April 2015

Floor 3 Line 2 UV light trial - Microbiological outcomes.

Background

Ultra Violet (UV) light of certain wavelengths cause damage to DNA. Microorganisms exposed to high levels of UV radiation have their DNA damaged to the point that they can no longer reproduce. Therefore, UV can be used to prevent the proliferation of microorganisms.

A UV light was mounted below the flat bed conveyor on Line 2 on floor 3, which makes cannelloni and kids lasagne. This is one of only two lines in the filling process which are direct food contact (the other being Floor 3, Line 3 which makes Lasagne). Flat pasta is cooked and cooled in low risk and feeds into the filling hall. It runs over a bridge and on to the belt in question. The pasta is then cut in to lasagne sheets or formed into cannelloni tubes and removed. In both cases the pasta is removed from the line in to foils by hand. Line 2 was chosen in preference to Line 3 because products from line 2 have a higher frequency of out of specification microbiology results. This is thought to be due to the sterilising effects of the hot fill sauces in the lasagne products.

Due to the amount of starch deposited on the belt (providing a food source), the constant use of water (transportation of organisms) as a lubricant and the unavoidable use of hands (introduction of bacteria and viruses) to remove the sheets/rolls, microorganisms inevitably end up multiplying on the belt. If done properly, cleaning between runs will remove the microorganisms. Care is needed to clean all equipment (depositors, guillotine and formers) as well as the belt itself and hand washing is essential. However in the middle of long runs it is not practical to clean down the line; giving the conditions and time necessary for the belt to become a source of contamination for the flat pasta.

This trial was carried out to verify if the use of UV light to prevent the multiplication of microorganisms on the food contact belt and whether it would have a beneficial effect on product safety and quality.

Method

A set of control swabs was taken over two days, during production, at the same point on the belt before the light was switched on - see fig 1a. The location was chosen to ensure that the swab was taken from the belt after UV treatment but immediately before further product contact. Instructions were given to the QA team ensure consistent swabbing (fig 1b). The swabs were tested for Total Viable Count (TVC) and for Enterobacteriaceae (Ents). TVC is count of all living bacteria on the swab and Ents are an organism found in the gut which indicates that pathogenic organisms may be present.

This exercise was then repeated several times while the UV light was operational and again after it was removed.

Fig 1a – Swab Location

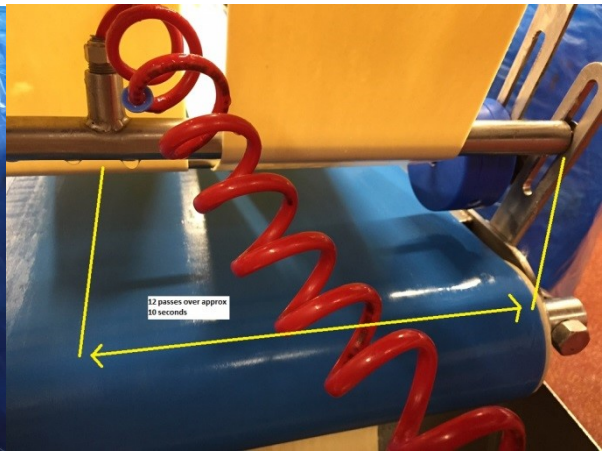

Fig 1b – swab location and instructions

Results.

The results have been appraised using 3 measures:

1. Effects on the average levels of total microorganisms (TVC) on the blue belt (*fig 2)*.
2. Effects on the average levels of indicator organisms on the blue belt *(fig 3).*
3. Effects on finished product microbiology *(fig 4).*

Results of TVC swabbing

Fig 2. – Average levels of TVC recovered from belt swabs with UV On/Off.

