

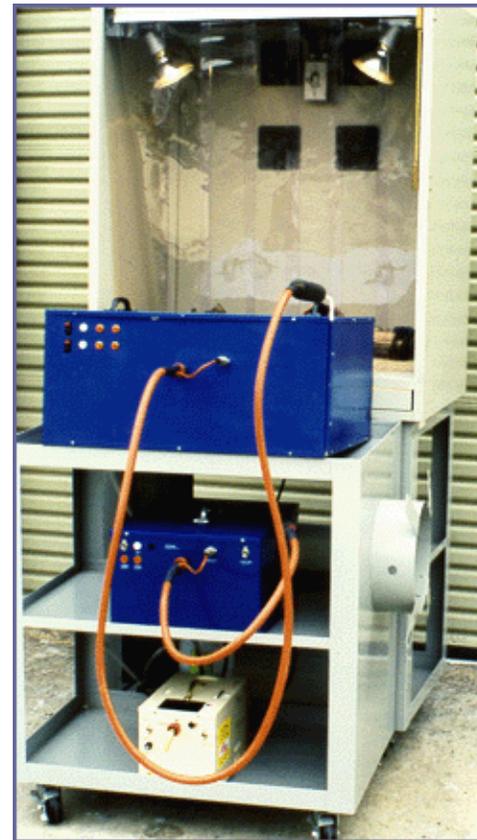
MINI-MAX

CLEANING & WASTE MANAGEMENT SYSTEM

1997



SOUTH COAST
AIR QUALITY MANAGEMENT DISTRICT
CLEAN AIR AWARD
FOR TECHNOLOGY



AQUEOUS YET WATERLESS CLEANING AND CORROSION CONTROL

MINI-MAX CLEANING AND WASTE MANAGEMENT SYSTEM

STEAM

$H_2O + 100^{\circ}C (212^{\circ}F) = \text{STEAM}$



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ENHANCED CLEANING - ADDITIVES & INHIBITORS

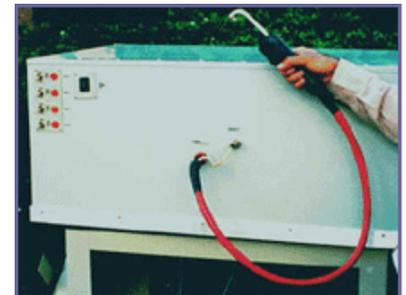
Step 1 → Step 2 → Step 3 → Step 4

Water injected
into patented
heating chamber

Water turns
to steam vapor

User directs
flow, blowing
contaminant off

Trap contaminant in
waste management
cabinet



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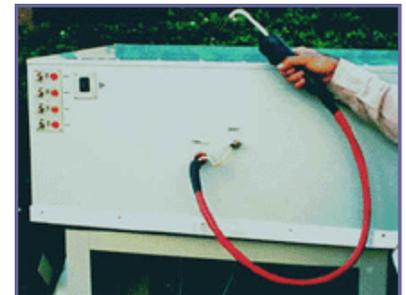
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Cleaning Efficiency Based On:
Heat, Pressure, and Vapor-Phase Water



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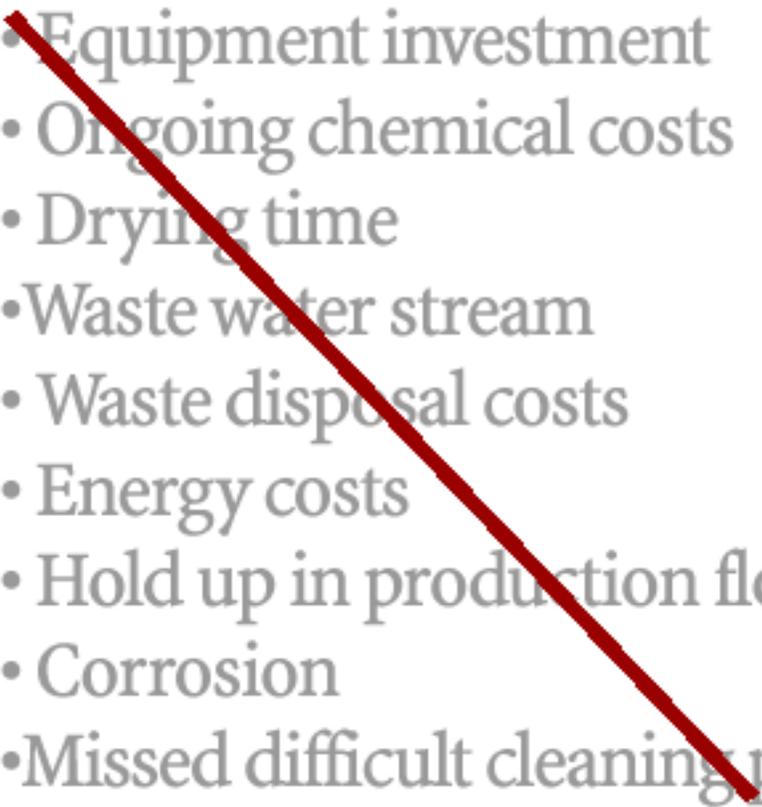
ALTERNATIVE CLEANING vs. STEAM VAPOR CLEANING

