

Presenter: Joe McChesney | Date: 4/4/2019

# Modified Alcohol: A Vacuum Degreasing Process



PRESENTED BY:



# Session Topics

- **Cleaning Basics**
- **What is Modified Alcohol**
- **Metalnox M6386**
- **Equipment / Process**
- **Sustainable Future**

# Cleaning Basics

**IN TODAY'S MANUFACTURING WORLD  
MOST ITEMS ARE CLEANED !**

*(Several Times in Some Cases)*

- ✓ Critical Performance
- ✓ Reliability
- ✓ Process Requirements
- ✓ Personnel Safety

“Soils/contaminants/etc. **must be removed!**”

# Cleaning Basics

Increased demands for **QUALITY & RELIABILITY** calls for continuous improvements in many manufacturing processes, including cleaning.

Your end product must meet all applied specifications in a manner that assures success of operations.

Cleaning methods **must meet EH&S** concerns as well as "get the job done!"

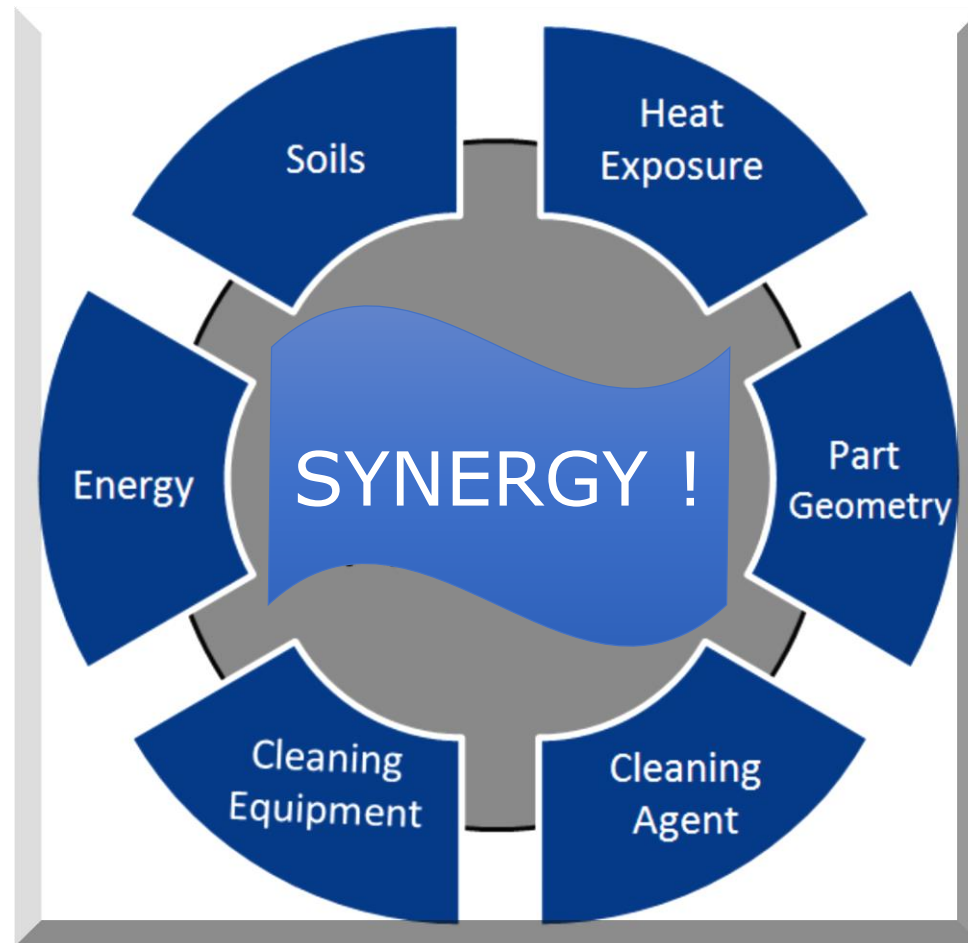


# Cleaning Basics

## Basic Process Requirements

- Cleaning Performance
- Compatibility With Substrates
- Process Efficiency/Environmental Impact
- Worker Safety (EH&S)

