Critical Cleaning of Cannabis and Related Botanical Residues

Featuring Alconox

product quality cleaning workshops
WEBINAR
ALCONOX
Critical Cleaning Experts

The PQCW offers practical, hands-on and independent, training in cleaning.

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Cleaning Research Group at SHSU
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Michael Moussourakis
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Webinar Hosts

The PQCW Team

Barbara and Ed Kanegsberg – "The Cleaning Lady and the Rocket Scientist"

- BFK Solutions - Consultants in Critical Cleaning
- Authors and Editors of the two-volume CRC Handbook for Critical Cleaning
- Independent evaluations and recommendations
- Co-chairs of the Product Quality Cleaning Workshops
- barbara@bfksolutions.com and ed@bfksolutions.com

Darren Williams – "The Professor"

- Professor of Physical Chemistry at Sam Houston State University
- Leader of the Cleaning Research Group
- Co-chair of the Product Quality Cleaning Workshops
- Performs cleaning trials and formulates cleaning chemistries
- williams@shsu.edu

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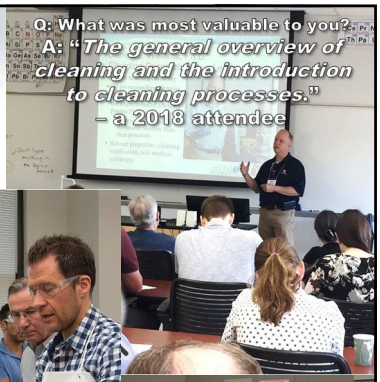
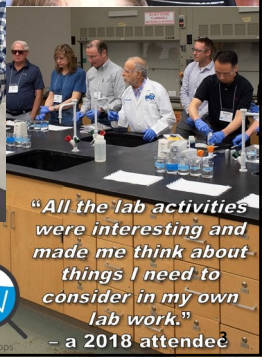
Product Quality Cleaning Workshops

- May 10-20, 2021
- Live and interactive
- Remote = no travel
- Continuing education credit
- Register at pqcw.net
  - Become a cleaning expert





3/31/2021
PQCWebinar with Alconox
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ALCONOX Critical Cleaning Experts

75 YEARS

About Michael Moussourakis

- Michael Moussourakis
- 20+ yrs, biopharm and medical device, process optimization, troubleshooting, training, critical cleaning, filtration
- Alconox Inc. (New York, USA)
- mmoussourakis@alconox.com
- ++(914)610-3057
- Senior Director
  Technical Marketing & Strategic Affairs

- Not the model in this picture ---------→

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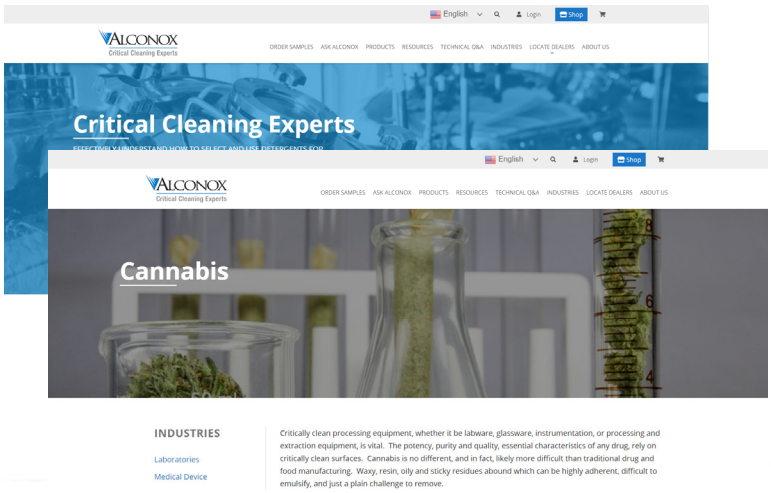
Today's Talk

