Biofilm and Antimicrobial Elimination Study with High Temperature Superheated Steam

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Keys of the Study

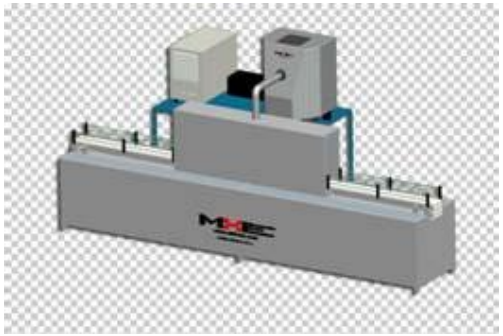
Initial contamination: 6.65 $\times 10^6$ cfu/ml, 6.82 log cfu/ml

Example of Steam inactivation of biofilm in 10 seconds and other conditions are reported with MHI and Bayzi Steam. Please contact author for full report.

MHI does not endorse or warrant the results of this CIFT led investigation. Users are cautioned that results are only provided from a public document and are not meant in any manner to imply a health claim - the tests are not extensive enough to warrant such a claim yet. No such claim has been authorized by any government agency. Steam is an agent which under the correct conditions of use and temperature could have antimicrobial efficacy. Please contact the author or CIFT for a complete report. This document does not contain the entirety of report and has not been independently verified by Micropyretics Heaters International Inc. and/or Bayzi Corporation. For clarity please contact the author at The Ohio State University, Columbus OHIO, USA. The detailed address and contact information is available from the University Web-site.

MHI STEAM GENERATORS
Typical Models

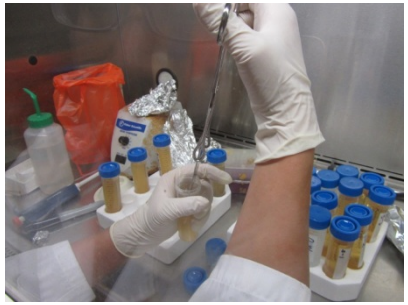
Industrial Steam Generation Systems



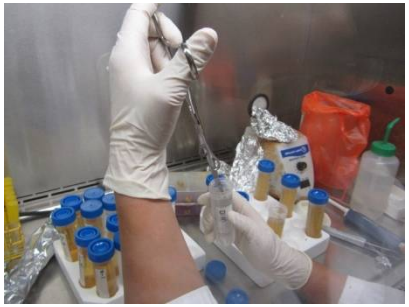
Autoclaved stainless steel Coupon-Day 1

Place into *B. staerothermophilus* (2.7×10^6 cfu/ml) in trypticase soy broth-Day 1

