FIAF Thursday Workshop

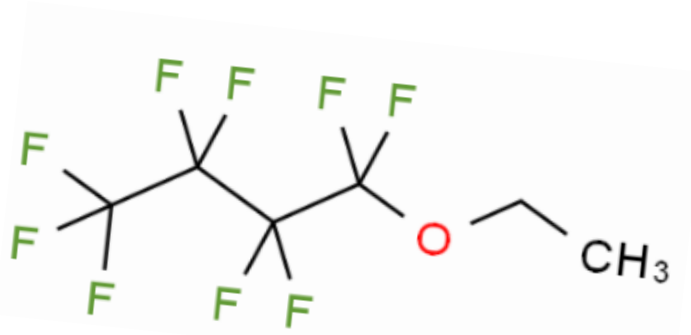
Motion Picture Film Cleaning

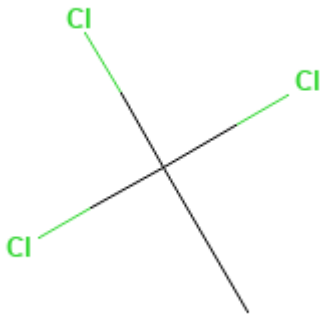
December 11th 2025

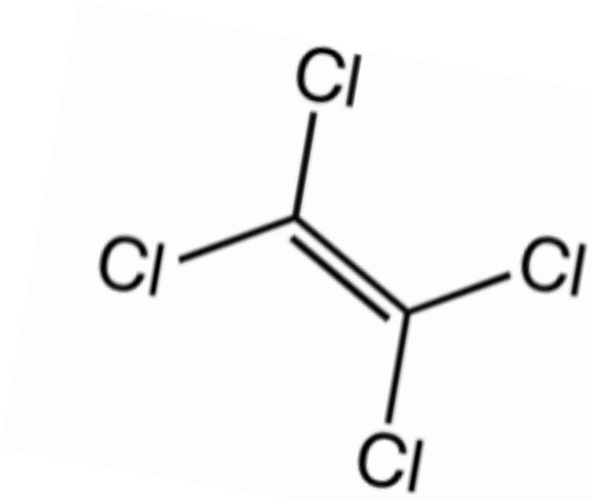
Swedish
Film Institute

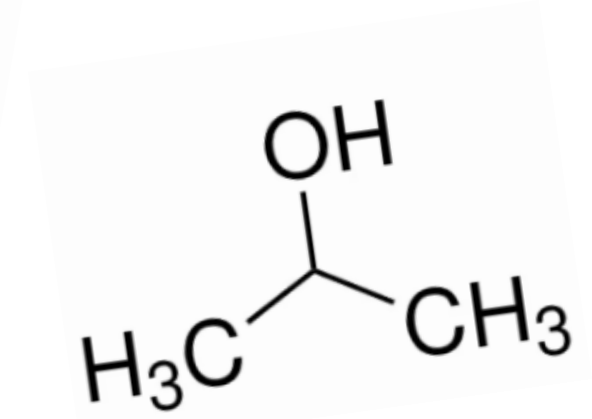
Content

- Film cleaning practices and challenges
- Cleaning machines
- Cleaning solvents







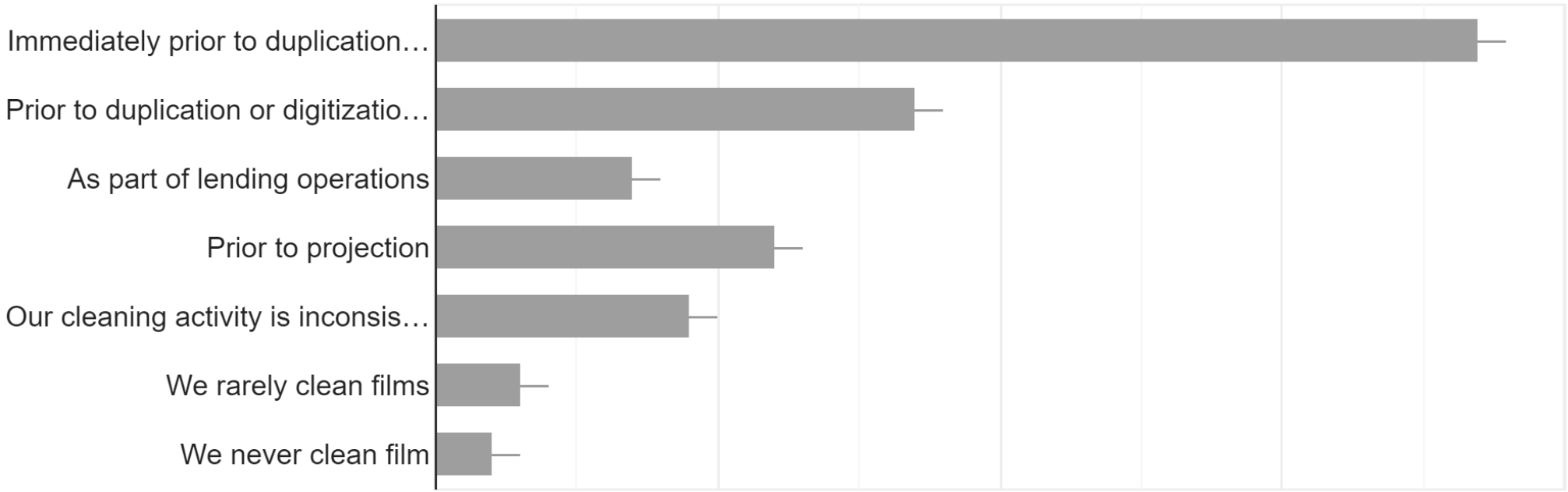