- Introduction
- What is the problem?
- Basic detergency
  - Critical Cleaning
  - Cleaning Chemistry
- Cleaning Methods
- Detergent Selection
- Cleaning Optimization
- Case Studies
  - Tough Cannabis
  - Turning Up the Heat
  - Trimming Costs & Plants
  - Automated & Effective
- Discussion and Questions



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Introduction

- Privately held 75+ yr. old company
- Third generation family ownership
- Detergent manufacturer serving
  - Laboratories
  - FDA: biopharma, medical device, healthcare, food, cannabis, cosmetic
  - Precision manufacturing: solar, aerospace, electric
- Over half a century of global distribution
- Over 50 countries – and all 7 Continents
- Expert technical support – Our pride

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What is the problem?

- Plain and simple – cannabis, CBD and related botanical extracts:
  - Sticky and adherent
  - Not water soluble
  - Complex blend – terpenes, cannabinoids, pesticidal agents, phenolic compounds
  - The Plant of the Thousand and One Molecules[1]
- Complete removal from….
  - Analytical glassware
  - Boiling flasks
  - Extraction vessels
  - Processing lines…..
- Avoid batch-to-batch and strain-to-strain contamination
- The essence of residue free cleaning

[1] NIH 2016

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Define Critical Cleaning

What is critical cleaning?

- Cleaning that impacts the value of the finished output from whatever is being cleaned
- Typically some observation, measurement or validation is done related to precision critical cleaning
- Critical cleaning in FDA or USDA regulated industries of components or substrates is the complete removal of undesirable contaminants to a desired preset level
- The preset level is normally the minimum level at which no adverse effects take place in a subsequent operation.

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Chemistry of Cleaning

- Organic solvents
  - e.g., ethanol, isopropyl alcohol, acetone
- Commodity chemicals (aqueous)
  - e.g., caustic, phosphoric acid
- Water
  - Only cleans things soluble in it
  - Excellent where water alone will work
- Detergent
  - Surfactants
  - Formulated aqueous cleaning
  - No fragrances; no dyes
  - Controlled impurities
  - Easier waste disposal

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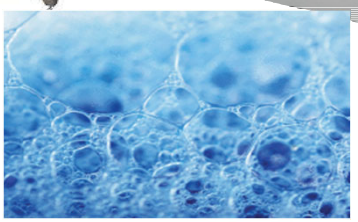
Cleaning Methods

- Manual
- Soak
- Scrubbing
- Agitated Immersion
  - Ultrasonic
  - Bubbled
  - Pump under immersion



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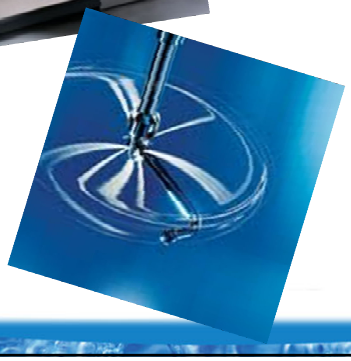
Cleaning Methods



- Spray in air (high pressure)
  - Automatic machine (Dishwasher)
  - Automated sprayball clean-in-place (CIP)
- Chemistry mediated
- Some mechanical cleaning energy from the spray
- Low foaming

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Detergent Selection

Hard to Choose Which Cleaner

- Over 3000 Cleaner suppliers
- Quality levels ranging from appearance grade to semiconductor quality
- There are formulations for gross soil removal and fine trace soil removal
- Formulations change for economy, performance or marketing claims
- Green cleaners? Residues?