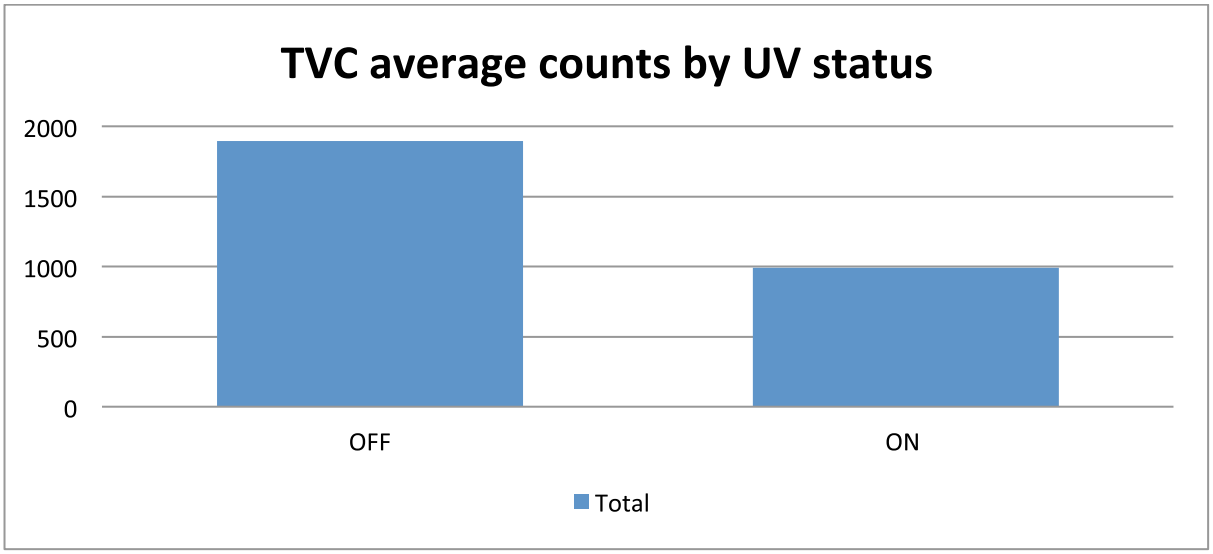

Fig 2 shows that there was a significant reduction in the levels of TVC recovered from the belt. It should be noted that the levels dropped, but the belt was not sterile.

Fig 3 - Result of Entero swabbing with UV light On/Off

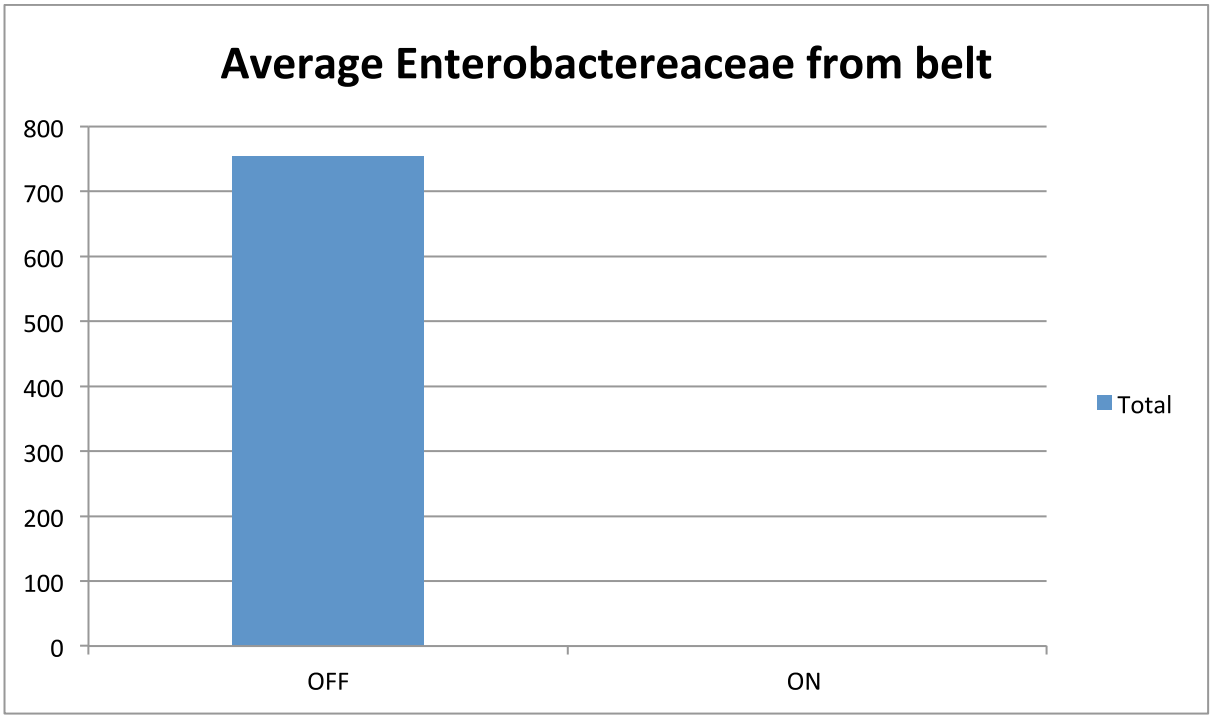

Fig 3 shows that no Enterobacteriaceae were recovered from any swabs taken while the belt was on.