AMIA

AMIA Preservation Committee – survey 2021

When does your organization typically clean films?

53 Antworten



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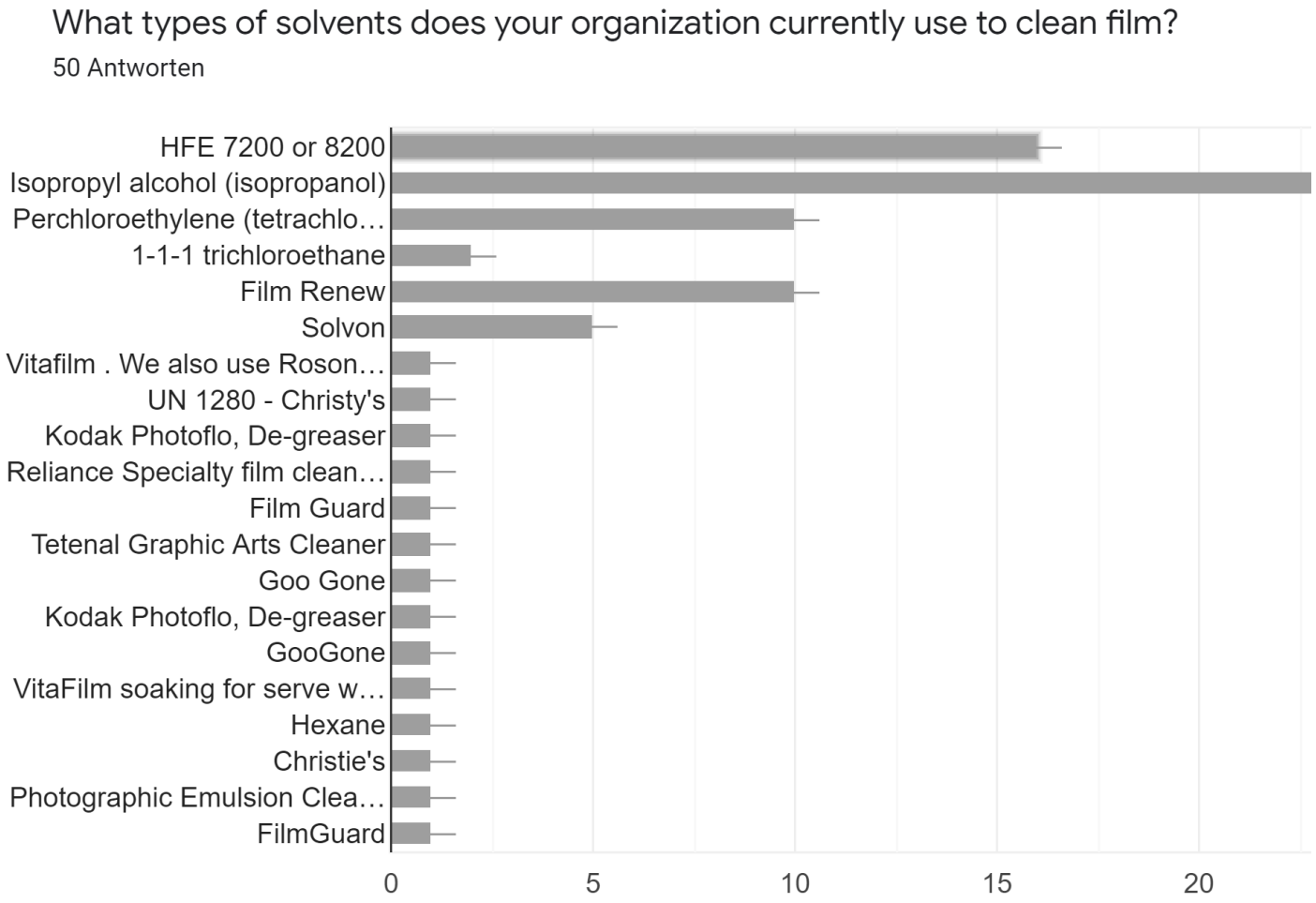
- **Isopropanol:** 50% (25)
- **HFE 7200/ 8200**: 32% (16)
- **Perchloroethylene:** 20% (10)
- **Film Renew:** 20% (10)
- **Others**: Solvon, Christie’s, Goo Gone, Photoflo, Hexane, etc.