- **Seek those with Regulatory and Quality support**
  - **Documentation, support, SOPs, toxicity, etc.**

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Detergent Selection

pH and Residues Removed

Type Cleaner	pH	Typical Soils
Mineral acid	0-2	heavy scales
Mild acid	2-5.5	salts, oxides, metallic
Neutral	5.5-8.5	light oil and particle
Mild alkaline	8.5-11	oils, particles, films
Alkaline	11-12.5	natural oil, fat, resin
Corrosive	12.5+	heavy grease/soils

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Detergent Selection

Common Substrates in Cannabis Industry Type

- Most Plastics - ok w/ broad range of aqueous cleaners
- Stainless steel - ok with most alkaline detergents
- Glass (borosilicate, lab–grade) – fine across most detergents
- Art Glass – completely submerged, minimize contact time

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Cleaning Process Development and Optimization

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Our whitepaper and guide suite:

- Analytical detection methods
- Residue acceptance criteria limits
- Cleaner residue sampling techniques
- Comprehensive documentation

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Cleaning Process Development and Optimization

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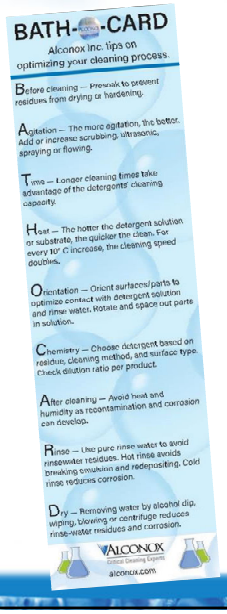
The 9 Variables of Effective Cleaning

- Success is more than Detergent
- The 9 variables: **BATH-O-CARD**

1. **B**efore-clean
2. **A**gitation
3. **T**ime
4. **H**eat
5. **O**rientation
6. **C**hemistry/Conc.
7. **A**fter-clean
8. **R**insing
9. **D**rying



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Cleaning Process Development and Optimization

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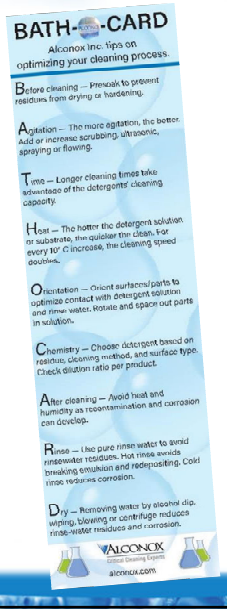
The 9 Variables of Effective Cleaning

1. **Before cleaning** — Presoak to prevent residues from drying or hardening.
2. **Agitation** — The more agitation, the better. Add or increase scrubbing, ultrasonic, spraying or flowing.
3. **Time** — Longer cleaning times take advantage of the detergents' cleaning capacity.



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Cleaning Process Development and Optimization

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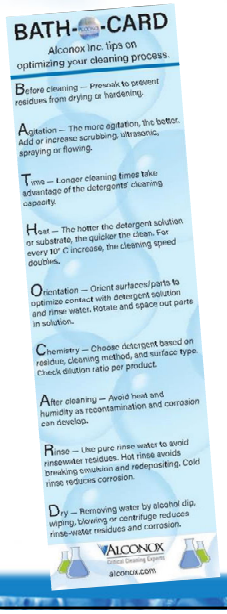
The 9 Variables of Effective Cleaning

4. **Heat** — The hotter the detergent solution or substrate, the quicker the clean. For every 10° C increase, the cleaning speed doubles.
5. **Orientation** — Orient surfaces/parts to optimize contact with detergent solution and rinse water. Rotate and space out parts in solution.
6. **Chemistry** — Choose detergent based on residue, cleaning method, and surface type. Check dilution ratio per product.



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Cleaning Process Development and Optimization

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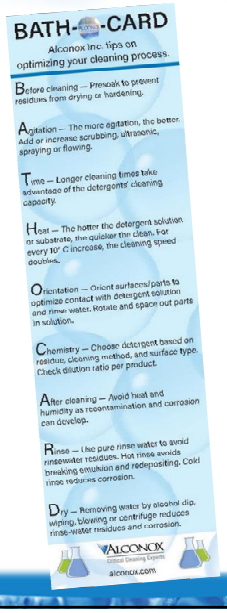
The 9 Variables of Effective Cleaning

7. **After cleaning** — Avoid heat and humidity as recontamination and corrosion can develop.
8. **Rinse** — Use pure rinse water to avoid rinse water residues. Hot rinse avoids breaking emulsion and redepositing. Cold rinse reduces corrosion.
9. **Dry** — Removing water by alcohol dip, wiping, blowing or centrifuge reduce