# Cleaning Basics



# Application Areas

## Precision Cleaning

- *Mechanical parts*
- *Aircraft*
- *Automotive*
- *Watch*
- *Jewelry, Etc.*

## Medical Industry

- *Implants*
- *Surgical Tools*
- *Cannula, Etc.*

## Precision Optics

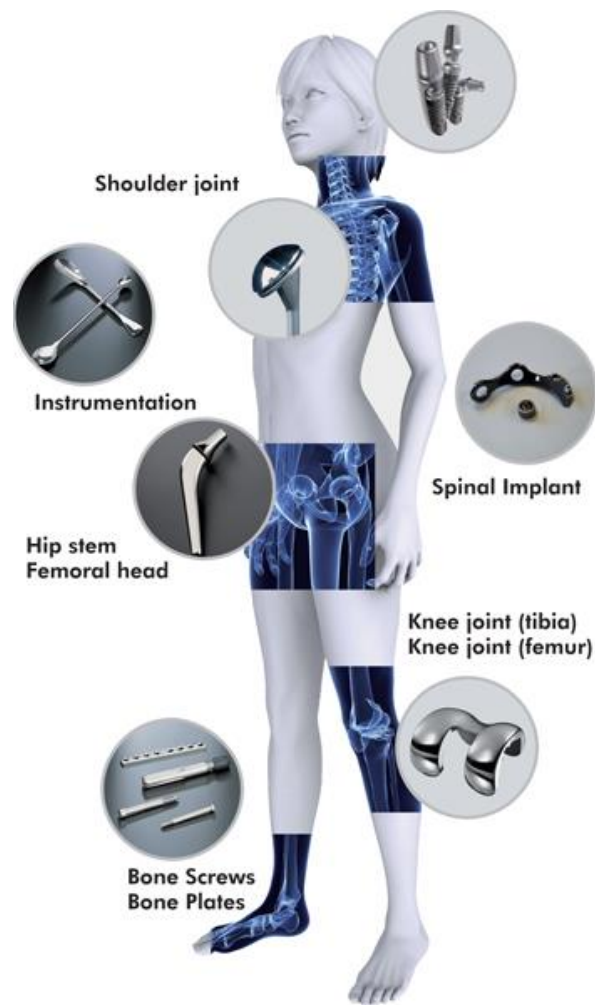
- *Lenses*
- *Mirror*
- *Prisms*
- *Masks, Etc.*

## Coating Industry

- *Carbide Tools*
- *Automotive Parts*
- *Fixtures*



# Critical Cleaning

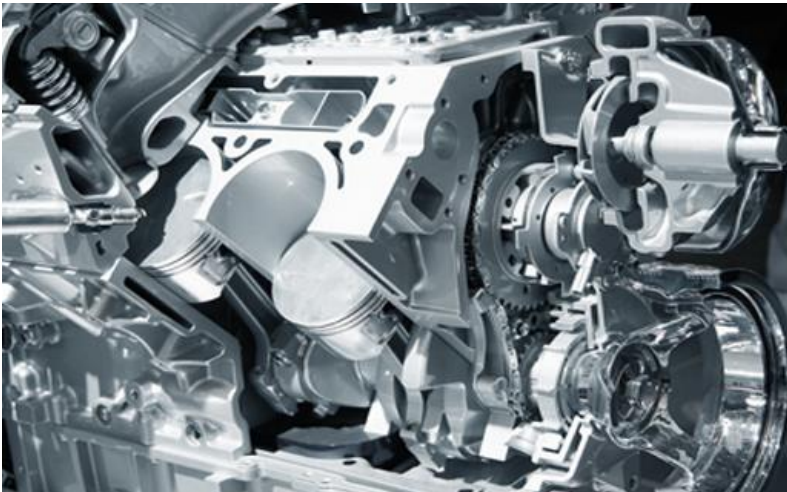




# Precision Cleaning



# Automotive





# Aerospace



# Precision Optics, Glass, & PV

Optical lenses, eyewear,  
glass, plastic parts.