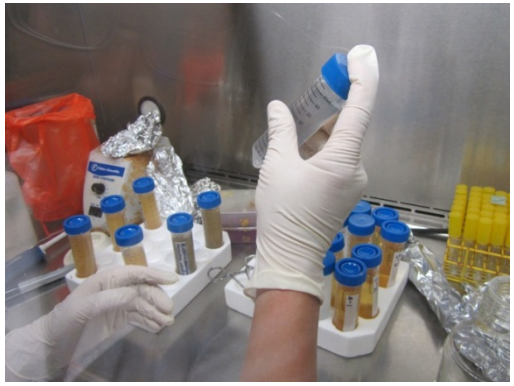
Incubation at 55°C for 24 hr -Day 1



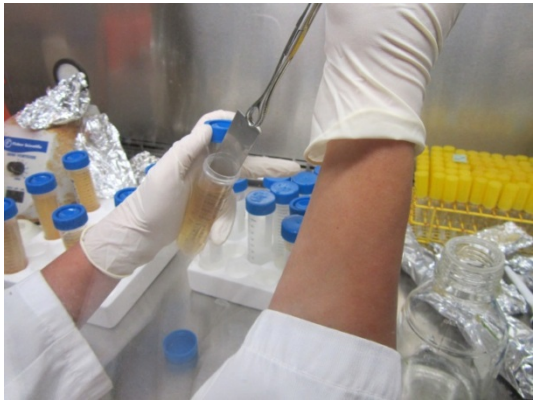
Take out incubated coupon-Day 2



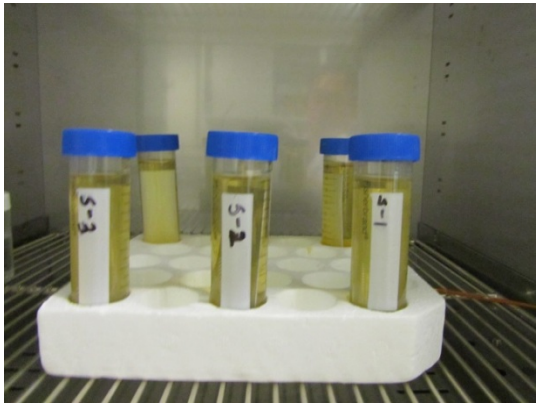
Place into sterilized distilled water-Day 2



Wash gently 5 s in sterilized distilled water to remove the bacterial spores and vegetative bacteria & Keep only biofilm



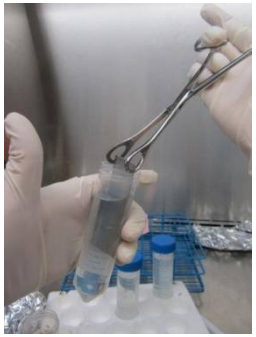
Place into trypticase soy broth to grow biofilm



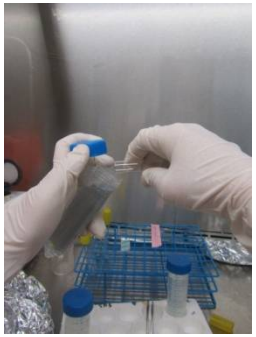
Incubate at 55°C for 6 days

After 6 days incubation

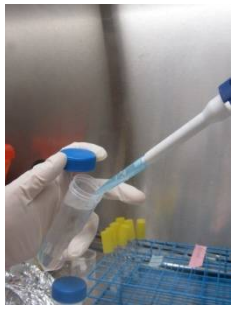
After 6 days incubation in trypticase soy broth take out the stainless coupon



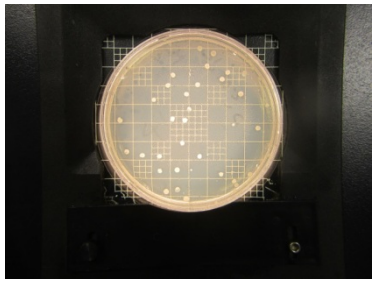
Gently rinse with sterile distilled water
(to remove the surface microorganism)



Place into sterile 0.1% peptone dilution water with 3 g of sterile glass bead



Agitate for 1 min using a bench top vortex mixer at the maximum speed to break down the biofilms into dilution water



Serial dilution, incubation & plate counting
: Stainless steel coupon: $2.48 \pm 0.32 \times 10^4$ cfu/ml
Teflon coupon: $2.46 \pm 0.32 \times 10^4$ cfu/ml

