate List) for use in EEE
    - Releases DSL update to coincide with ECHA updates to Candidate List

- Current Database Version:
  - Declarable Substance List: D23.00
    - 2021 updates in January (SVHCs), April (TSCA PBTs) and July (SVHCs, CRMs)
  - Material Class List: M2.00 (last updated August 2019)
  - Exemption Lists: EL3.0(EU)/EL1.1(China)
  - Data Exchange Format: X8.10 (updated March 2020 to meet SCIP reporting requirements)

ISO/IEC Material and Substance Declaration

International Electrotechnical Commission

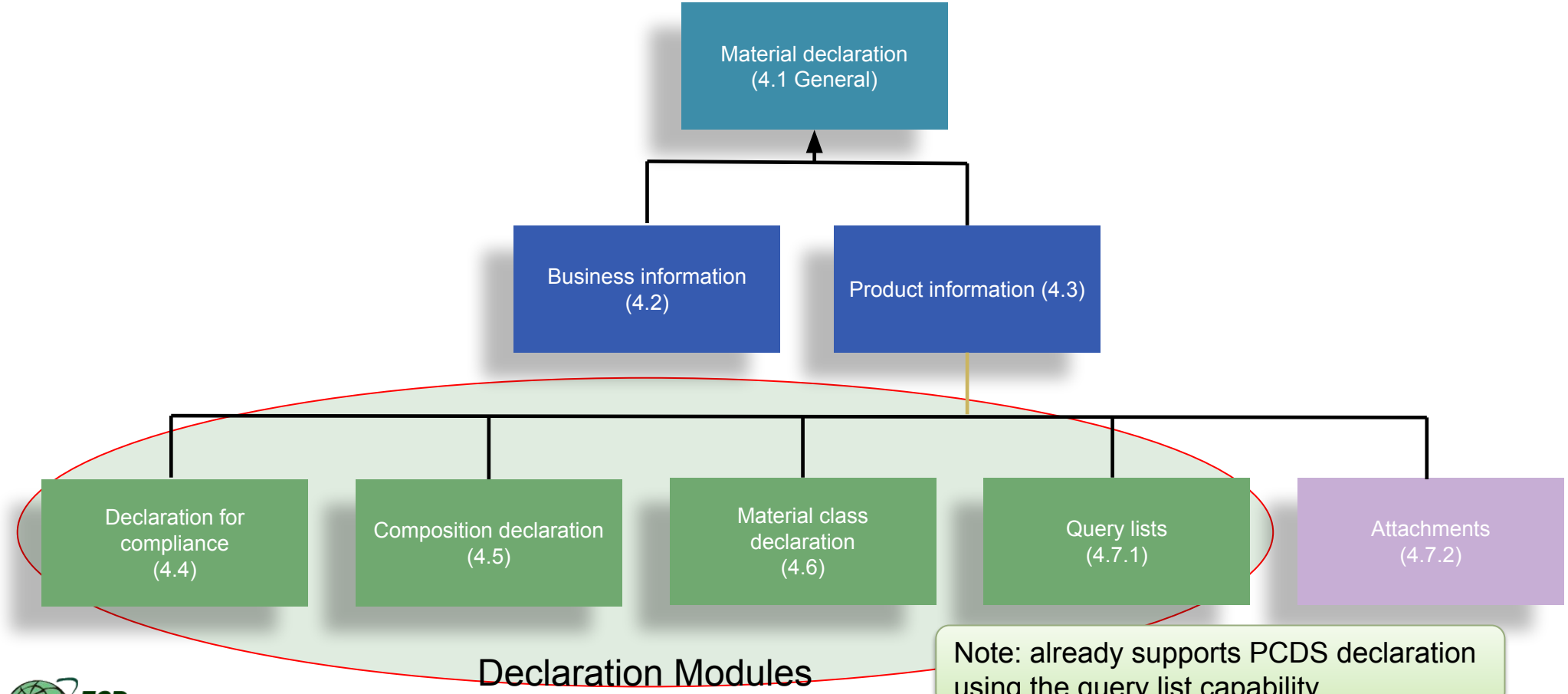
- Development underway for a dual-logo ISO/IEC Standard (ISO/IEC 82474-1)