What's your biggest concern/ problem with film cleaning processes today?

- Operational challenges (high cost of machines and solvents and maintenance issues)
- Environmental impact
- Health and saftey hazards (need for proper ventilation and appropriate PPE)
- Cleaning performance
- Discontinuation of the production of reliable film cleaning machines
- Risk of physical damage to film

More info: The Association of Moving Image Archivists - Preservation Committee

Film Cleaning Machines

Ultrasonic system	Immersion	Spray	Rolling / wet buffers
Cavitation phenomenon: High frequency sound waves generates the formation of gas bubbles which, when collapsing, generate extra energy and so the solvent power is increased.	Soaking (often with submerged rotary buffers) to ensure that the whole surface area of the film is in contact with the solvent.	Atomization nozzles spray the solvent on the surface of the film. Better control of the solvent consumption than in an immersion system. Lower evaporation than in a cleaning machine with a tank.	Rotary buffers wetted with a solvent are rolling in the opposite direction of the film progression. Add a mechanical effect to the film cleaning capacity of the solvent itself. Can create stripes / scratches if not correctly adjusted. Low evaporation.

Film Cleaning Machines – Lipsner Smith Ultrasonic

- **Lipsner Smith Ultrasonic CF9200, 9300, 9400**
- Ultrasonic System (cavitation principle: shock waves)
- Full immersion
- Liquid recovery
- Solvent: **HFE (8200) / Perchloroethylen**
- Vendor situation:
  - **MMT** (Media Migration Technology) vendor of LS cleaning machines

Film Cleaning Machines – Lipsner Smith Excel 1100

- **Lipsner Smith Excel 1100 or 1400 (new)**
- Rolling wet buffers
- No immersion tank
- Solvent: **Isopropanol**

Film Cleaning Machines – BSF Hydra

- Solvent : Isopar G fluid
- Rolling wet buffers
- Small machine
- Low solvent consumption

Source: Cinetech UK website (Cinetech UK Ltd)

Film Cleaning Machines – Kodak Photomec

- Spray system through atomization nozzles
- Solvent : HFE 7200
- Small machine
- Possibility to modify it to run IPA

Source: Kodak

Film Cleaning Machines – Photomec ISO

- for sale in 2026
- Solvent : IPA
- Technic : wetted buffers
- Size similar to the lipsner smith 9200

Source: Kodak

DIY Film Cleaning Machines

SFI's "DIY" water-based cleaning machine

- Degreasing agent + wetting agent (Photoflo / stab)
- Very efficient with oil, grease and tape residual.
- Non compatible with nitrate
- Huge water consumption (as it is)

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Film Cleaning Machines – General comparison

Brand	MMT	MMT	MMT	MMT	Cinetech	Photomec	Photomec / Kodak
Model	Lipsner smith 8200 modif /9200 refurbished	Lipsner smith 9300	Lipsner smith 9400	Excel 1400 update	BSF Hydra	ISO	P 200 modification
Price	$$-	$$$$-	$$$$-	$$	$$-	$$+	$
System	Immersion / ultrasonic	Immersion / ultrasonic	Immersion / ultrasonic	Wet buffers	Wet buffers	Wet buffers	Spray
Solvant	HFE ↔ Perch	Perch	HFE 8200 or similar	IPA	Isopar G	IPA	HFE 7200 → IPA
Film Speed	50 to 200 fpm	0 – 200 fpm	0 – 200 fpm	5 – 200 fpm	0 – 100 fpm	100 – 200 fpm	50 / 100 / 200 fpm
Consumption	Good	Very Good	Very Good	Medium	Excellent	Good	Medium

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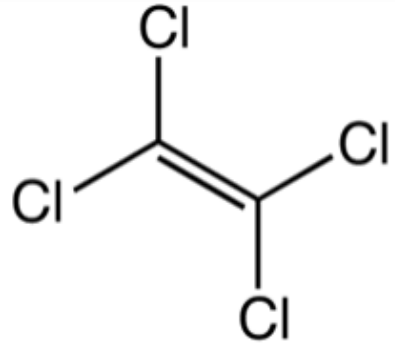
Source: Kodak

Cleaning solvents - Perchloroethylene (PCE/ PER)