Electronic and industrial  
plastics & glass products.  
Photo Voltaic Cells & Wafers

Soils range from  
fingerprints to pitch.





# Market Trends

## Move to Environmentally Green Cleaning Processes for Complex/Challenging Parts

- Move away from Legacy Halogenated Solvents such as *PERC*, *TCE*, *MC*, and *nPB* (EH&S Issues)
- Move away from Water-based Process due to consumption, discharge, energy, residues, and cost of operations.
- Move toward Closed Solvent Systems



# Market Trends

## Key Benefits of Closed Solvent Systems

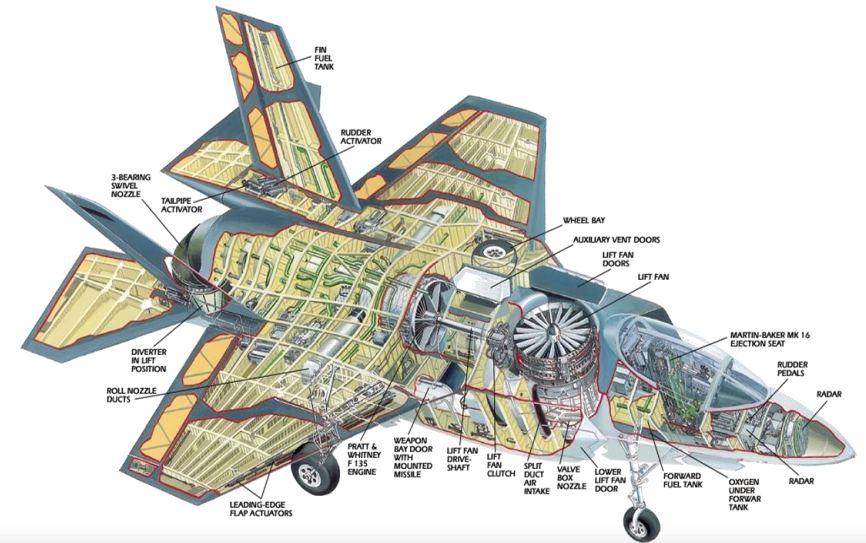
- Ultra-Low VOC emissions
- Very Low chemical consumption
- Concentration of soil – low waste stream
  - Not throwing away cleaning chemistry
- Very Low odor
- Low worker exposure (Safety Plus)
- Low corrosion potential
- Ability to pull a vacuum to enhance drying / reduce carry-out
- Compact foot print (wash/rinse/dry @ one system)





# Why Use Solvents?

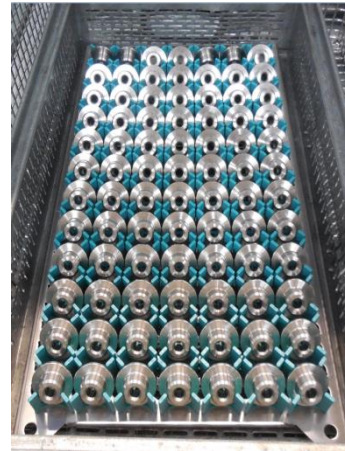
- The fact that today's cleanliness specifications for precision and critical cleaning cannot have any contaminant residue or rinse water residue on the end product, drives some users toward solvent.
- Use of solvent in manufacturing is **GROWING** due to inability of water to perform in certain criteria, component spacing, and restrictive drying process.
- Materials compatibility is a major area for concern where solvent is superior!  
*(Example: Multiple metals and lubes)*



