Temporary Replacements for Isopropyl Alcohol

This letter is in response to inquiries about the current shortage of Isopropyl Alcohol (IPA). IPA is a commonly-used cleaner for various substrates in the graphics industry, and is currently limited in availability, due to the ongoing pandemic. This document describes the different cleaning solutions tested by 3M Commercial Solutions Division (CSD), and the best alternatives to a tradition mixture of IPA and Water (in a 2:1 ratio), which can be used temporarily until IPA is more available.

Testing Plan:

CSD conducted testing of substrates to compare the cleaning ability of various common cleaners, available as temporary alternatives to IPA. Below is a list of cleaners, substrates and films used in the study.

Cleaners:

- Isopropyl Alcohol and water (2:1)
- Water
- Denatured Alcohol
- Denatured Alcohol and water (2:1)
- White Vinegar
- Apple Vinegar

Substrates:

- Drywall, painted with low-VOC paint
- Vehicle paint/clearcoat

Films:

- 3M™ Transit Wrap Graphic Film IJ46-20
  - Removable without heat or chemicals from most surfaces
- 3M™ Controltac™ Graphic Film with Compy™ Adhesive v3 IJ180Cv3-10
  - Removable with heat from most surfaces, within the warranty period
- 3M™ Print Wrap Film IJ180mC-10LSE (designed for low-surface-energy substrates, such as polyethylene)
  - Not removable

Procedure:

1. Films were cut into 1” x 10” strips, similar to the size used in the 3M™ Adhesion Test kit.
   - There are three broader categories of films, based on the adhesive characteristics.
2. The cleaners were applied on a freshly painted wall surface, and allowed to dry per the manufacturer’s recommendations.
3. The cleaners were also applied to a vehicle’s paint/clearcoat surface.
   - The substrates were cleaned using a sufficient amount to thoroughly rid the surface of contaminants.
   - Cleaners were applied to both surfaces using a clean, dry, lint-free towel.
4. The surfaces were allowed to dry a minimum of 5 minutes before applying film samples.
5. 3 samples of each film were applied to each substrate.
6. Each film sample was applied using hand pressure, followed with the 3M™ RBA-3 rivet brush, making three passes along the length of the sample. This process ensures full adhesive contact with the surface.
7. Each sample was allowed to dwell for between 15 and 20 minutes, in order to build adhesion.
8. A digital spring scale was used to measure the maximum adhesion value of each sample.

NOTE: Since only one lot of each film was tested, and only two surfaces analyzed, the table below will make a general statement on the effectiveness of the cleaner as it compares to the “control” of IPA.

Drywall Painted with Low-VOC Paint

Product:	No Cleaner	Water	Denatured Alcohol (DA)	DA/Water (2:1)	White Vinegar	Apple Vinegar
IJ46-20						
IJ180Cv3-10						
IJ180mC-10LSE						

Painted Vehicle

Product:	No Cleaner	Water	Denatured Alcohol (DA)	DA/Water (2:1)	White Vinegar	Apple Vinegar
IJ46-20						
IJ180Cv3-10						
IJ180mC-10LSE						

Legend:

- Green = Higher Adhesion than IPA/Water (2:1)
- Red = Lower Adhesion than IPA/Water (2:1)
- Gray = Equal to IPA/Water (2:1)

Analysis:

Based on the tables, the denatured alcohol and water (2:1) performed most similar to IPA, and may perform better in some cases. Since this is not a complete study, based on multiple lots of films, substrates and conditions, denatured alcohol can be used temporarily as a replacement for isopropyl alcohol. Note that this substitution should only be used on a customer test-and-approve basis.

Conclusion:

