

Design of a test rig for cleaning studies and evaluation of laboratory-scale experiments using pink guava puree as a fouling deposit model

ABSTRACT

A cleaning-in-place (CIP) test rig is commonly used to investigate the cleanability of food apparatus. The main focus of this work was to design a laboratory-scale cleaning test rig that operates at a fluid velocity of up to 2 m/s ($Re = 2.5 \times 10^5$) and that is capable of withstanding contact with detergents and disinfectants at temperatures from 20 to 70C. The design followed the standard design of a recirculating water tunnel that includes a test section. Computational fluid dynamic simulation was performed to find the minimum entry length to obtain fully developed flow at the test section. Cleanability of a flat stainless steel plate was investigated using pink guava puree as a physical fouling deposit model. The CIP process only considered the alkaline cleaning stage at cleaning condition of 0–2.0 wt % NaOH , 35–70C and 0.6–1.5 m/s. In general, removal of fouling deposit increased with increasing chemical concentration, temperature and velocity. These findings may be used to improve the CIP for real conditions in the food industry.