



Initial Development of an Automated Hand Washing System

Introduction



Effective hand hygiene has an undisputed role in reduction of cross-contamination and improving food safety. However, it is not simple to ensure successful hand washing in the food industry. There is interdependence between reliability and consistency of staff actions, equipment used, and process parameters that all combine to create an effective cleansing process. One method to move towards more controlled and consistent hand washing is to apply automation to the process.

The Food Refrigeration and Process Engineering Research Centre (FRPERC) at the University of Bristol, have a proven track record and experience in developing innovative pilot scale automation for the food sector. FRPERC enjoyed working with Safeway Hygiene Services Ltd on the initial development of the automated hand washing system.

Development

Many factors influence the efficacy of the hand cleansing process including pressures, volume flows, jet types, jet orientations, soaping, washing procedures, system sequencing, timings, etc. Re-configurable and programmable experimental rigs were constructed at FRPERC and extensive practical development trials were performed to evaluate basic parameter interrelationships.

A Programmable Logic Controller (PLC) was incorporated to allow washing cycles to be altered and reprogrammed. Structured trials and intuitional experimentation led to other advances confirming the requirements for 40°C water and a 2-handed soap rubbing action. Another key advance was the tuning of the pressure jet system for user comfort whilst maintaining sufficient impact for a pressure cleaning effect.

A multi nozzle development rig was constructed and used to establish a suitable nozzle configuration for demonstrating whole hand UV fluorescing gel cleaning coverage. All developments were incorporated into the automated prototype hand washing machine.

The prototype has an upper washing chamber containing 16 nozzles on 4 sparge tubes, and 2 soap spray nozzles. Pumps and control equipment are housed in the lower cabinet. The user puts their hands into the wash chamber below the soap jets and presses the activation foot switch. A non-contact sensor to detect hand presence replaced this switch in later versions. Soap is dispensed onto the hands and a flashing



light indicates the user should rub the soap onto their hands. The light becomes solid on for the last 2 seconds of soaping indicating to the user that the rinse cycle is about to start. A 10 second high intensity rinse follows with the user moving their hands within the jets for maximum washing effectiveness. This prototype rig consistently removes UV gel from the whole hand and is as effective as a sink based wash of three times the duration.

Additional studies at FRPERC evaluated drying technologies for possible inclusion in later versions of the HHU. Air knife techniques showed a reduction in drying rate with time, whereas hot air blowers showed an increase in drying rate.

Conclusions

The development work and prototypes built at FRPERC, provided Safeway Hygiene Systems Ltd with sufficient confidence to proceed with further commercialisation of the hand hygiene unit.

Further information can be downloaded in a .pdf leaflet on the handwash system development at FRPERC [\[new window\]](#)

For more information or help on PDF documents, see the [help on PDFs page](#).

UPDATE (June 2009):

Images of the commercial hand hygiene system.

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