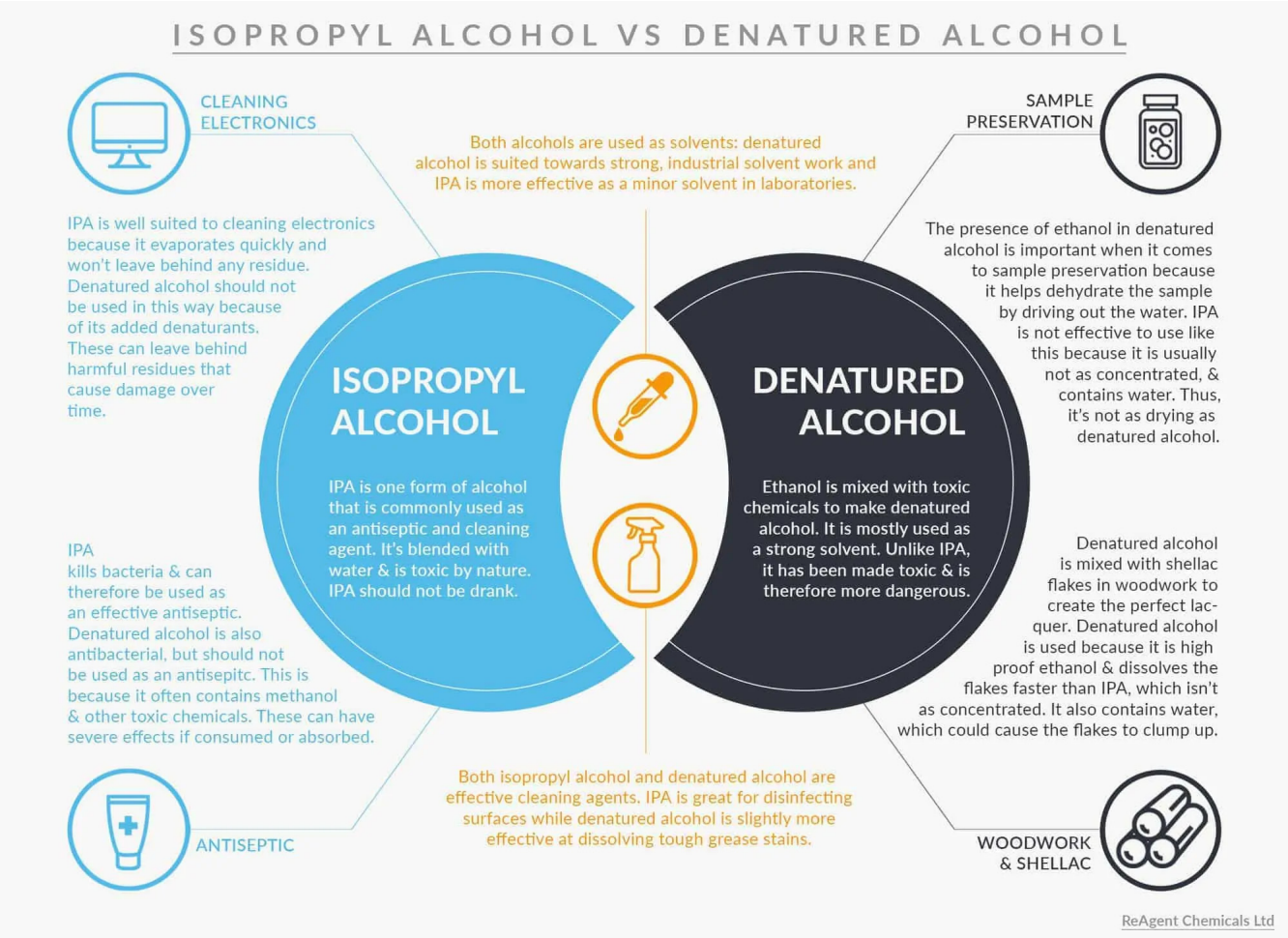
CSD temporarily gives approval to use denatured alcohol as a replacement for isopropyl alcohol in common cleaning procedures. Denatured alcohol with water in a 2:1 ratio is the recommended mixture, for best results. Ensure that the appropriate personal protective equipment is followed, per the denatured alcohol safety data sheet attached in the appendix section.

Per 3M Instruction Bulletin 5.1, the following table can be used as a guide for cleaning of various surface types with denatured alcohol. The alphanumerical headers before each substrate refer to their respective locations in Instruction Bulletin 5.1.

Category	Substrate(s)	3M Recommendation
B. Building Materials	3. Ceramic Tile, Countertop Laminate, Marble, Decorating Stone	Yes
D. Flexible Substrates	1. Banners	No, use only Method 1
	2. 3M Flexible Awnings and Sign Faces	No, use only Method 1
E. Glass	1. Waxes and Other Coatings on Glass	Yes
F. Metals	1. Aluminum	Yes
	2. Chrome	Yes
	3. Stainless Steel	Yes
	4. Steel	Yes
H. Plastics and Rubbers	2. Acrylic (such as Lucite™ and Plexiglass)	Yes
	3. Fiberglass	Yes
	4. Copolyester Sign Sheet	Yes
	5. Polycarbonate (such as Lexan™)	Yes
	6. Polypropylene and Polyethylene	Yes
	1. Expanded PVC (such as Sintra® or Lustra®)	Yes
	Paper-based Poster Board (such as Foam-Cor®)	Yes

Background Information:

The diagram below is a comparison of isopropyl alcohol and denatured alcohol.



