2

TESTING FOR POLLUTANTS

Future-Proofing Compliance — Utilizing Testing to Meet Tomorrow's Regulations

Purpose of the Presentation

- Highlight importance of testing
- Provide a process for regulatory preparedness

Why Future Regulations Matter ?

- Increase in the number of chemical regulations being introduced
- Global chemical regulations are becoming increasingly complex
  - ❖ Not just a single chemical but a family of chemicals
  - ❖ Influence of sustainability regulations on chemical regulations
  - ❖ Lack of harmonization
- Shorter implementation times

The Importance of Testing

Proactive Compliance

- Avoid last minute non-compliance when a regulation is implemented
- Ensure market access

Supply Chain Readiness

- Identify and phase out non-compliant substances
- Provides time to find alternatives or reformulate
- Ensures continuity of supply

The Importance of Testing

Risk Mitigation

- Reduce the cost of corrective actions later in the product lifecycle
- Prevent reputational risk

Competitive Advantage

- Meet or exceed brand expectation
- Demonstrates organization is a leader in chemical management and safety

Regulatory Readiness - Approach

1. Resources/Planning
2. Regulatory Monitoring
3. Review Draft Regulation and Assess
4. Testing
5. Implementation

Regulatory Readiness - Approach

1. Resources/Planning

- Who has responsibility for monitoring and testing?
- Who needs to be involved?
- Budget – testing costs
- Define the process/document

Regulatory Readiness - Approach

2. Regulatory Monitoring

- Sources for Regulatory Information
  - ❖ Regulatory Agencies
    - ➢ European Chemical Agency – news webpage/podcasts/newsletter
  - ❖ Industry Associations (e.g., EURATEX, AAFA)
    - ➢ guidance documents, regulatory position papers
  - ❖ Test labs
    - ➢ Newsletters, webinars

Regulatory Readiness - Approach

2. Regulatory Monitoring

- Sources for Regulatory Information
  - ❖ Regulatory Subscription Service (e.g., Compliance & Risk, yordas Group)
    - ➢ Offer webinars on regulatory updates
  - ❖ Brands

Regulatory Readiness - Approach

3. Review Draft Regulation and Assess

- Does the scope of the regulation apply to my business?
- Do brands already require RSL testing for the chemical(s)?
- Is the chemical(s) typically used in production processes?
  - ❖ Check existing chemical information (MRSL reports, SDS, Chemical Inventory List)
  - ❖ Check AFIRM's chemical information sheets
  - ❖ Check with suppliers
- Assess level of risk

Regulatory Readiness - Approach

4. Testing

- Determine scope of testing
  - ❖ materials to include
  - ❖ Colours to include
  - ❖ Sample type and quantity

- Select Appropriate Test Method - Confer with test lab test method to use

- Interpret Results
  - ❖ Compare results against proposed regulatory limits
  - ❖ Determine compliance
  - ❖ Document findings

Regulatory Readiness - Approach

5. Implementation

- Take Action Based on Findings
  - ❖ If chemical is present above limits
    - ➢ Identify source (root cause analysis)
    - ➢ Identify solutions (reformulation or substitution)
    - ➢ Test and assess solution
  - ❖ If compliant
    - ➢ Store results

- Continuous Monitoring
  - ❖ monitor regulatory updates for changes

AFIRM Restricted Substances List (RSL)

- Updated annually
- Recommendations for updates submitted annually
- Not all recommendations are accepted
- Voting process

AFIRM Restricted Substances List (RSL)

- Separated by chemical group
- Includes CAS #, limits, test methods and reporting limits
- Potential uses and other relevant information
- Link to Chemical Information Sheets