- Equipment investment
- Ongoing chemical costs
- Drying time
- Waste water stream
- Waste disposal costs
- Energy costs
- Hold up in production flow
- Corrosion
- Missed difficult cleaning parts

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ALTERNATIVE CLEANING vs. **STEAM VAPOR CLEANING**

- 
- | | |
|---|--|
| <ul style="list-style-type: none">• Equipment investment• Ongoing chemical costs• Drying time• Waste water stream• Waste disposal costs• Energy costs• Hold up in production flow• Corrosion• Missed difficult cleaning parts | <ul style="list-style-type: none">• Complete safety for user and environment• Elimination or reduction of solvents• Equipment portability• Cleaning without total disassembly• Cleaning in inaccessible areas• Minimal safety requirements• Practically maintenance free |
|---|--|

AQUEOUS YET WATERLESS CLEANING AND CORROSION CONTROL

MINI-MAX CLEANING AND WASTE MANAGEMENT SYSTEM

SAFETY

- NO steam stored under pressure, ensures user safety
- Steam vapor is safe even at high temperatures
- Gloves optional, no toxic chemicals
- Goggles recommended
- Used with waste management cabinet minimizes work exposure to debris and entraps residue being removed

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WASTE STREAM MANAGEMENT

- Organic solvents considered HAZARDOUS WASTE
- Liquid aqueous systems managed as waste streams
- Often additives used are unsuitable for sewer disposal
- Traditional filtration and evaporative techniques have significant costs

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WASTE STREAM MANAGEMENT

- Organic solvents considered HAZARDOUS WASTE
- Liquid aqueous systems managed as waste streams
- Often additives used are unsuitable for sewer disposal
- Traditional filtration and evaporative techniques have significant costs
- 500°F steam vapor evaporates leaving only residue of contaminants for disposal
- Residue collected on rags or absorbency pads - concentrated, manageable waste
- No waste water stream to contend with

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ENERGY AND WATER USAGE

Estimated Water Consumption, Steam Vapor Cleaning

Size Steam Vapor Cleaner

Water Use (average gal/8 hr shift)

Small

1 gal

Medium

2 gal

Large, continuous steam capability

5 gal

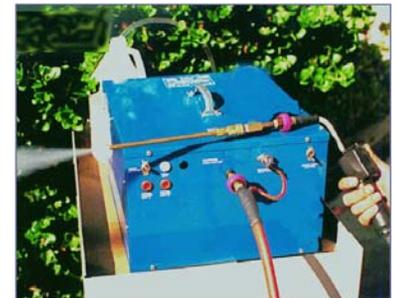


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MINI-MAX CLEANING AND WASTE MANAGEMENT SYSTEM

GENERAL APPLICATIONS

- Cleaning, degreasing, decontamination, corrosion control, parts cleaning, facility maintenance
- Rapid solubilization of a wide range of soils
- Use as final "rinsing" or "removal" of chemical cleaners
- Use as final detailing tool
- "Non-abrasive" vapor is perfect for delicate jobs

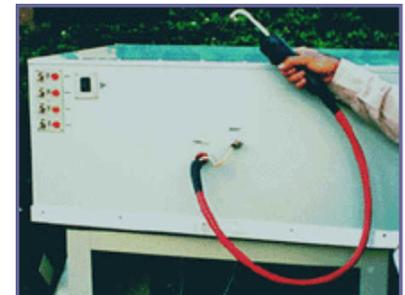


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GENERAL APPLICATIONS

- DEGREASE
- DECONTAMINATE
- CLEAN
- CORROSION CONTROL
- Used on electronics, weapons, automotive parts, ground support equipment, medical instruments, aircraft & helicopter engine equipment, food service, etc.



