INDUSTRIAL AND ANALYTICAL METHODS FOR THE DETECTION OF INDUSTRIAL FOOD FOULING

Kathryn A. Whitehead* and Joanna Verran
School of Biology Chemistry and Health Science, Manchester Metropolitan University, Manchester M1 5GD

ABSTRACT

A range of rapid industrial and analytical methods were used to compare the detection of residual cells and soil on stainless steel. Industrial methods included ATP (adenosine triphosphate) bioluminescence and ultra violet (UV) light detection. Microscopy methods comprised scanning electron microscopy (SEM), and epifluorescence microscopy. Methods used to detect changes in the surfaces due to the presence of soil included physicochemical analysis (contact angle, surface free energy, dispersive and polar measurements) and chemical methods (energy dispersive X-ray [EDX] and Fourier transform infrared spectroscopy [FTIR]).

Organic soils included complex (meat extract, fish extract, cottage cheese extract) and defined soils (oils [cholesterol, fish oil, mixed fatty acids]; proteins [bovine serum albumin, fish peptones casein]; carbohydrates [glycogen, starch, lactose]); at a range of concentrations (10 % to 0.001 %). *Listeria monocytogenes* (ATP bioluminescence and UV) or *Escherichia coli* (SEM and epifluorescence) were used in cell and soil assays. Overall, epifluorescence microscopy gave the best qualitative and quantitative results, thanks to the development of a novel differential staining method.

The results demonstrated that a variety of techniques need to be used if the type of food soil retained on a surface, and its effect on subsequent fouling and cleanability, is to be elucidated. Clearly some of these techniques are less suitable for use on site in the food industry, but the provision of supporting data enhances and validates the simpler methods, leading to improved cleaning techniques. This programme of work compared each of these methods to determine their merits, shortfalls and relationships in terms of soil detection, enabling recommendations to be made as to appropriate value, and implementation.