CAS No.	Substance	Limits Component Materials in Finished Product	Potential Uses & Additional Information	Suitable Test Method Sample Preparation & Measurement	Reporting Limit Limits above which test results should be reported
	Acetophenone & 2-Phenyl-2-Propanol				
98-86-2	Acetophenone	50 ppm each	Potential breakdown products in EVA foam when using certain cross-linking agents, including Dicumyl Peroxide.	Extraction in acetone or methanol GC/MS, sonication for 30 minutes at 60° C	25 ppm each
617-94-7	2-Phenyl-2-Propanol				
	Acidic & Alkaline Substances				
N/A	pH value	Textiles: 4.0 – 7.5 Leather: Chrome-tanned: 3.2 – 5.5 Other: 3.5 – 7.5	pH value is a characteristic number, ranging from pH 0 to pH 14, which indirectly shows the content of acidic or alkaline substances in a product. pH values less than 7 indicate sources of acidic substances, and values greater than 7 indicate sources of alkaline substances. To avoid irritation or chemical burns to the skin, the pH value of products must be in the range of human skin—approximately pH 5.5. AFIRM recommends the limits cited to comply with global regulations and to minimize the chances of Chromium VI formation during tanning and processing of leather. For chrome-tanned leather, the final fixing bath of the re-tanning process should always have a pH below 4.0 to guard against the formation of Chromium VI. Important: Egypt, Morocco, and the Gulf Cooperation Council (GCC) require pH for leather not lower than 3.5.	Textiles and synthetic coated fabrics: EN ISO 3071:2020 Leather: EN ISO 4045:2018	N/A

AFIRM Testing Matrix

- Updated annually as needed
- Level 1 and Level 2 designations
- Based on brand data and LabTAC guidance
- Resource to understand risk in materials

Substance	Natural Fibers	Synthetic Fibers	Natural & Synthetic Blends	Synthetic Coated Fabrics	Natural Leather & Fur Skin	Natural Materials	Metals	Other: Porcelain, Ceramic, Glass, Crystal, Etc.	Feathers & Down	Polymers									Coatings & Prints	Glue
										EVA	PU Foams	All other PU & TPU	Rubber (Excludes Latex and Silicon Rubbers)	Polycarbonate	ABS	PVC	All Other Foams, Plastics & Polymers			
Acetophenone & 2-Phenyl-2-Propanol										2										
Acidic & Alkaline Substances (pH)	1	1	1	1	1															
Alkylphenol (AP) & Alkylphenol Ethoxylates (APEOs), including all isomers	1	1	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1
Azo-amines & Arylamine salts	1A	1A	1A	1A	1A	1A			1A										1	
Bisphenols		1	1	1	1					2	2	2	2	1	2	2	2			
Brominated & Organophosphorus Substances	2B																			
Chlorinated Paraffins				2K	1					2	2	1	1	2	2	1	2			
Chlorophenols	2	2	2		2															
Chlorinated Benzenes & Toluenes		2	2	2																
Cyclosiloxanes	2	2	2														2C	2		
Dimethylfumarate (DMFu)					2															
Dyes, Forbidden & Disperse		1A	1A	1A														2		
Dyes, Navy Blue		2	2																	
Fluorinated Greenhouse Gases																				
Formaldehyde	1	1	1	2	1	1D							2					1	1	

A Level 1 for dyed/colored materials (non-white) only.
B Level 2 only if Flame Retardant use or contamination is suspected or if TPP use suspected in PU,TPU, or other polymeric materials.
C Level 2 for silicone polymers only.
D Level 1 for Wood, Paper, and Straw materials only.
E Level 2 for Wool materials only.
F Level 2 if extractable Chrome above 1 ppm only.
G Copper is exempt from restriction limits in Metal parts.
H Level 2 for plant-based fibers only; N/A for animal-based fibers.
J Level 1 for Cadmium and Lead only; Crystal is exempt for Lead.
K Level 1 for PVC materials only. Otherwise, Level 2.
L Level 2 for Styrene/Butadiene Rubbers (SBRs) only.
M Level 1 if PFAS use or contamination is suspected.
N Level 1 if Rubber or black Polymeric materials, otherwise Level 2.
P Level 1 for PU and PVC- based materials only.
Q Level 1 for glues fixed in final product

AFIRM Laboratory Technical Advisory Committee (LabTAC)

- Regulatory assistance
- Assist with determining most suitable test methods
- Technical questions