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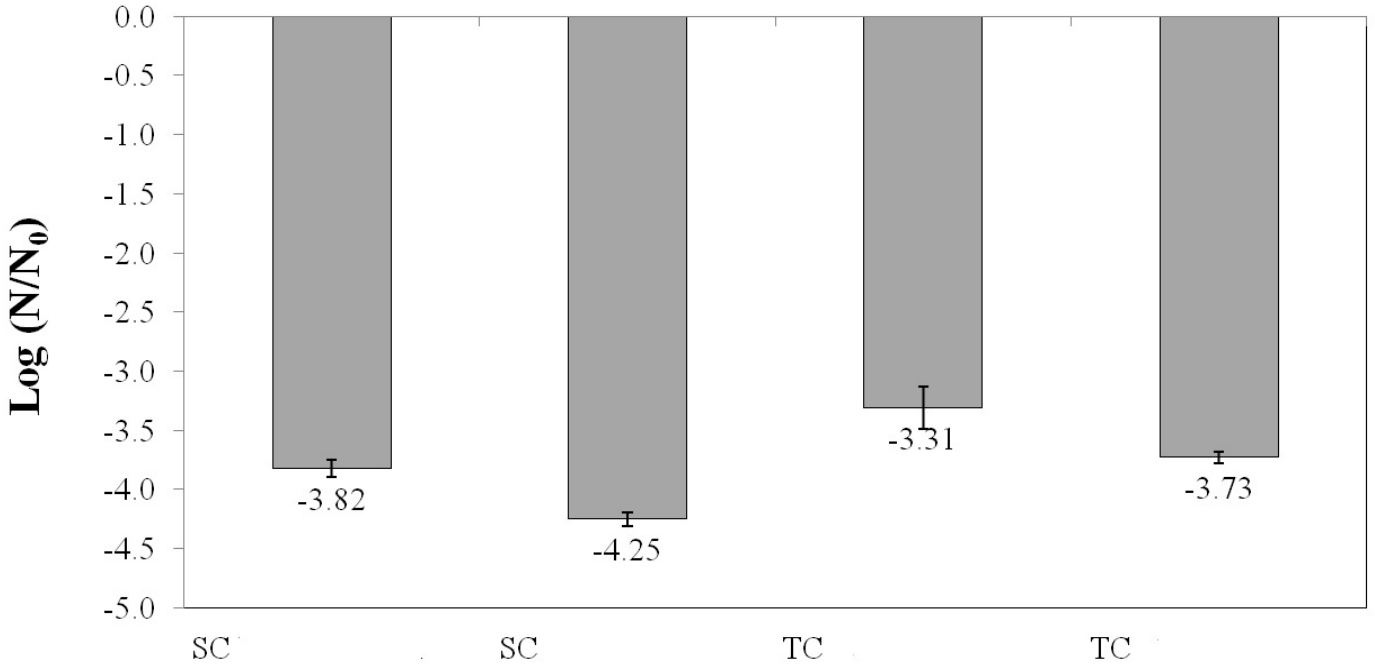
Steam inactivation, 10 s for each side

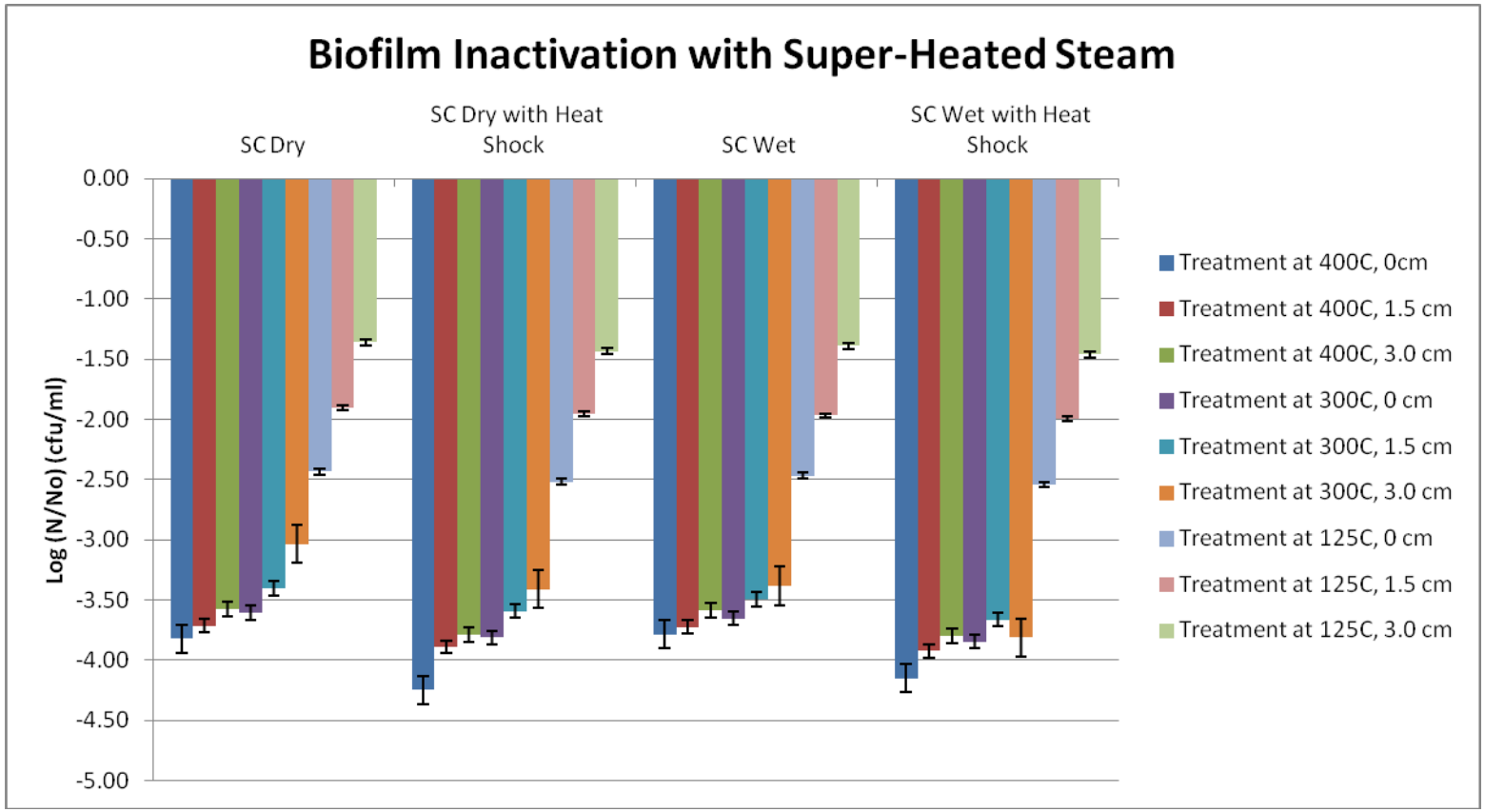
Initial contamination: 6.65 $\times 10^6$ cfu/ml, 6.82 log cfu/ml