# Removal of chips /oils /coolants



## Various Applications





# Challenging Parts





# Challenging Parts





# Challenging Parts – The Goal

Challenging Parts to Clean and Dry Parts



6 to 12 Minutes Typical

# Cleaning Chemistry Options

	Hydrocarbons	Chlorinated Hydrocarbons	Modified alcohols	Aqueous cleaners
Substance/ Substance class	C9-C13 Isoparaffins	Trichloroethylene Perchloroethylene	Modified alcohols	Alkaline cleaner
Polarity	Non – polar	Non-polar	slightly polar	polar
Organic contaminations (non polar) e.g. oil, fat	<b>very good</b>	very good	good	moderate
Organic, (polar) e.g. “combination contamination”	moderate	moderate - good	<b>very good</b>	moderate
Inorganic, (polar) contamination (Salts)	moderate	moderate	moderate - good	very good
Solid contamination (e.g. chips, particles, dust...)	<div style="display: flex; align-items: center;"> <div style="border: 2px solid red; width: 50px; height: 20px; margin-right: 10px;"></div>           Depends on machine configuration         </div>			

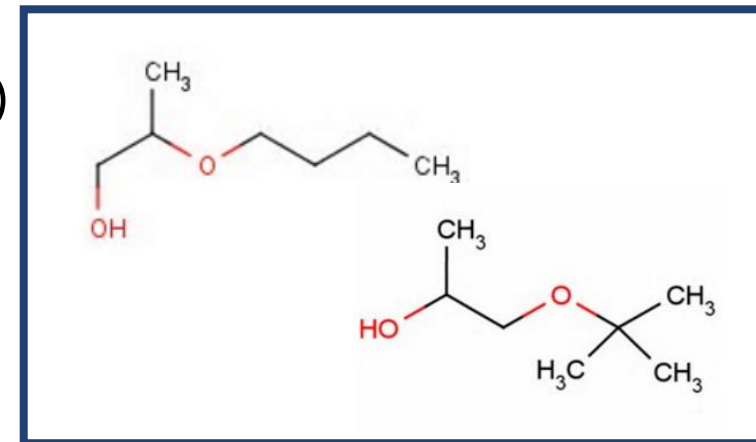


# What is Modified Alcohol?

- ✓ A water-free solvent with excellent cleaning power
- ✓ A single chemistry with both polar and non-polar properties
- ✓ One chemistry that cleans parts made with oils or water based coolants
- ✓ Distillable and highly recoverable
- ✓ A non-hazardous biodegradable organic solvent
  - RoHS compliant
  - CFC free (chlorofluorocarbon free)
  - Halogen free
  - Non-flammable
- ✓ Has proven compliant to ISO 10993-5 (in-vitro cytotoxicity)



## KYZEN Metalnox M6386 Modified Alcohol



# Cleaning Chemistry Options

Polarity: "Like dissolves like"

**Water**

$$\begin{array}{c} \delta^+ \text{H} \quad \text{O} \quad \text{H} \delta^+ \\ \quad \quad \quad \delta^- \end{array}$$

⇒ **polar**

⇒ ideal for the removal of polar soiling

**Hydrocarbons**

$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{---CH}_2\text{---CH---CH}_2\text{---CH---} \\ | \\ \text{CH}_2 \\ | \\ \text{CH}_3 \end{array}$$

⇒ **Non-polar**

⇒ ideal for the removal of non-polar soiling

# Modified Alcohol Vacuum Vapor Degreasing

## Key Benefits

### ✓ **Better Cleaning**

- Low Surface Tension
- Continuous Removal of Contaminants
- Polar and Non-Polar Soils

