



BUILD ELECTRONICS BETTER

IPC 1402 – Standard for Greener Cleaners Used in Electronic Manufacturing

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My Goals for Your Take Away



- > Understand what the IPC 1402 standard is and why it is important

- > Understand the Scope / Purpose
 - What is in and out of scope of the standard

- > Understand who is the intended users and potential value to those users

- > Gain a high level overview of the IPC 1402 standard



- > What is the standard
 - An attempt to establish a baseline as to what can be defined as a “green cleaner”.

- > How does it fit into the electronic industry
 - Topics of “green” and “safe” currently dominate a large volume of talking points in the industry
 - Some attempt must be made to unify the language and company claims around these talking points.



In the Void of a Standard Such as IPC 1402... what if ???



- > Comparing “green” cleaners and claims from one manufacturer to another (if using different standards that are not commonly connected)
 - would require in depth toxicological knowledge to understand which product was more “green”.

- > Individual organizations could have a “race” to the top or bottom in regards to what could be defined as “green”.
 - NGO’s, tox firms and government bodies have the individual goal of providing a high level of worker safety and environment protection
 - Industry has the goal of showing that their products are safe.

IPC 1402 – Standard Overview



- > Section 1 – Scope
- > Section 2 – Applicable Documents
- > Section 3 – Cleaner Overview
- > Section 4 – Health, Safety and Environmental Requirements
- > Section 5 – Overall Requirements
- > Section 6 – Verification



- > This standard applies to cleaning products used in the Electronics Manufacturing, including but not limited to original equipment manufacturers, electronics manufacturing services companies, board manufacturers, cable and wire harness manufacturers and electronic industry suppliers.
- > This standard applies to direct use chemicals to clean products or components, as well as to clean manufacturing machines or tooling during operation and maintenance.
- > This standard is focused on reducing the human health and environmental impacts and improving the safety of cleaning products used during the manufacturing process.



- > The purpose of this standard is to set pragmatic, minimum criteria for greener cleaning products used in electronics manufacturing that can be feasibly and efficiently applied by decision-makers to protect workers and the environment.
- > The minimum criteria are based on a foundational set of scientifically defensible environmental, health and safety requirements using a combination of list-based data sources, information found on Safety Data Sheets and analytical testing results.
- > Additional guidance is included to facilitate continuous improvements in formulating safer cleaning products.

Cleaning Product Categories That Are In Scope of this Document Include (But Are Not Limited To):



- > Removing solder and flux residuals from PCBs, components
- > Cleaning of the contaminated surfaces inside reflow ovens
- > Cleaning the flux residual on stencil, carrier, and frames
- > Cleaning adhesive dispersing needles
- > Screen wiping



- > Optimal Lens Cleaning
- > Packaging printer cleaning
- > De-bonding solutions for re-work or recycle
- > Degreasing tooling and machine parts
- > Stripping of coatings

Product Categories That Are Out of Scope of This Document Include (But Are Not Limited To):



- > Demolding solutions
- > Cleaners used in non-manufacturing activities (e.g. laboratory, office housekeeping, and maintenance unrelated to manufacturing)
- > Surface treatment agents used to promote adhesion, etching and post etching operations, and chemical mechanical planarization (CMP process)

- > This standard is intended to be used by chemists, EHS professionals, and engineers working at companies formulating cleaning products or manufacturing electronics.
- > It can also be used by purchasers and other stakeholders interested in evaluating use of safer cleaning products by suppliers.



- > Electronic manufacturers can demonstrate their commitment to protection of workers and the environment by specifying use of this standard for selecting cleaning products.
- > Cleaning product formulators can demonstrate their commitment to providing greener and safer products to the market by formulating products to meet this standard, and following the included guidance to continually improve their formulations.



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- > Cleaners are rated and assessed “as sold”
 - Thus if a product is sold as both a concentrate and prediluted “ready to use”, the two different sale schemes can have a different assessment.