- Functionality to meet requirements for all industries
  - participation by broad range of industries (several liaisons with industry groups)

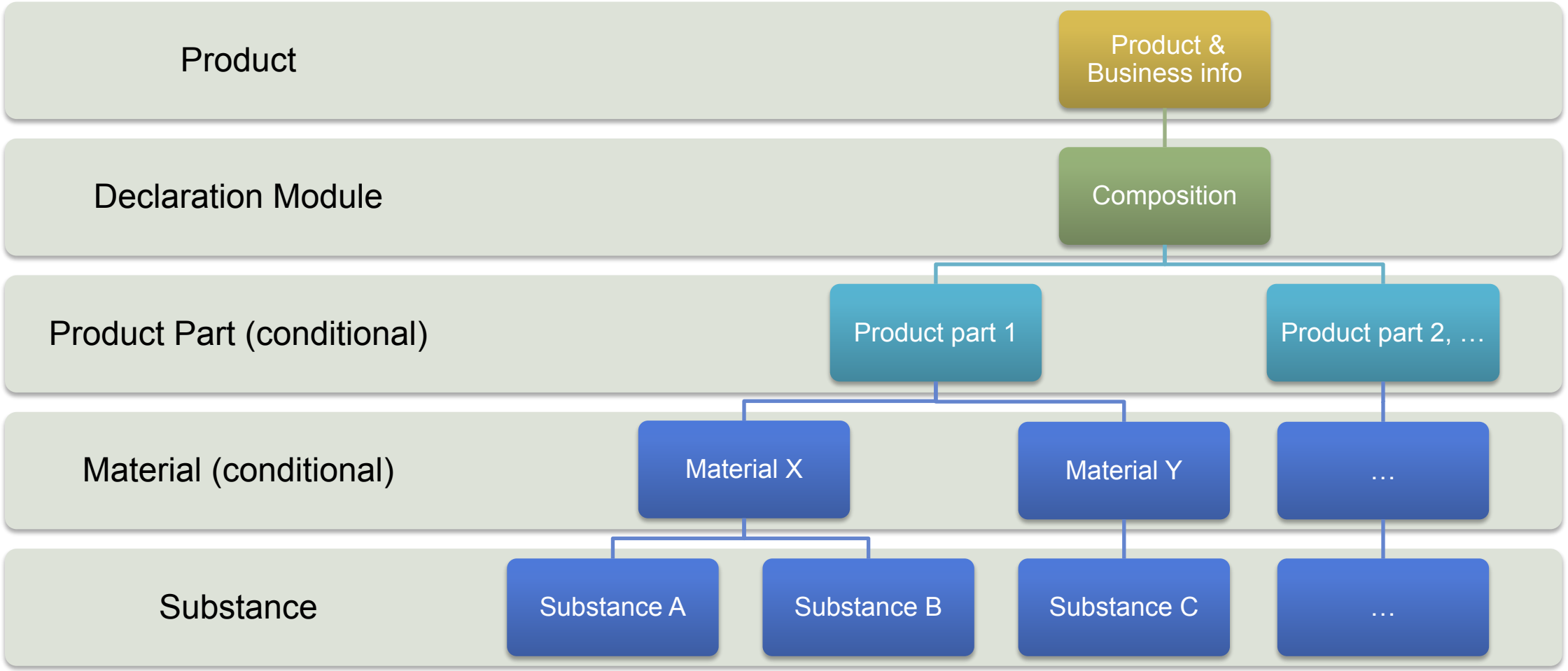
- New Features for comprehensive material and substance declarations
  - Additional data fields to support circular economy requirements
  - Standardized requirements and format for reference lists
    - DSL, query lists, exemption/application lists, material classification lists
  - System to System (S2S) web services protocol (WSDL)
  - Enhanced consideration for data accuracy and security
  - Harmonized material classification list
  - Modularity to add additional declaration modules