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Cleaning Process Development and Optimization

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Applying BATH-O-CARD concepts:

- 10°C increase doubles cleaning speed
- Increase chemistry concentration for bath life / capacity
  - "Dump truck" gets bigger
- Optimize substrate orientation for cleaning and rinsing speed
- Increase agitation to increase cleaning speed
- Use the correct chemistry for faster cleaning

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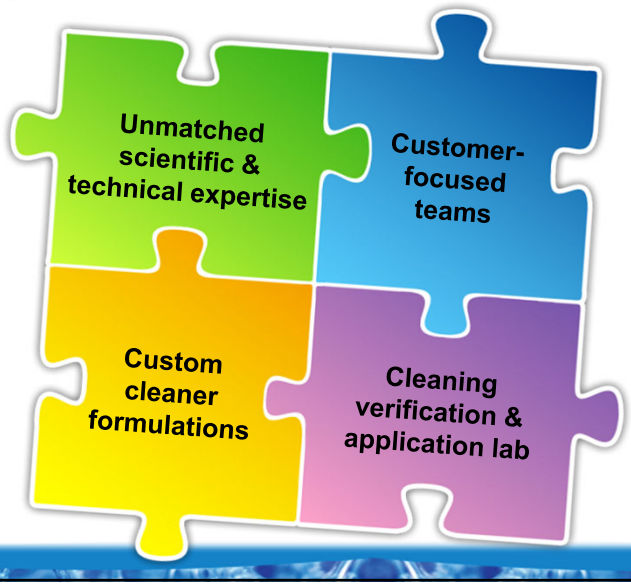
Cleaning Process Development and Optimization

75 YEARS



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Case Studies

75 YEARS

Cannabis Case Study 1:
Tough Cannabis

- An advanced extraction process with robust, well grown plants (mitigated by expert consultant)
  - high purity, difficult to clean extract
- The old alcohol method wasn't cutting it

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Case Studies

75 YEARS

Cannabis Case Study 1 (cont.): Tough Cannabis

- The company/consultant called us → our "go-to" detergent for cannabis/recommendations which helped
  - Bathocard 'smart'
  - Heat
  - Mechanical action → ultrasonic
  - Presoaking
- Not done yet….

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Case Studies

75 YEARS

Cannabis Case Study 1 (cont.): Tough Cannabis

- Ultra high purity
- Large globules → clogging drain
- Higher concentration (capacity)
  - more capacity, smaller micelles
- They then asked about irrigation lines….
- Enzymatic cleaning removes organic & pesticidal build up

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Case Studies

75 YEARS

Cannabis Case Study 2: Turning Up the Heat

- A boiling flask *coated* with resin
- Scraping with a chisel
- Acetone and alcohol hazards

- BATHOCARD Smart = high %

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Case Studies

75 YEARS

Cannabis Case Study 2 (cont.): Turning Up the Heat

- High % Detonox soak did not appear to be working
- Heated; still not fully effective
- Supplied constant heat and ultrasonic probe
  - Residue completely removed

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Case Studies

75 YEARS

Cannabis Case Study 3: Trimming Costs and Plants

- Outside US cannabis processor
- Many cleaning applications
  - Floors
  - Tools, trimmers
  - Labware
  - Processing equipment
- IPA was effective, but….
  - $25 USD per gallon…?