- > A strict stance for VOC assessment was not taken
 - This is because globally, local and regional governments have adopted considerably different VOC definitions and lists for exempt compounds.
 - > Thus VOC is not currently scientifically uniformly defined

- > As list-based data sources improve and data gaps for raw materials are closed, it is understood that product assessments can change as more or better data becomes available.

IPC 1402 – Formulation Requirements



- > Full formula disclosure is required to proceed with an assessment
 - Self assessments with redacted ingredient names or hired third party assessors can be used to protect intellectual property.

- > Full disclosure means all substances and/or mixtures including intentionally added and known impurities and residuals, shall be declared if present at greater than or equal to 0.01% (100 ppm) by weight at the product level unless a lower reporting threshold is required. (e.g., listed by RSL)



IPC 1402 – Assessments Made Base On

> Human health hazards:

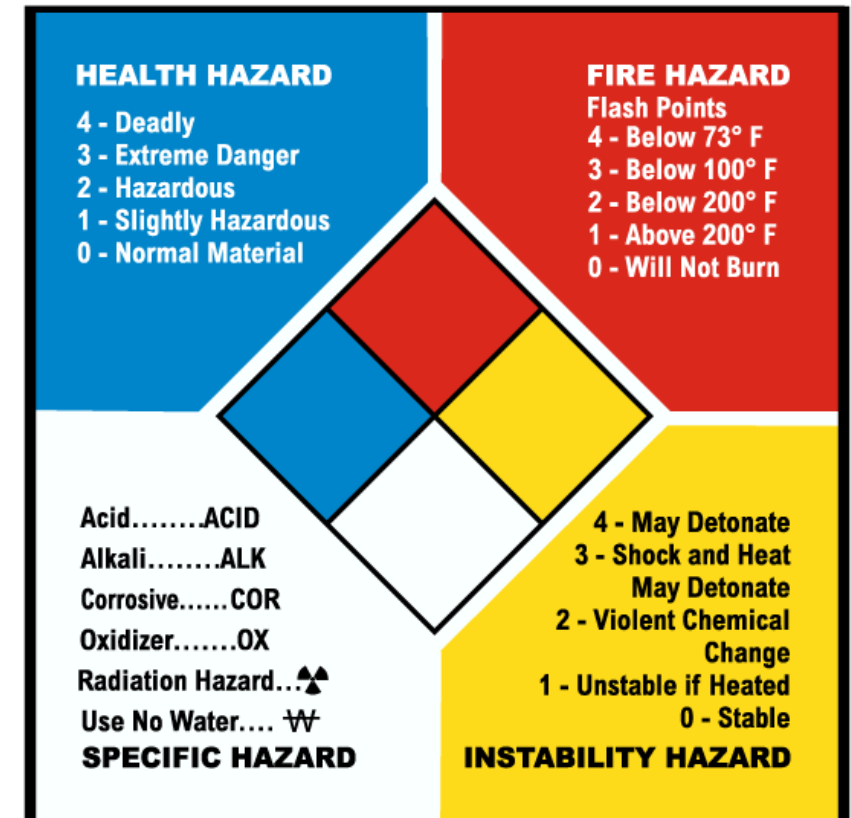
- Group 1 – life threatening effects (acute or chronic), life-altering irreversible adverse effects, or impacts that can be transferred between generations
- Group 2 – all human health hazards that lead to adverse health effects not included in Group 1

> Environmental requirements:

- Acute Aquatic Toxicity, Chronic Aquatic Toxicity, and Persistent, Bioaccumulative and Toxic (PBT)

> Physical Hazards

- Explosive, flammable, etc.