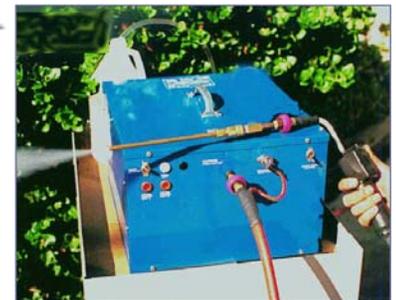
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COSTS SAVING ESTIMATES

U.S Navy Report

Fleet Activity Support Technology Transfer (FASTT-P-2) using this technology as a viable alternative to solvent cleaning and degreasing of weapons, automotive parts, electronics, printed circuit boards, ground support equipment and other items estimates a capital cost of approximately \$8,300 with an annual savings of nearly \$400,000 - a payback of under 1 year (actually 1 week).



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CASE STUDIES

Electronics Assembly, General Cleaning

Steam vapor cleaning has been evaluated for removal of flux and other contaminants for surface-mounted assemblies. Tests were performed for the U.S. Navy at Crane, IN. Ten motherboards and 26 interface cards were cleaned with steam vapor technology. NO damage due to heat or electrostatic discharge (ESD) was detected. The U.S. Navy has authorized use of the steam-vapor technology with avionics and other applications.



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CASE STUDIES

Final Surface Preparation, Biomedical Application

The overall process of unwinding the roll of stainless steel strip, bending, shaping, and laser-welding the product requires 4.5 h. Prior to laser-welding the original process called for the strip to be run through solvent, then wiped with paper towels. It is important to remove all traces of solvent; any residual solvent interferes with laser-welding. Unfortunately, residual solvent produced welding "misses" resulting in an unacceptable reject rate. An automated steam vapor cleaner was implemented prior to laser-welding. The reject rate was reduced to negligible levels, production was increased by over 30%, and solvent usage eliminated.

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CASE STUDIES

Detail Cleaning of Refrigeration Equipment

B/E Aerospace, Galley Products Group in Anaheim, CA produces some 90% of the airline galley refrigeration equipment worldwide. B/E also repairs refrigeration in-house and specifies options for field repair. After some process optimization, B/E has introduced steam vapor cleaning to replace some mineral spirits cleaning of segments of refrigeration tubing.

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CASE STUDIES

Detail Cleaning of Refrigeration Equipment

Initially, assemblers, accustomed to cleaning with mineral spirits, were unfamiliar with the new technology. By making the equipment available in the shop, operators found a number of applications for steam vapor cleaning. It is currently in regular use in assorted applications as a final cleaning technique.

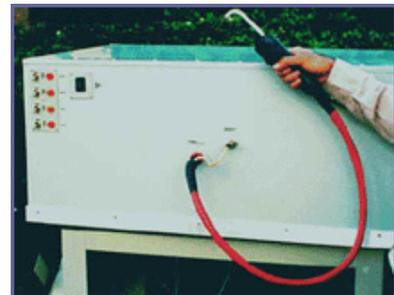
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CASE STUDIES

Printing Equipment

The *Los Angeles Daily News* is subject to stringent requirements for solvent elimination mandated by the South Coast Air Quality Management District (SCAQMD). The *Los Angeles Daily News* implemented steam vapor cleaning technology for an assortment of printing-related cleaning applications. As a result, solvent tank cleaning at the facility was eliminated. Emissions of volatile organic compounds (VOCs) were reduced from 20 to 2.2. tons annually.



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CASE STUDIES

Special Parts Cleaning, MWR Bowling Center
Sub Base Kings Bay, GA

Mr. Gordon Adams, maintains the 16 pinsetting machines along with a bowling lane conditioner. Mr. Adams testified that he has used the Mini-Max Modular II steam cleaner since August 2000 for all 16 pinsetters and the lane conditioner and this machine has reduced his cleaning work time from what used to be 10 days to what is now 1 day. Mr. Adams said he now cleans the lane conditioner in 1 hour/month and saves up to 4 hours/month over the past cleaning method.



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CASE STUDIES

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Mr. Adams said he saves time now because he does not need to take the machinery apart to perform cleaning. The Mini-Max Cleaner has totally replaced one Safety-Kleen solvent vat/chemical pumping/collection tank system.



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CONCLUSION

- Steam vapor cleaning has a wide range of applications: electronics, aircraft, ground equipment, plant maintenance, and biomedical, etc.
- Adopted by U.S. Military, Fortune-500 Companies, and small to medium-sized manufacturers.
- To date, manufacturer has observed no injury to products and no personnel injury

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There are so many potential applications for steam vapor cleaning that "we haven't even scratched the surface yet."

-Naval Air Warfare Center Aircraft Intermediate Maintenance Facility at Coronado, CA

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