COMPARISON OF THE CLEANABILITY OF PIECES OF EQUIPMENT IN STAINLESS STEEL AND CERAMIC

Thierry Bénézech[1*], François Guillotin[2], Yahaya Sylla[1], J. Jacquemont[1], Christine Faille[1]
[1] *INRA, UR 0638, 369 rue Jules-Guesde, BP 20039, 59651 Villeneuve d'Ascq cedex, France*
[2] *NCA Technologies Inc. 510 Ninth Avenue – Bearver Falls, PA 15010 USA*

ABSTRACT

NCA, in association with NeoCeram, is a company specialized in innovative products and technologies for fluid filling & dosing applications in the pharmaceutical, food, cosmetic, and other specialty industries. This company proposes equipment in ceramic as pumps, valves and flow control components. The interest of ceramic materials is the potency of various designs reducing the presence of coupling and joint areas which is considered as an improvement in terms of hygiene particularly in the food industries.

Ceramic materials were made in high purity in aluminum oxyde (99.7% Al_2O_3) from NeoCeram. Work was carried out on different systems to compare the respective cleanability of ceramic and stainless steel. Pipes with or without a sudden expansion to mimic simple equipment design cases, in addition to coupons placed in square pipes (Faille *et al*. 1999), were soiled by *Pseudomonas fluorescens* biofilms grown for 48 h in diluted (1/10) skimmed milk at temperatures 20°C. The growth medium was circulated in the pipes under low wall shear stress conditions for the pipes or just gently agitated in sealed square pipes containing the coupons.

The total viable counts (TVC) before and after cleaning in place (CIP) was obtained through an agar overlay technique (Husmark *et al*., 1999) for the pipes or through surface swabbing for the coupons prior to plating. Similar mean wall shear stress conditions in turbulent flow regime were obtained for the CIP cleaning (NaOH at 0.5 % and 40°C) using a pilot plant scale test rig under. Coupons allowed us to visualize the biofilm through epifluorescence microscopy and SEM microscopy on both stainless steel and ceramic materials. Ceramic items were shown to significantly improve the cleanability of the systems, even if the geometry appeared to play a major role due to the specific flow arrangements tested. Attempts were made to explain such an improvement.

References

Husmark U, Faille C, Ronner U Benezech, T. 1999. Bacillus spores and moulding with TTC agar: a useful method for the assessment of food processing equipment cleanability. *Biofouling*, 14: 15-24.

Faille C, Dennin L, Bellon-Fontaine MN, Benezech T. 1999. Cleanability of stainless steel surfaces soiled by *Bacillus thuringiensis* spores under various flow conditions. *Biofouling*. 14:143-151.