Fig 4. Number of finished product spec failures (excluding yeasts)

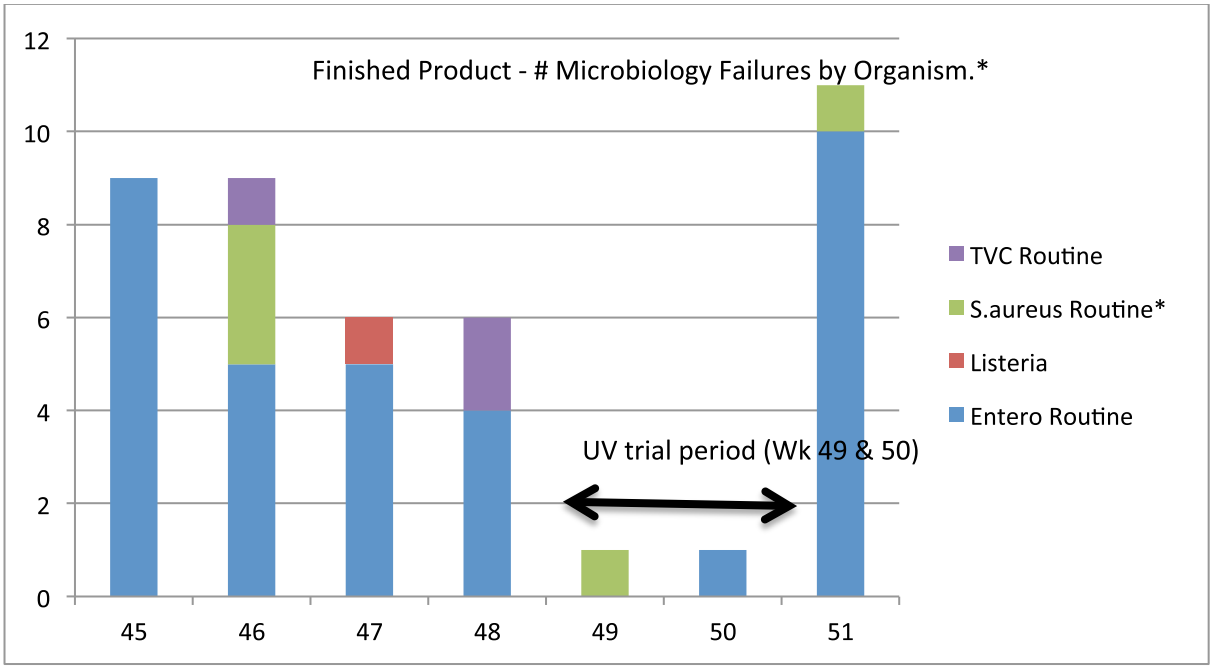

Fig 4 shows a significant reduction in the number of out of specification results from product produced on line 3:2 during the two weeks of the trial. There were 3 further spec failures during

weeks 49 and 50 which were on product produced while the light was off. E.g. before 8:00 a.m. or at the weekend and these have not been included in the graph.

*yeast results have been excluded from the data as these are known to be introduced by the cheese topping so are not relevant to the project.

Summary of results

The results clearly show a reduction in levels of microorganisms present on the belt while the UV light was in use. More encouraging is the very significant drop in the number of product micro problems while the trial was taking place. The Staphylococcus failure in fig 4 during week 49 was a presumptive result only, so did not ultimately fail [redacted] specifications, however it has been included in the data as this organism is indicative of a handling issue.

It should be noted that during the UV trial, TVC was still being recovered from the belt, though at lower levels. We also saw a very limited number of finished product fails occur during the trial. This illustrates clearly that while UV is effective in reducing microorganism levels and will make a significant contribution to reducing micro on the flat pasta line, it cannot replace good practice and cleanliness or help with any issues in raw materials or with product handling. The UV light will only work where the light can reach; this means that dirt and debris will protect organisms from the effects of the treatment. Therefore, the line will still need a thorough clean down between runs and be subject to any permissible clean as you go procedures to remove debris or deposits from the belt. This point should be made clear and re-iterated as there is a danger that people could rely on the UV to replace thorough cleaning. The phrase UV *cleaning* should be avoided at all costs as this is misleading. The other limitation to be aware of is that while UV will inactivate any microorganisms it treats; it will not denature any toxins which are present. Again, effective cleaning is the only way to mitigate that risk.

In final summary I would recommend that UV be used in specific circumstances such as on food contact surfaces where, if used in conjunction with good practices, I feel it will be of great benefit to product safety and quality.

[redacted]

Lab Manager

23/03/15