Heiko Hinrichs - Bureau Veritas

Kathy Leung - Intertek

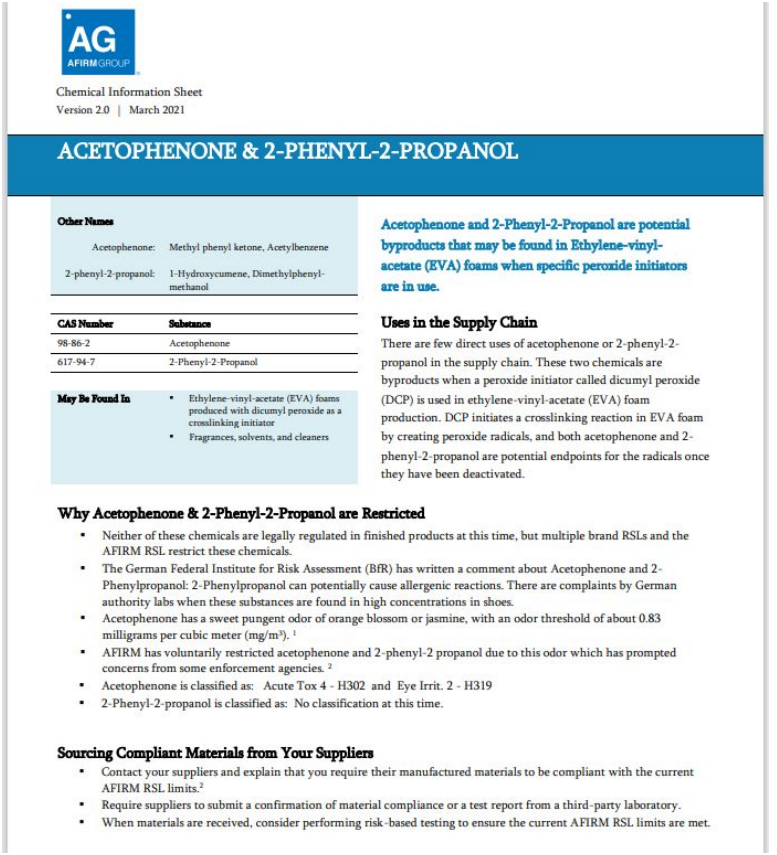
Frank Kempe - SGS

Kathrin Endress - TUV Rheinland

Bruce Ng - UL Solutions

AFIRM Chemical Information Sheets

- Provide guidance on the substances found in the AFIRM RSL
- Good resource for understanding a chemical substance or for failure resolution



Chemical Information Sheet
Version 2.0 | March 2021

ACETOPHENONE & 2-PHENYL-2-PROPANOL

Other Names

Acetophenone:	Methyl phenyl ketone, Acetylbenzene
2-phenyl-2-propanol:	1-Hydroxycumene, Dimethylphenyl-methanol

CAS Number	Substance
98-86-2	Acetophenone
617-94-7	2-Phenyl-2-Propanol

May Be Found In

- Ethylene-vinyl-acetate (EVA) foams produced with dicumyl peroxide as a crosslinking initiator
- Fragrances, solvents, and cleaners

Acetophenone and 2-Phenyl-2-Propanol are potential byproducts that may be found in Ethylene-vinyl-acetate (EVA) foams when specific peroxide initiators are in use.

Uses in the Supply Chain

There are few direct uses of acetophenone or 2-phenyl-2-propanol in the supply chain. These two chemicals are byproducts when a peroxide initiator called dicumyl peroxide (DCP) is used in ethylene-vinyl-acetate (EVA) foam production. DCP initiates a crosslinking reaction in EVA foam by creating peroxide radicals, and both acetophenone and 2-phenyl-2-propanol are potential endpoints for the radicals once they have been deactivated.

Why Acetophenone & 2-Phenyl-2-Propanol are Restricted

- Neither of these chemicals are legally regulated in finished products at this time, but multiple brand RSLs and the AFIRM RSL restrict these chemicals.
- The German Federal Institute for Risk Assessment (BfR) has written a comment about Acetophenone and 2-Phenylpropanol: 2-Phenylpropanol can potentially cause allergenic reactions. There are complaints by German authority labs when these substances are found in high concentrations in shoes.
- Acetophenone has a sweet pungent odor of orange blossom or jasmine, with an odor threshold of about 0.83 milligrams per cubic meter (mg/m^3). [1]
- AFIRM has voluntarily restricted acetophenone and 2-phenyl-2 propanol due to this odor which has prompted concerns from some enforcement agencies. [2]
- Acetophenone is classified as: Acute Tox 4 - H302 and Eye Irrit. 2 - H319
- 2-Phenyl-2-propanol is classified as: No classification at this time.