### ✓ **Lower Operating Costs**

- Lower Energy and Chemical Consumption
- Stability

### ✓ **Green**

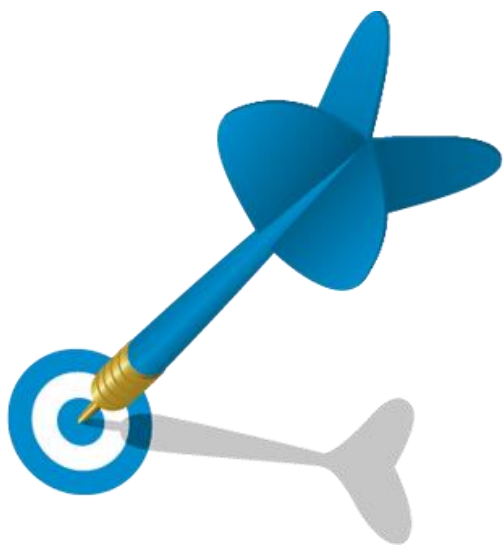
- Zero Emissions Under Vacuum Operation

### ✓ **Safe**

- Reduces Human Exposure

# Goals and Requirements

## Key Factors



1. Effective Cleaning
2. Non-HAP Solvents
3. Low VOC emissions
4. Capable of removing polar and non-polar soils
5. Meet application-specific cleaning specifications
6. Cleaning prior to painting or bonding
7. Rust prevention and protection
8. Solvent
  - Re-use
  - Low consumption

# Vacuum Process Sequence

## Wash #1

- Removes bulk contaminants
- High volume solution circulation/filtration
- Part rotation and oscillation
  - Ultrasonic impingement
  - Immersion degreasing

## Wash #2

- Much cleaner version of Wash #1
- Immersion degrease/filtration
- Pure Solvent Vapor Rinse

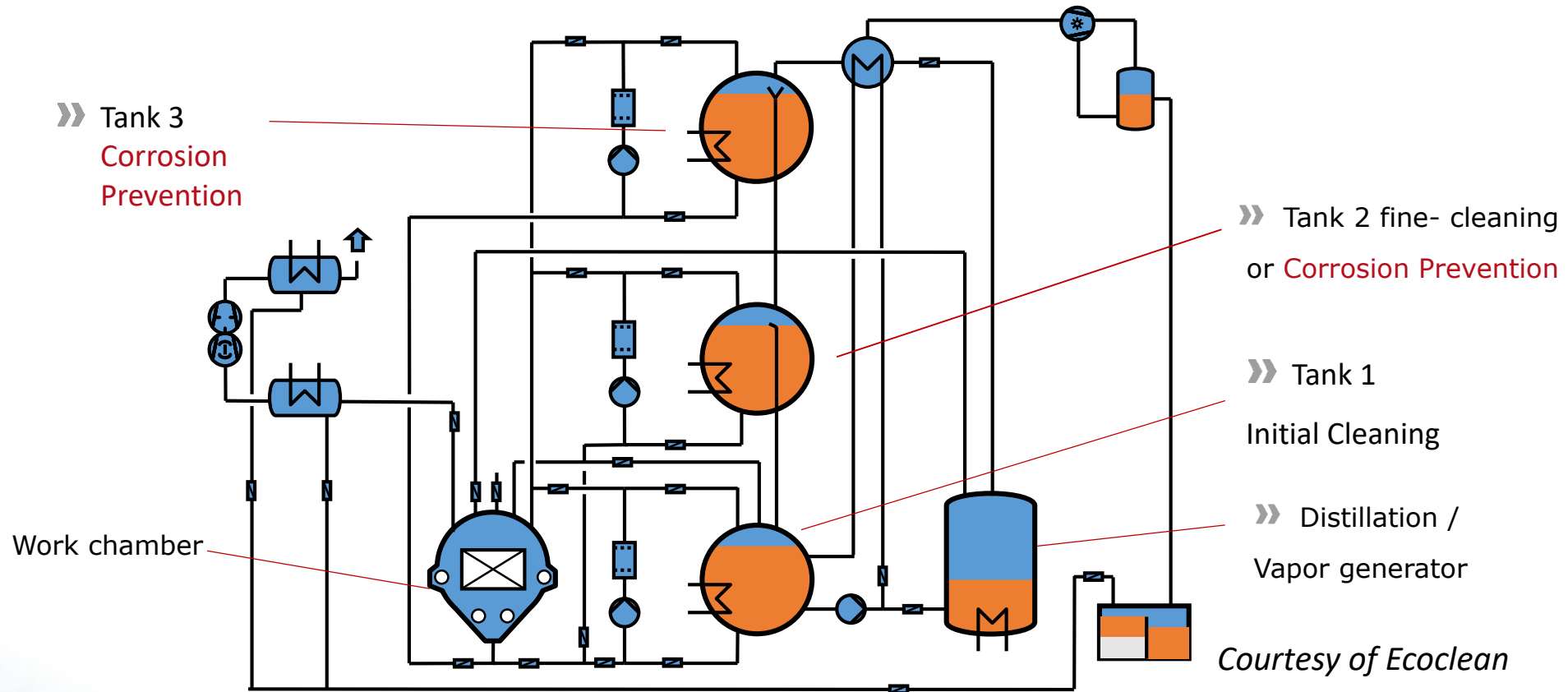
## (Optional) Corrosion Preventative Stage #3