Minimum Criteria for Greener cleaners



> RSL

- RSL Compliance

> Health

- No High ones in Human Health Group 1

> Environment

- No High ones in Persistent, Bioaccumulative and Toxic (PBT) endpoint

> Safety

- Not classified as High in Safety Group

> Other

- $2 \leq \text{pH} \leq 11.5$

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Analytical Testing Requirements



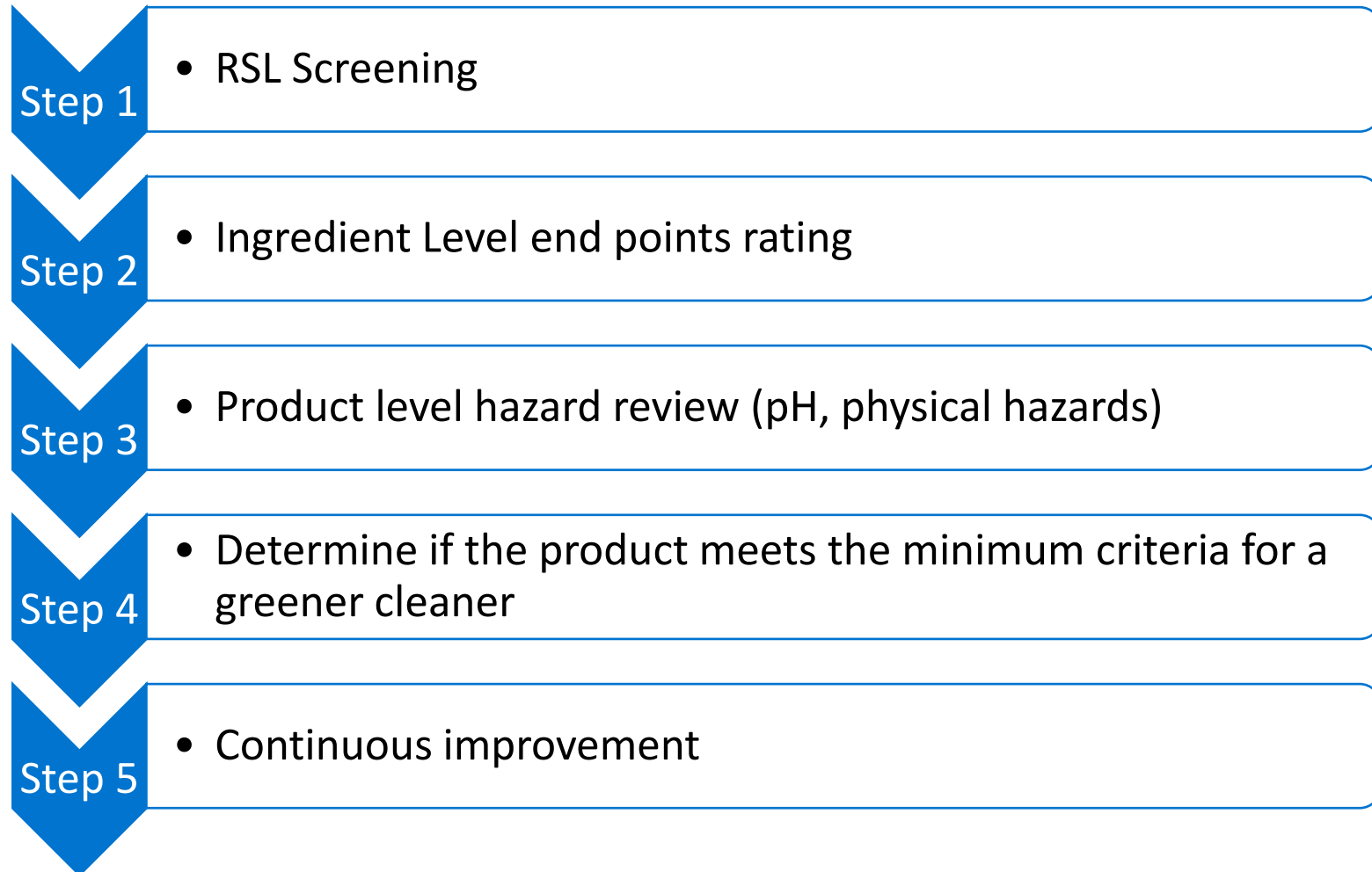
> Cleaner manufactures shall provide a testing report using the test methods and detection methods shown to the side