Sourcing Compliant Materials from Your Suppliers

- Contact your suppliers and explain that you require their manufactured materials to be compliant with the current AFIRM RSL limits.[2]
- Require suppliers to submit a confirmation of material compliance or a test report from a third-party laboratory.
- When materials are received, consider performing risk-based testing to ensure the current AFIRM RSL limits are met.

AFIRM Chemistry Toolkit

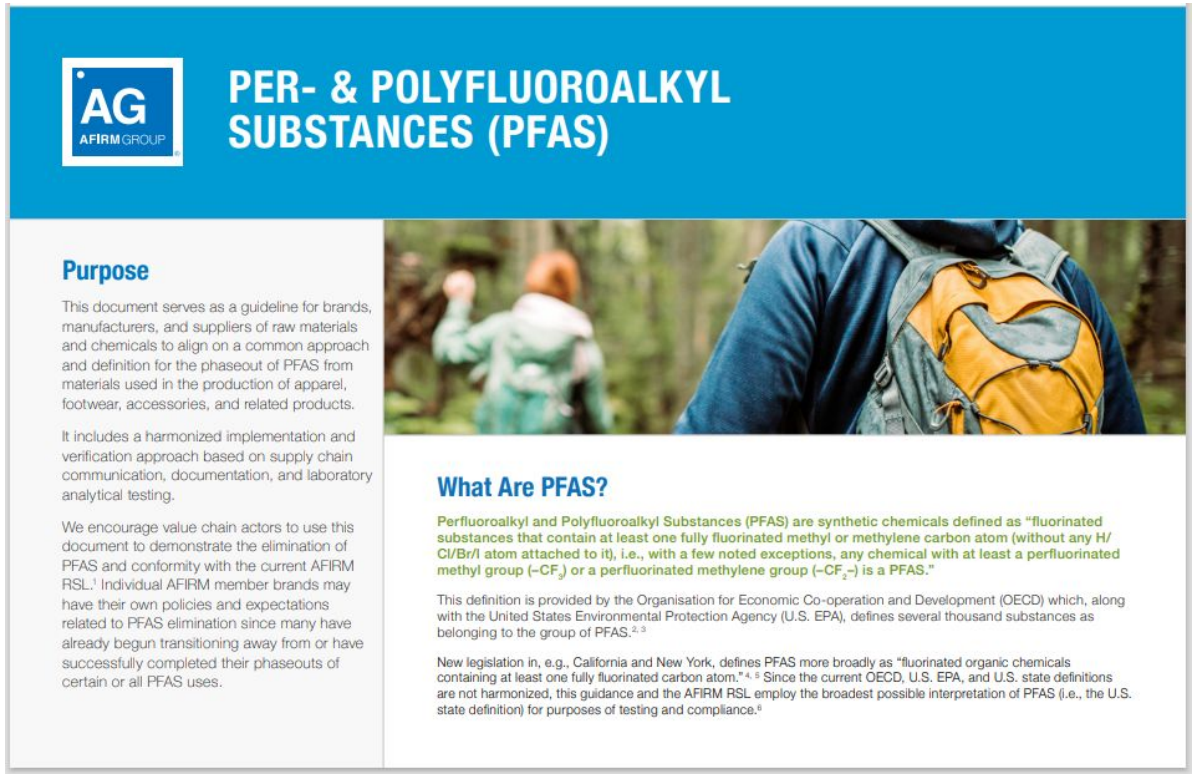
- Comprehensive guide to RSL implementation, failure resolution, some examples of best practices
- Chemical Guidance Document provides an overview of chemicals used in the manufacturing process