Source: https://www.chemicals.co.uk/blog/isopropyl-alcohol-vs-denatured-alcohol

There exist some key differences between the two alcohols. The main difference is that denatured alcohol is more harmful to humans than isopropyl alcohol, so precautions should be taken when handling denatured alcohol. There also exists some potential for residue to be left behind when cleaning with denatured alcohol. These residues did not appear to affect adhesion values, within the scope of this study.

Further details about surface cleaning can be found in 3M Instruction Bulletin 5.1 – Select and Prepare Substrates for Graphic Application.

Further details about denatured alcohol can be found at:

- https://www.chemicals.co.uk/blog/isopropyl-alcohol-vs-denatured-alcohol
- https://www.jmnspecialties.com/downloads/sds/2414-denatured-alcohol-sds/file

The information provided in this letter related to material content represents 3M Commercial Solutions Division's knowledge and belief as of the date it is provided. If you have questions about the information contained in this document, please contact our 3M Commercial Solutions Division Technical Information at 1-800-328-3908, or on-line at www.3Mgraphics.com.

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Appendix A: Personal Protection Section of Denatured Alcohol Safety Data Sheet

Safety Data Sheet
Denatured Alcohol

UNSUITABLE EXTINGUISHING MEDIA: N/A
SPECIAL FIRE FIGHTING PROCEDURES: Wear NIOSH approved Self Contained Breathing Apparatus with a full face piece operated in a positive pressure demand mode with full body protective clothing when fighting fires. Avoid contact with skin and breathing smoke, fumes, and decomposition products. Cool fire exposed containers with water fog to prevent bursting.
UNUSUAL FIRE AND EXPLOSION HAZARDS: N/A
HAZARDOUS COMBUSTION PRODUCTS: None Known

SECTION VI – ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTIVE EQUIPMENT: Refer to section VIII for proper Personal Protective Equipment.
SPILL: Absorb with non-combustible material like vermiculite, sand or earth and rinse with small amount of soapy water. Do not allow to drain into sewers or storm drains. Dispose of in accordance with local, state and federal regulations.
WASTE DISPOSAL: Dispose of in accordance with federal, state, and local regulations. Do not dump in sewers. Wrap container and place in trash collection, do not puncture, incinerate, or reuse container.
RCRA STATUS: Product should be fully characterized prior to disposal (40 CFR 261).

SECTION VII – HANDLING AND STORAGE

HANDLING AND STORAGE: Keep away from sparks and open flames. No smoking. Keep container tightly closed.
OTHER PRECAUTIONS: None
INCOMPATIBILITY: Strong oxidizing agents.

SECTION VIII – EXPOSURE CONTROLS/PERSONAL PROTECTION

HAZARDOUS INGREDIENT	OSHA PEL	ACGIH TLV
Ethyl Alcohol	1000 ppm	1000 ppm
Isopropyl Alcohol	500 ppm	400 ppm

ENGINEERING CONTROLS / VENTILATION: General ventilation and local exhaust should be adequate.
RESPIRATORY PROTECTION: Not required
PERSONAL PROTECTIVE EQUIPMENT: Safety glasses and chemical resistant gloves
ADDITIONAL MEASURES: Wash hands thoroughly after handling.

SECTION IX - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Clear, Colorless Liquid
ODOR: Alcohol solvent
ODOR THRESHOLD: N/D
BOILING POINT: 80°C (176°F)
FREEZING POINT: N/D
FLAMMABILITY: Highly Flammable Liquid
FLASH POINT: 53°F (12°C)
AUTOIGNITION TEMPERATURE: N/D
LOWER FLAMMABILITY LIMIT: N/A
UPPER FLAMMABILITY LIMIT: N/A
VAPOR PRESSURE (mm Hg): Not Established
VAPOR DENSITY (AIR=1): 1
EVAPORATION RATE: < 0.8 (Slow)
SPECIFIC GRAVITY (H2O=1): 0.905 @ 77° F (25° C)
pH: N/A
SOLIDS (%): N/D
SOLUBILITY IN WATER: 100%
PARTITION COEFFICIENT: n-OCTANOL/WATER (K_{OW}): N/D
VOLATILITY INCLUDING WATER (%): 99%
VOLATILE ORGANIC COMPOUNDS (VOC): 0%
DIELECTRIC STRENGTH (Volts): N/A
DECOMPOSITION TEMPERATURE: N/D
VISCOSITY: N/D

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Source: http://sds.chemtel.net/webclients/ram/XQ6210.pdf