ISO/IEC 82474-1 Data Exchange Declaration Modules

- Flexible architecture to support additional declaration modules in the future



Structure of Composition Declaration



Material Classification Lists

- Fragmentation of Material classifications and categories is causing issues for many manufacturers
  - Automotive material categories
  - EEE material classification (IEC 62474)
  - ECHA SCIP material categories and mixture categories
  - …..
- Mapping tables
  - IEC 62474 material classes to SCIP material categories
    - investigating mixture categories
  - Similar for automotive material categories

IEC62474 Material Class List version M2.00			SCIP Material Category 202010		
Level 2 Class ID and Name	ID	Level 3 Class Name	Default Mapping	Identifier	Text
M-10 Steels and ferrous materials	M-100	Stainless steel	Default	66376	metal > steel > stainless steel
M-10 Steels and ferrous materials	M-101	Cast and sintered irons	Default	66369	metal > iron (and alloys of, except steel)
M-10 Steels and ferrous materials	M-101	Cast and sintered irons	Alternate	66374	metal > steel
M-10 Steels and ferrous materials	M-119	Other ferrous alloys, non-stainless steels	Default	66377	metal > steel > alloy steel (except stainless steel)
M-12 Non-ferrous metals and alloys	M-120	Aluminium and its alloys	Default	66380	metal > aluminium (and alloys of)
M-12 Non-ferrous metals and alloys	M-121	Copper and its alloys	Default	66392	metal > copper (and alloys of, except bronze and brass)
M-12 Non-ferrous metals and alloys	M-121	Copper and its alloys	Alternate	66388	metal > bronze
M-12 Non-ferrous metals and alloys	M-121	Copper and its alloys	Alternate	66386	metal > brass
M-12 Non-ferrous metals and alloys	M-122	Magnesium and its alloys	Default	66399	metal > magnesium (and alloys of)
M-12 Non-ferrous metals and alloys	M-123	Nickel and its alloys	Default	66402	metal > nickel (and alloys of)
M-12 Non-ferrous metals and alloys	M-124	Zinc and its alloys	Default	66411	metal > zinc (and alloys of, except brass)
M-12 Non-ferrous metals and alloys	M-125	Lead and its alloys (including Pb solders)	Default	66396	metal > lead (and alloys of)
M-12 Non-ferrous metals and alloys	M-126	Tin and its alloys (including Pb-free solders)	Default	66406	metal > tin (and alloys of), except bronze
M-12 Non-ferrous metals and alloys	M-149	Other non-ferrous metals and alloys	Default	66415	metal > other non-ferrous metal (and alloys of)
M-15 Precious metals	M-150	Gold	Default	66417	metal > other non-ferrous metal (and alloys of) > precious-meta
M-15 Precious metals	M-151	Platinum	Default	66417	metal > other non-ferrous metal (and alloys of) > precious-meta

- Strong cross-sector interest in harmonizing material classification list.
  - Objective of lists are sometimes different ☐ creates challenges for harmonization

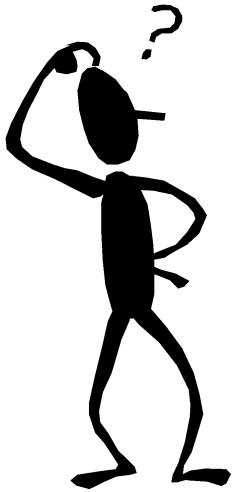
Summary

- Manufacturers should expect more substances in article restrictions around the world
  - e.g. U.S. and Canada

- Many emerging requirements for additional information from supply chains
  - Substance content – hazardous, other
  - Materials – type, circularity, recyclability, sourcing, chain of custody
  - Inventory of environmental impacts including carbon footprint
  - Circularity aspects including durability

- Manufacturers should prepare methods and tools for more obtaining more comprehensive information from suppliers
  - Start dialogue with suppliers
  - Consider how information will be transferred, stored and rolled up

- Circular Economy will pose new opportunities and challenges for all industries



Thank you

Questions?

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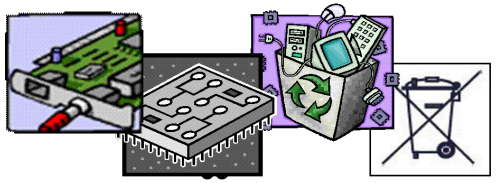

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