AFIRM Training Videos

- Short videos (less than 10 minutes each) intended to give an overview on various topics
  - Introduction to AFIRM
  - Understanding the AFIRM RSL
  - Selecting Materials for Testing
  - How to Read a Test Report
  - Failure Resolution

AFIRM Guidance Documents

- Developed to assist the industry with specific concerns
  - PFAS
  - VOC
  - Sampling Guidance
- Coming soon
  - Recycled Materials
  - Bisphenols



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PER- & POLYFLUOROALKYL SUBSTANCES (PFAS)

Purpose

This document serves as a guideline for brands, manufacturers, and suppliers of raw materials and chemicals to align on a common approach and definition for the phaseout of PFAS from materials used in the production of apparel, footwear, accessories, and related products.

It includes a harmonized implementation and verification approach based on supply chain communication, documentation, and laboratory analytical testing.

We encourage value chain actors to use this document to demonstrate the elimination of PFAS and conformity with the current AFIRM RSL.[1] Individual AFIRM member brands may have their own policies and expectations related to PFAS elimination since many have already begun transitioning away from or have successfully completed their phaseouts of certain or all PFAS uses.

What Are PFAS?

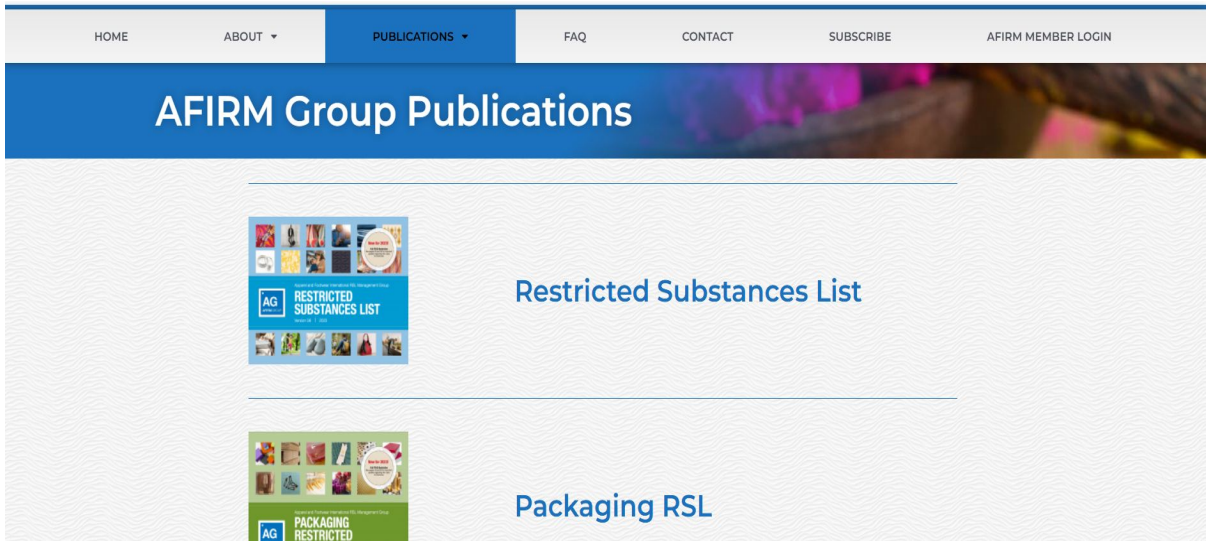
Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) are synthetic chemicals defined as "fluorinated substances that contain at least one fully fluorinated methyl or methylene carbon atom (without any H/Cl/Br/I atom attached to it), i.e., with a few noted exceptions, any chemical with at least a perfluorinated methyl group ($-CF_3$) or a perfluorinated methylene group ($-CF_2-$) is a PFAS."

