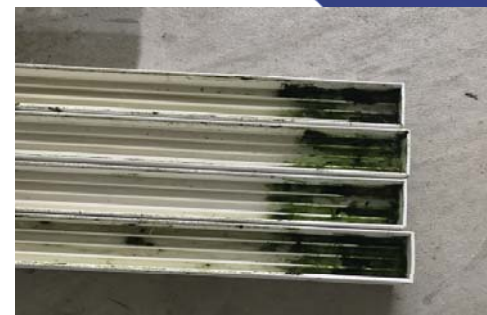


# CHEMICAL-FREE ALGAE CONTROL

# Background

## THE CHALLENGE

- Algae is a natural infestant and poses an imminent threat to hydroponic systems
  - Phytotoxic
  - Consume nutrients
  - Decrease yield
  
- Growth of Algal Biofilm on Reusable PVC-U Gutter
  - Rockwool and roots removed
  - Reusable gutter washed by sprinkling system
  - Thick algae residue on both ends of the gutter



# Background

## COMMERCIAL PRODUCTS

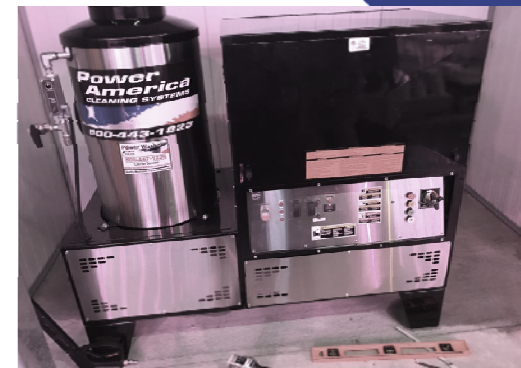
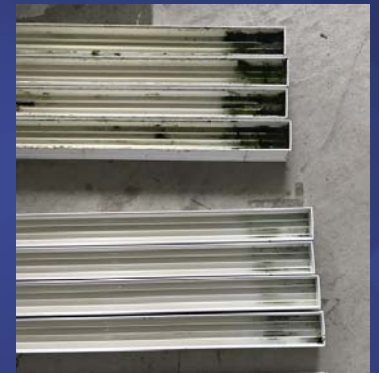
- Commercial algaecides
  - Contains harmful and/or corrosive ingredients
    - Copper salt – environmental toxins to finfish and mollusks
    - Ethanolamine – severe health hazard
    - Triethanolamine - acute, sub-chronic and chronic aquatic toxin
    - Dimethyl Benzyl Ammonium Chloride – poisonous, severe health hazard
    - Zinc dimethyldithiocarbamate – poisonous, acute & chronic aquatic toxin



# Methodology

## GREEN ALTERNATIVE

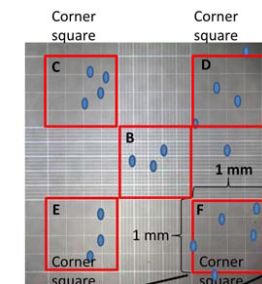
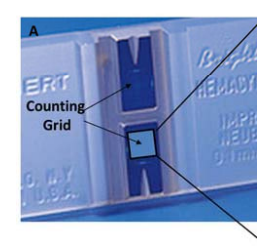
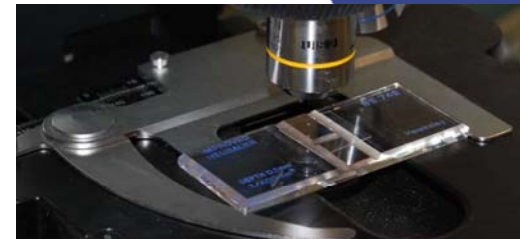
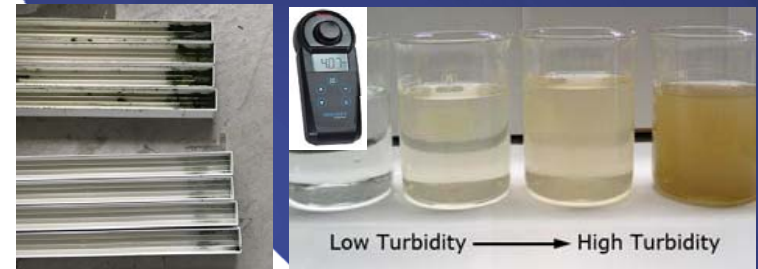
- Pressure washer
  - Pressure nozzle (>500psi)
  - Adjustable water temperatures (from 50-80°C)
  - Chemical free
- UML's role
  - Validate new pressure washer
  - Identify optimal processing temperature
  - Amount of algae residue & amount of algae removal



