

Automation of Hand Washing in this COVID Era

1. What is the problem?

- Persuading people to wash their hands **for 20 seconds** without having to remember to sing happy birthday to themselves to ensure that the process lasts that long - not feasible in a busy working environment.
- The amount of **water which is wasted** during the hand washing process.

2. Why is it needed/what is the need?

Change in Behaviour

Instructions on appropriate hand washing are not only a matter of improving personal hygiene but are an essential part of many professional training. The current COVID-19 pandemic has further highlighted the need to ensure that people wash their hands properly and effectively to prevent the spread of the virus. This has been a problem within healthcare for decades. Hospital Trusts have spent countless time and money trying to ensure that staff and visitors wash their hands for the **correct amount of time** to ensure effective cleaning and reduce the spread of germs.

Reports indicate that between 70-80% of people wash their hands after toilet use. But only 20% wash them for the **required time**. Therefore, **the issue is not persuading people to wash their hands, it is enabling them to wash their hands properly**. The American Society for Microbiology estimates that, on average, only about 20% of people in airports have clean hands — meaning that they have been washed with soap and water, for at least 15 seconds¹

We know that the duration of the hand washing process is a critical factor for removing microorganisms, as has been demonstrated through experiments conducted with hands artificially contaminated with pathogens or their indicator organisms³⁻⁴. We also know that, on average, most people wash their hands for **between 6-8 seconds**⁵

Please see NHS video [HERE](#) highlighting what happens when you only wash your hands for a few seconds. Also, note that this NHS official training has remained the same for over 10 years with the exception that the NHS now advises to wash hands for 20 seconds rather than 15 seconds.

Environmental Issues - Water wastage

Alongside the issue of correct hand washing and the prevention of disease, we also have the issue of wasted water. Note that, in the video above, the water is left running for the whole duration of the hand washing process; this is to prevent re-contamination of the hands by touching the taps. Please see the UK government's official video on hand washing [HERE](#) and notice that, once again, the tap is left running for the whole duration.

Using the following calculations gives a rough and very conservative estimate of the amount of water wasted in one NHS Trust per day:

A running tap uses **6 litres of water per minute**⁶. Using just the 20 seconds of hand washing (rather than the whole process) means that 2 litres of water are wasted per hand wash. To use an example, Say a specific NHS Trust employs around 9,400 staff. Let's say only two thirds are at work for one 24-hour period. That gives us 6,266 staff and, assume that each member of staff only washes their hands once per shift. That equates to 12,533 litres of water wasted per day by just one hospital Trust. In reality, we would expect this calculation to be significantly higher when you consider that each member of staff should be washing their hands after each patient contact.

3. What is the solution?

We propose a simple automated, touchless, hand washing process as follows:

- The user begins the hand washing process by activating a motion detector on the tap
- Upon activation, the tap gives 3 seconds of water to wet the hands
- A countdown on the soap dispenser alerts the user that soap will be dispensed on 3 seconds
- Once soap is dispensed, a timer starts on the tap to alert the user that water will be dispensed in 20 seconds. In the meantime, the user has no option but to continue rubbing their hands together with the soap.
- After the 20 seconds, water is dispensed for 5 seconds to remove the soap.

4. What is the call to action from the wider engineering membership?

Challenge

- Is there an automated, touchless, hand washing system that meets the recommended Covid-19 hygiene cycle and is not wasteful of water?
- If not, who would help to make an affordable version for general use?

What are we looking for?

The conceptualising team believe that the technology for this process already exists but is used for different purposes. The team also believes that this proposal will have benefits in all aspects of public life including Airports, Healthcare, and the hospitality sector to name a few.

The idea has support from both Staffordshire University and Royal Wolverhampton NHS trust. The proposing team are looking for industrial collaborators to design and develop prototypes. The team at Staffordshire can help with testing the devices and conduct studies on behavioural change. This will help the company to take the product to market.

Conceptualised by

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