This definition is provided by the Organisation for Economic Co-operation and Development (OECD) which, along with the United States Environmental Protection Agency (U.S. EPA), defines several thousand substances as belonging to the group of PFAS.[2, 3]

New legislation in, e.g., California and New York, defines PFAS more broadly as "fluorinated organic chemicals containing at least one fully fluorinated carbon atom."[4, 5] Since the current OECD, U.S. EPA, and U.S. state definitions are not harmonized, this guidance and the AFIRM RSL employ the broadest possible interpretation of PFAS (i.e., the U.S. state definition) for purposes of testing and compliance.[6]

AFIRM Publications

- All these tools can be found on the AFIRM website AFIRM-Group.com under the Publications tab
- Available in Chinese (simplified and traditional), English, Indonesian, Japanese, Spanish, Turkish and Vietnamese



RCA CAPA

- Root Cause Analysis (RCA)
- Corrective Action (CA)
- Preventative Action (PA)

RCA CAPA Process Overview

RCA: Root Cause Analysis **CAPA:** Corrective Action / Preventative Action

Purpose: Systematic approach to identify, correct, and prevent non-conformances, audit findings or complaints

Scope: Raw materials, components, chemicals, and finished goods

Importance: CAPA is essential for regulatory compliance, product safety, and continuous improvement in quality management systems (QMS) to ensure adherence to requirements

Key Steps:

- Initiation & information capture
- Containment & documentation
- Root Cause Analysis (RCA)
- Corrective Actions (CA)
- Preventive Actions (PA)

Initiation & Key Information Capture

Who Initiates: Typically requested by Product Safety, Regulatory Compliance, or Quality teams

Triggers:

- Failed lab test (e.g., RSL failure)
- Non-conforming raw material/component
- Regulatory or customer audit

Captured Information:

- Material/component details, manufacturer, and factory
- Chemical name and CAS number
- Regulatory requirement (e.g., country-specific) or Brand's RSL (e.g., AFIRM RSL)
- Lab report and failure description

Containment & Documentation

Identification:

- Designate team to manage non-conforming materials
- Record PO numbers, batch numbers, lot information, etc.

Quarantine:

- Segregate non-conforming products/materials in a designated area
- Hold shipping or distribution until resolution
- Notify stakeholders

Documentation:

- Capture and share images of quarantined materials
- Maintain records for traceability and compliance

Root Cause Analysis (RCA)

Investigation:

- Analyze, explore, and understand the non-conformance and identify its primary root cause(s)
- Identify how non-conformance occurred and escaped detection (For example: Analyze production process and machinery cleaning)

Example Root Cause:

- Cross-contamination from improper cleaning of finishing machinery (e.g., residual C6 chemistry)

Supporting Evidence:

- Production records, cleaning logs, photos, test results, measurements, invoices.

Key Considerations:

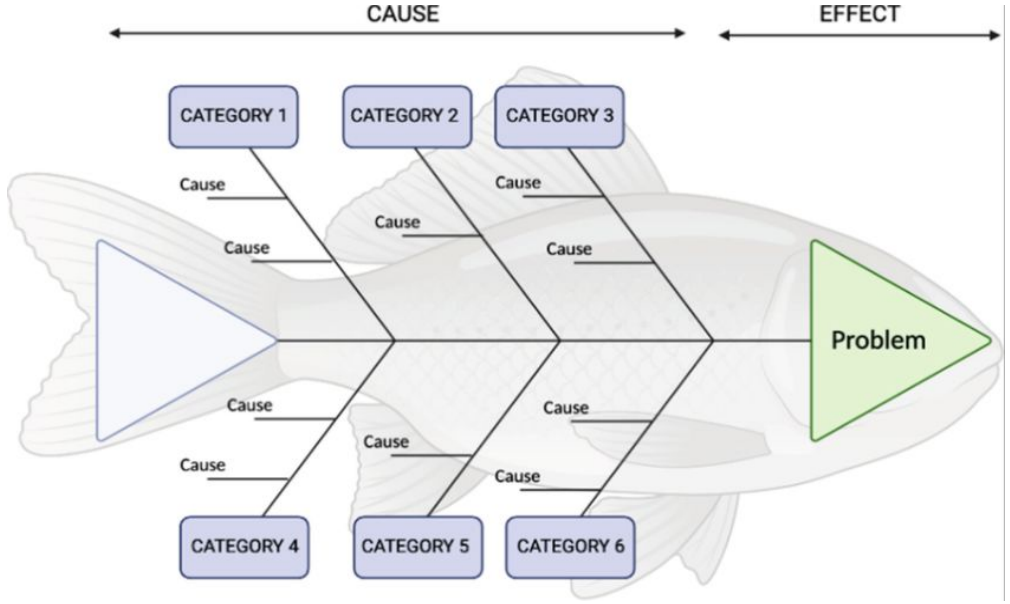
- Was the chemical addition intentional or accidental?
- Are other styles or lots affected?