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Case Studies

75 YEARS

Cannabis Case Study 3 (cont.): Trimming Costs and Plants

- MSRP of Detonox - ~$87 USD / gal
- At 4% makes 25 gal = $3.48 USD / gal
- Savings of over $20 / gal
- **Purchasing IPA @ 32 gal / wk - $800 → ~$700 savings per week**
- **Bulk save more $$**

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Case Studies

75 YEARS

Cannabis Case Study 4: Automated & Effective

- Numerous small parts and glassware
  - Flask, vials
  - Trimmers
- Cleaning in large scale washer
- Recommend detergent required numerous cleanings

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Case Studies

75 YEARS

Cannabis Case Study 4 (cont.): Automated & Effective

- Review BATHOCARD concepts
  - Proper orientation
- Switch to proven Keylajet
  - High alkaline, high chelating
  - Low foaming
  - Effective even in cosmetic industry

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Cannabis Detergents

ALCONOX Critical Cleaning Experts — 75 YEARS

- Detonox® Ultimate Precision Cleaner
  - Manual cleaning detergent (foamer)
  - Moderate alkaline (pH 10.5)
  - Excellent for cannabis resins, cosmetics
  - Soaking, scrubbing, ultrasonic
- Keylajet® Low-Foaming High Alkaline Liquid
  - Low foaming detergent for automated or manual (use PPE)
  - High alkalinity (compatibility check; glass & stainless great)
  - For the toughest residues around – heavy sticky cannabis residue, viscous grease, water proof cosmetics, etc.
    - Especially where "elbow grease" can't be applied

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Cannabis Detergents

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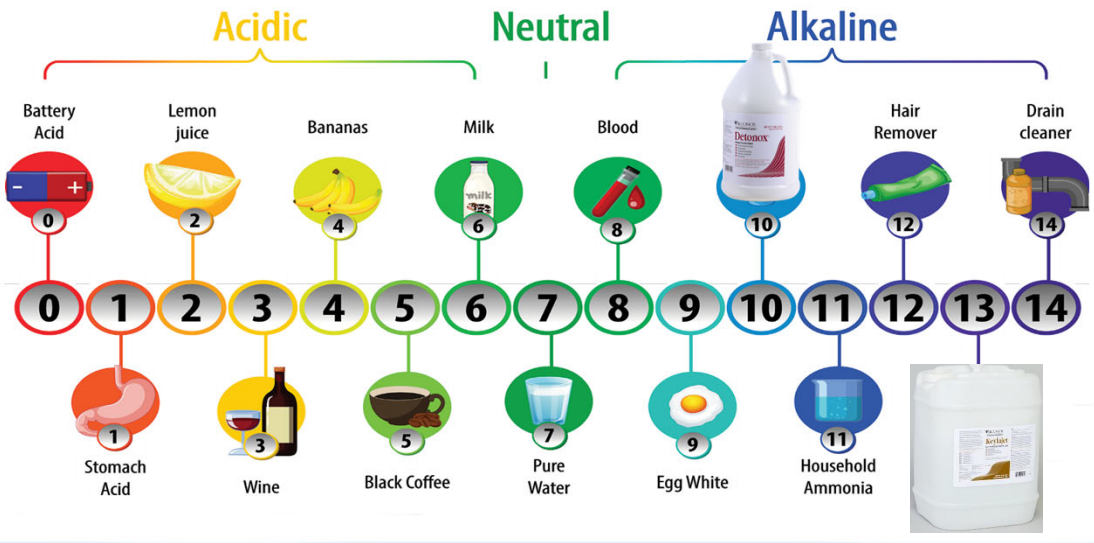

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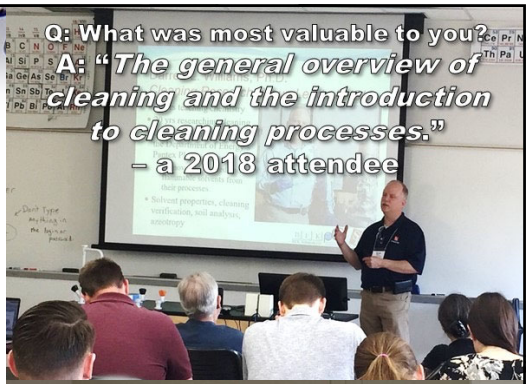
Product Quality Cleaning Workshops

COME TO THE PQCW

- When? May 10-20, 2021
- Where? Online
- More Info? pqcw.net



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