> Reports should be obtained by an independently certified laboratory

Chemical Name or Chemical Group Name	CAS RN	Threshold Limit	Testing Method	Minimum Detection Limit
Benzene	71-43-2	100 ppm by weight	GC-MS or HPLC-MS	5 ppm
Dimethyl benzene / Xylene	1330-20-7	100 ppm by weight	GC-MS or HPLC-MS	5 ppm
Ethylbenzene	100-41-4	100 ppm by weight	GC-MS or HPLC-MS	5 ppm
H-Hexane	110-54-3	100 ppm by weight	GC-MS or HPLC-MS	5 ppm
Methanol	67-56-1	100 ppm by weight	GC-MS or HPLC-MS	5 ppm
N-methylpyrrolidone (NMP)	872-50-4	100 ppm by weight	GC-MS or HPLC-MS	5 ppm
Toluene	108-88-3	100 ppm by weight	GC-MS or HPLC-MS	5 ppm
Chlorinated Organic Compounds	All group	100 ppm by weight (in total chlorine)	EN 14582 or US EPA SW-846 5050/9056	50 ppm
Brominated Organic Compounds	All group	100 ppm by weight (in total bromine)	EN 14582 or US EPA SW-846 5050/9056	50 ppm
	Dodecamethylcyclohexane (D6), 540-97-6			
Volatile Methyl Siloxanes (VMSs)	Decamethylcyclopentasiloxane (D5), 541-02-6	100 ppm by weight (in total)	Self Disclosure	NA
	Octamethylcyclotetrasiloxane (D4), 556-67-2			
Ozone Depleting Substances (ODS)	Various, See Table xx-1 in Annex XX	No intentional use	Self Disclosure	NA
Alkylphenols (AP) & Alkylphenol Ethoxylates (APEO)	Various, See Table xx-2 in Annex XX	100 ppm by weight (in total)	Self Disclosure	NA
	Various, See OEDC LISTS			
Perfluorooctane Sulfonate (PFOS) and Related Compounds, Perfluorooctanoic Acid (PFOA) and Related Compounds	OF PFOS, PFAS, PFOA, PFCA, RELATED COMPOUNDS AND CHEMICALS THAT MAY DEGRADE TO PFCA (AS REVISED IN 2007), See Table C-1 in Annex C.	100 ppm by weight (in total)	Self Disclosure	NA



Workflow for Final Classification



Assessment Protocol and Hazard Information Summary



#	Ingredient Name	CAS#	Group I Human				Group II Human				Environmental			Physical													2 ≤ pH ≤ 11.5 (Y/N)	Meet Restricted Substance (Y/N)									
			C	M	R	E	AT	ST/S	ST/R	SnS	SnR	IrS	IrE	AA	CA	PBT	Ex	FG	Cmp	OxG	GuP	FL	FS	SR	FG/W	OL			OS	OP	Cor	Dex					
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Product Level Rate																																					



Hazard Information Summary



70% IPA in water as an example

#	Ingredient Name	CAS#	Group I Human				Group II Human					Environmental			Physical										2 ≤ pH ≤ 11.5 (Y/N)	Meet RSL (Y/N)											
			C	M	R	E	AT	ST/S	ST/R	SnS	SnR	IrS	IrE	AA	CA	PBT	Ex	FG	Cmp	OxG	GuP	FL	FS	SR			FG/W	OL	OS	OP	Cor	Dex					
1	Propan-2-ol	67-63-0	L	L	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Y	Y			
2	Water	7732-18-5	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Y	Y			
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Product Level Rate			L	L	L	L	L	M	L	L	L	L	M	L	L	L	L	L	L	L	L	L	M	L	L	L	L	L	L	L	L	L	L	L	Y	Y	





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Questions

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