RCA ensures that CAPAs address the true cause, **not just symptoms**.

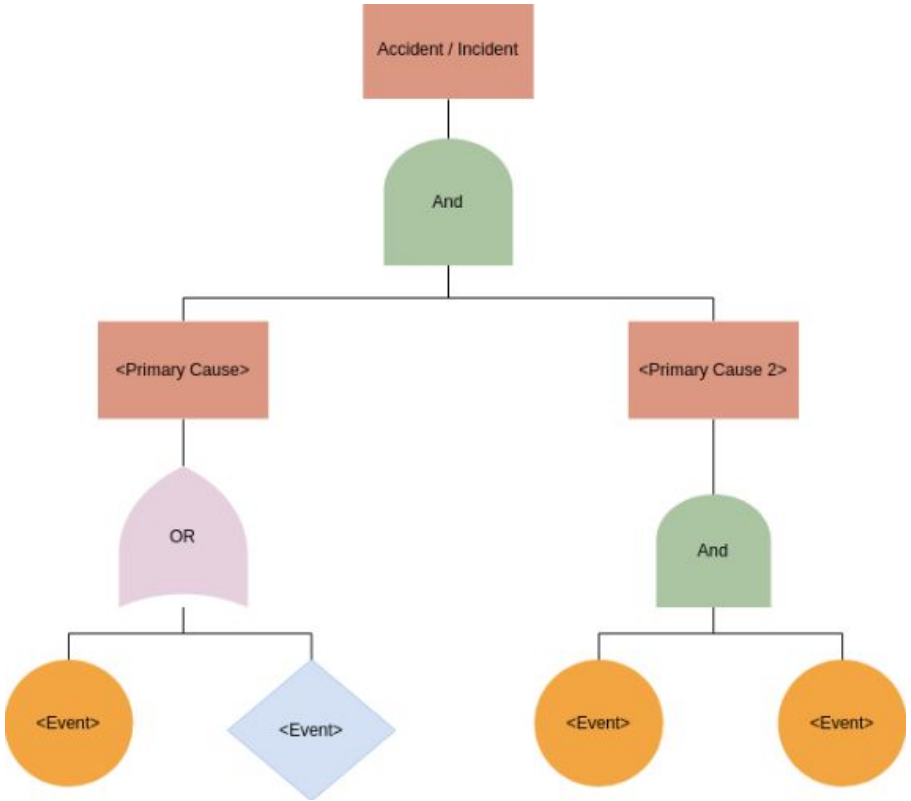
RCA - Tools

5 Whys: Asking "why" repeatedly to trace the issue to its origin.

Fishbone Diagram (Ishikawa): Categorizes causes into areas like people, process, equipment, and measurement.



Fault Tree Analysis (FTA) and Pareto Analysis: to provide deeper insights.



Corrective Actions (CA)

Immediate Steps:

- Isolate contaminated rolls/materials
- Remove non-compliant chemicals from all recipes
- Segregate and dispose of restricted substances

Responsibilities:

- Assign owners for each action (e.g., dye direction, lab manager)
- Set timelines and track completion

Effectiveness Check:

- Verify corrective actions resolve the issue without adverse effects on the material and/or the product's performance or aesthetic

Questions to Consider:

- How many units in total are being corrected?
- How are you segregating material and/or product? Outline the containment efforts
- Is there a need to coordinate efforts to remedy other materials/products that have already left the facility?

Preventative Actions (PA) & Long-term Improvements

Process Improvements:

- Update and audit chemical recipes
- Continuous training on machinery maintenance and cleaning
- Ensure all test samples are from bulk production, not samples

Sustainability:

- Remove restricted chemicals from inventory
- Ongoing monitoring and documentation

Supply Chain Communication:

- Share learnings and preventive measures with suppliers and partners