# Methodology

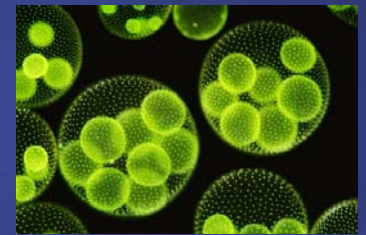
## SOP

- Sampling protocol
  - Algae will be sampled from PVC-U gutter using cotton swab
  - Redisperse algal sample in sterile water
  - Turbidity measurement – onsite indirect quantification of algal cell counts
  - Hemocytometer – off-site direct quantification of algal cell counts

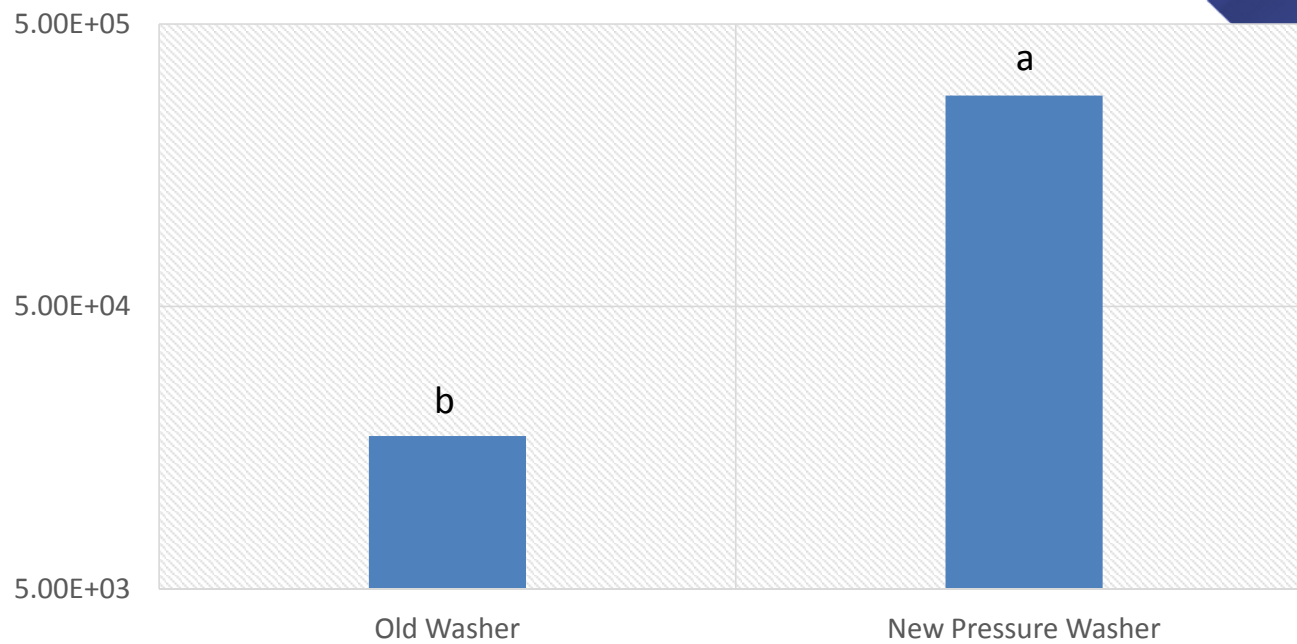


# Data Results

OLD SYSTEM VS NEW SYSTEM

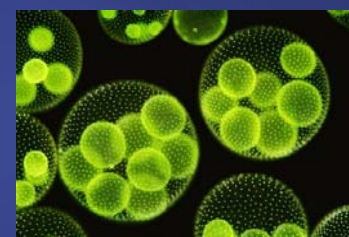


Total Algae Removal (Cells/cm<sup>2</sup>) –  $\alpha=0.05$

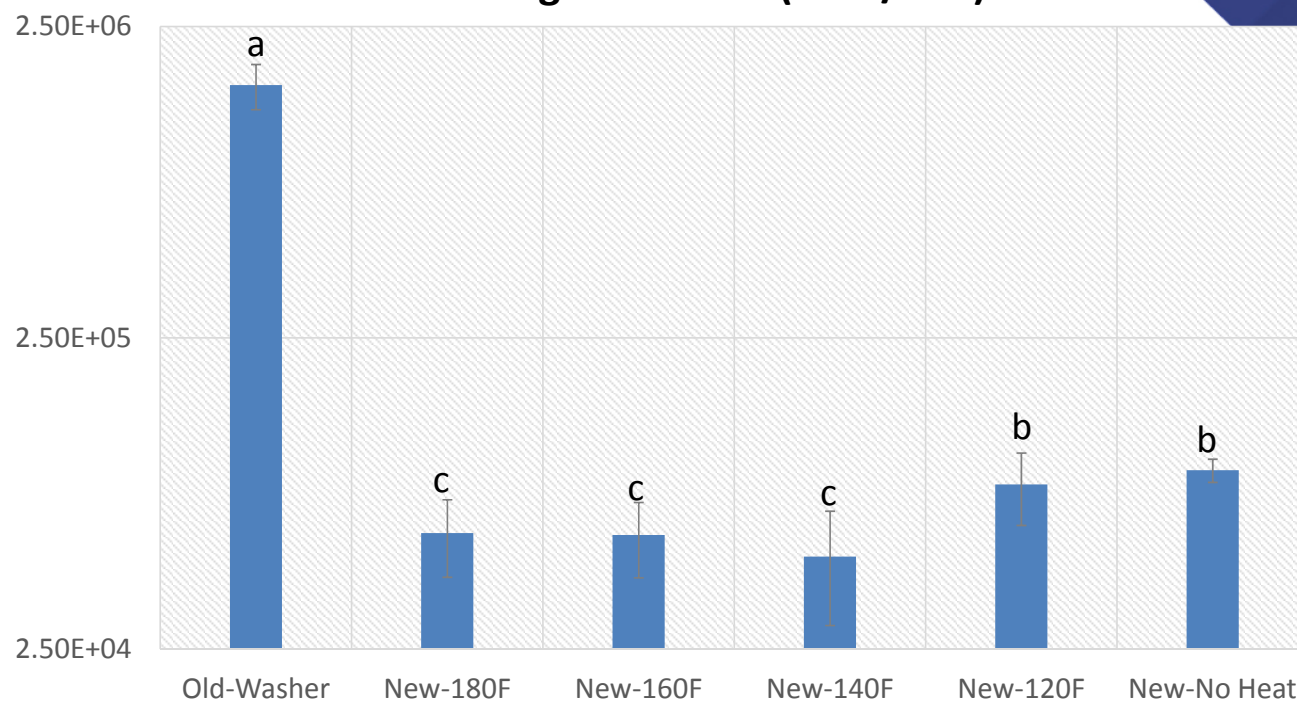


# Results

## TEMPERATURE OPTIMIZATION



**Final Algae Residue (Cells/cm<sup>2</sup>) –  $\alpha=0.05$**



## Conclusion

- The **new pressure-washer system is statistically more efficient at removing algae**
- The recommended temperature for the new system is at **140°F**
  - Significantly different from pre-wash, no heat and 120°F
  - Insignificant difference between 180, 160, and 140°F
  - 140°F optimal to achieve best performance while reducing energy costs



# Acknowledgements

- Toxic Use Reduction Institute (TURI)
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# THANK YOU!