- **Cleaning efficiency**
  - Excellent

- **Environmental hazard**
  - Replaced 1- 1- 1 Trichloroethane (ozone depleting substance (ODS))
  - Small ozone depletion potential (ODP) and global warming potential (GWP)
  - Toxicity to aquatic organisms and air toxic

- **Human health hazard**
  - Exposure mainly through inhalation
  - Acute toxicity and irritation
  - Carcinogenicity: Classified by EPA (2005) as “likely to be carcinogenic in humans” by all exposure routes
  - Requires filter-mask
  - Non-flammable

- **Regulations**
  - From **2025** regulated by the EU. **Reporting of PER required** (annual volumes starting Q1 2025 (for 2024 data))
  - Phase-out in the US: all consumer uses and many commercial uses of PCE (Biden-Harris Administration Announces Latest Actions under Nation’s Chemical Safety Law to Protect People from Cancer-Causing Chemicals Trichloroethylene and Perchloroethylene | US EPA)

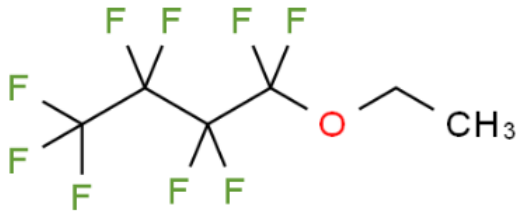
Cleaning solvents - Hydrofluoroether (HFE)

- **Cleaning efficiency**
  - Medium

- **Environmental hazard**
  - Zero ODP and very low Global Warming Potential (GWP), introduced to replace solvents with Ozone Depletion Potential (ODS)
  - Contains **PFAS** (Per- and polyfluoroalkyl substances):
    - Manufactured chemicals (do not occur naturally), persistent environmental pollutants (“forever chemicals”)
    - High evaporation rate

- **Human health hazard**
  - Low toxicity, but risks for human health
  - Non-flammable

- **Regulations**
  - Global initiatives to restrict and ban PFAS substances
  - European Chemical Agency (ECHA) 2026 (Per- and polyfluoroalkyl substances (PFAS) – ECHA)



- **Vendor situation**
  - 3M phase out (Novec 8200/ 7200) until the end of 2025
  - Inventec: PROMOSOLV 9000 (PFAS containing) as replacement for HFE 8200

Cleaning solvents – Isopar G

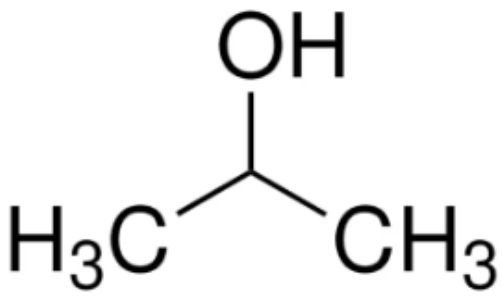
- **Cleaning efficiency**
  - Good
- **Environmental hazard**
  - Toxic to aquatic life with long lasting effect
- **Human health hazard**
  - Flammable (cat 3)
  - May be fatal if swallowed and enters airways / requires filter-mask
- **Vendor situation**
  - Several Chemical suppliers

Cleaning solvents – Isopropyl alcohol/ Isopropanol

- **Cleaning efficiency**
  - Good

- **Human health hazard**
  - Highly flammable (Cat 2)
  - Aspiration hazard (Cat 1)

- **Vendor situation**
  - Widely accessible: available at Hardware stores, pharmacies, chemical suppliers



Cleaning solvents – General comparison

	Perchloroethylene	HFE	IPA	Isopar G
Price	$	$$$	$	$
Health Hazard	Skin & eye irritation May cause drowsiness and dizziness Carcinogenicity	Possible hazard in case of thermal decomposition	Highly flammable (3) Causes serious Eye irritation May cause drowsiness and dizziness	Flammable (2) May be fatal if swallowed and enters airways
Environmental hazard	Toxic for aquatic life Hazardous for ozone layer	Contains PFAS		
NFPA Rating	3 / 0 / 0	3 / 1 / 0	1 / 3 / 0	1 / 2 / 0
Evaporating rate	Low	Very High	Low	Very Low
Cleaning efficiency	Very good	Low	Good	Good

Regulations / Protocols

- Prior to acquire a film cleaner, check the national & municipal regulations for the chemical (storage, handling and waste disposal)
- Conduct an internal risk analysis about the film cleaning activity, regarding both the solvent and the machine
- Prepare the room (safety data sheet available/ extinguisher / ventilation (potentially carbon filtering system)/ smoke detector / spill containment pallet/ fire cabinet…)
- Personal protective equipment (Mask, goggles, gloves…)
- Creates routines for storage, handling and waste disposal
- Staff training

Thank you!

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