- Dedicated solvent with CP additive
- Immersion soak/filtration

## Vacuum Dry

# Vacuum Process Sequence

*Typical Cleaning and Solvent Conservation in ONE system*

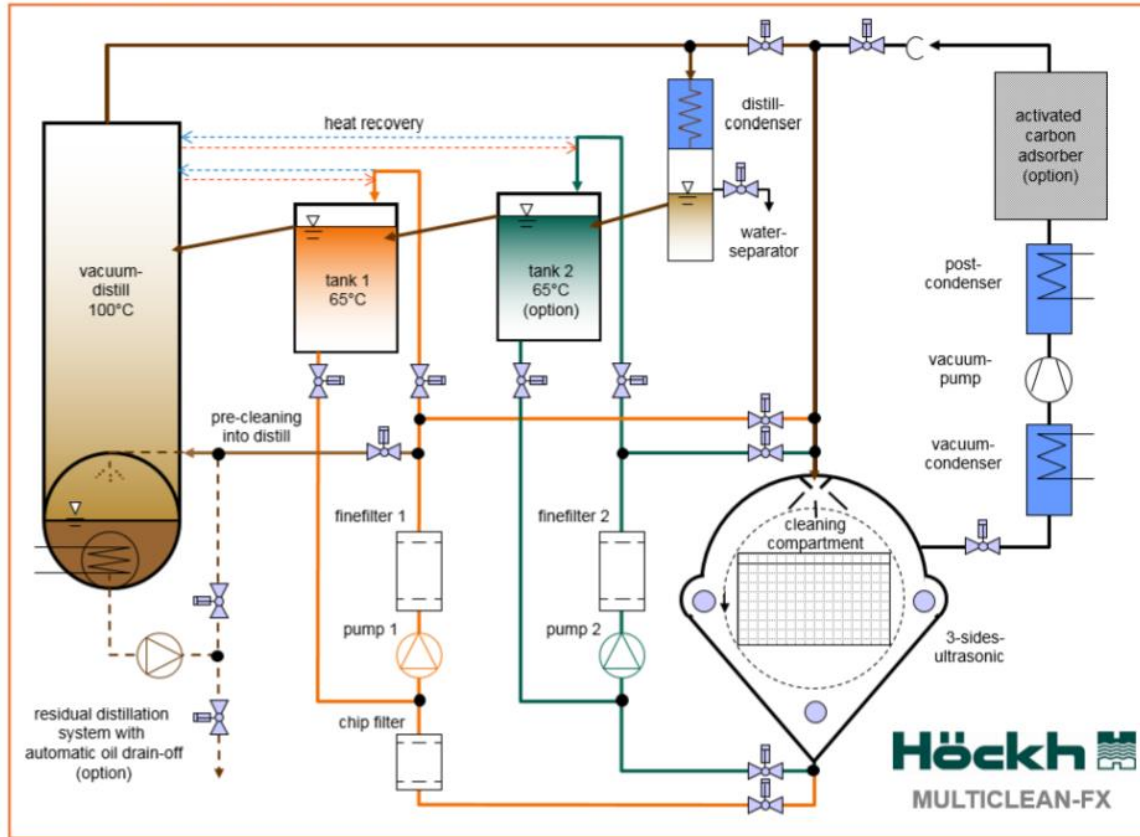


*Courtesy of Ecoclean*



# Vacuum Degreasing Process Flow

Process-Scheme:



# Modified Alcohol Compatibility

*Table 3: Metals and Alloys*

Substrate	M6386
2024 Aluminum- Bare	R
2024 Aluminum- Alclad	R
2024 Aluminum- Anodized	R
Black Anodized Aluminum	R
3003, 6061 and 7075 Aluminum	R
7075 Aluminum- Alclad	R
Brass	R
Silver	R
Gold	R
Copper	R
1018 Steel	R
304 and 316 Stainless Steel	R
Magnesium	R
Titanium	R
Steel, All ASTM, SAE & EN 10027	R

R = Approved Rating

# Modified Alcohol Compatibility

Table 1: Typical Chemical and Physical Properties

Parameter	100% Concentrate	Special Values
Clarity	Clear	
Color	Colorless	
Odor	Mild	
Flash Point, °C (TCC)	61°C	
Boiling Point, °F/C	161°C	
Volatile Organic Compound (VOC) g/L EPA Method 24	876.6 g/L	
Chemical Oxygen Demand, (COD), mg/L (ppm)		232.5 <sup>1</sup>
pH	Not Applicable	
Specific Gravity	0.83 – 0.93	
Weight/gallon	7.3	
Refractive Index, ° BRIX	45 - 52	
Non-volatile Residue (NVR) %	0.0%	

# Vacuum Degreasing Meets Ideal Performance Goals

- ✓ Excellent Cleaning for Both Polar and Non-Polar Soils
- ✓ Effective Precision Cleaning
  - ✓ Low Surface Tension
  - ✓ Tight Geometries
- ✓ Able to Clean Parts Without Separating Them
- ✓ Continuous Removal of Contaminants (filtration / distillation)
- ✓ Rust prevention and protection (if required)
- ✓ Dry – Dry – Dry !!!!!
- ✓ Solvent
  - ✓ Re-use
  - ✓ Low consumption



# Vacuum Degreasing Meets Ideal EH&S Goals

- ✓ No water required for washing or rinsing
- ✓ No Water To Drain
- ✓ Not a HAP
- ✓ Low VOC Emissions
- ✓ Low Operating Costs
- ✓ Lower Energy and Chemical Consumption
- ✓ Safe and Non-Toxic Chemistry
- ✓ Enclosed, Vacuum Operation Reduces Human Exposure





# Vacuum Equipment Partners

- ❖ ***Baron Blakeslee Serec***
- ❖ ***Cemastir***
- ❖ ***Ecoclean***
- ❖ ***Firbimatic***
- ❖ ***Hoeckh***
- ❖ ***IFP***
- ❖ ***ILSA***
- ❖ ***Pero***
- ❖ ***Roll***



\*Approximately 28 units sold in 2018



# Sustainable Future

Today's new solvents are replacing the older generation at a rapid pace.

## WHY?

- EH&S Conditions (Corporate and Gov)
- Cost of Operations
- Compatibility of new components

## Progress in new Vacuum Degreasing systems:

- ✓ Use considerable less solvent
- ✓ Generate very low emissions to the atmosphere
- ✓ Isolate the operator from process
- ✓ Usually incorporate automation for process control

# Why Solvent?

The old adage that solvent cleans better, faster, and in more restrictive places than water can ever reach—is still true!

The fact that today's cleanliness specifications for precision and critical cleaning cannot have any contaminant residue or rinse water residue on the end product ... still drives some users toward solvent.

# Get Informed!

There is an abundance of information available in today's world to consider the best cleaning method to suit your needs.

From government resources, environmental organizations, equipment suppliers, chemical suppliers, to technical papers and consultants.

There are companies that will perform cleaning analysis of your parts using a specific process to verify the results before you make a commitment. Most are free!

**Use these resources to supplement your decision.**



# Strategic Alliances

Customers

Distributors & Representatives

Contaminant Vendors

Cleaning Equipment Manufacturers

Enablers of Technology





# Thank You/Questions

Stop by Booth#7079 to learn more about how we can help you!



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