~4 log reduction for 10 seconds exposure

Stainless Steel and Teflon Coupons

Alternate bars with/wo standard heatshock is for surface prep



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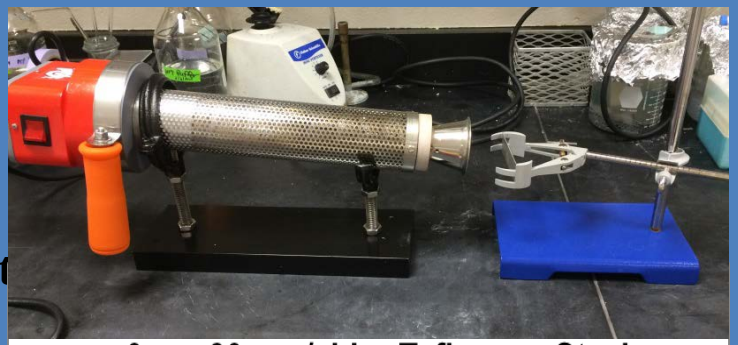
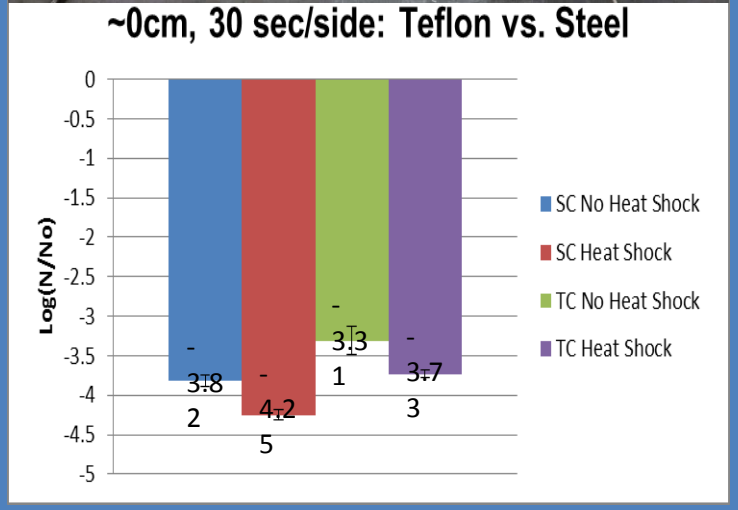
** Part of Main Conclusion: Super-heated steam at 400°C and close to steam exit point, resulted in a mean log reduction of 4.0 log for the biofilm. However at even at a 125°C setting (or about 60 mm from exit), a significant log-reduction was noted with this steam generator unit. Higher temperature - shorter residence time. Good steam like the one employed is required.



Temperat

125°C
125°C
125°C
300°C
300°C
300°C
400°C
400°C
400°C



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