Information Sheet

Validation of ATP Hygiene Monitoring

Established Pass / Fail values

Pass / Fail thresholds for ATP Hygiene monitoring have been determined empirically over the pass 30 years that the technology has been in use globally by the food industry.
There is no common standard of ATP measurement because there are many different requirements that can affect the final residual contamination. For example, there are differences between industries, types of organic soiling and ATP content , types of equipment and surface materials, types cleaning chemicals and cleaning processes applied, as well as differences in ATP detection apparatus each with its own different measurement scale. Accordingly relative units of measurement are applied (RLU = Relative Light Units)

Several of these have been published in the literature are described below. However care needs to be exercised in interpreting this data since the unit of measurement is a Relative Light Unit (RLU) which is not an international standardised unit of measurement. The RLU value and scale will vary depending on the instrument / reagent system used.

In an extensive review article, Kyriakides & Patel shows ATP results in RLU and the difference between unclean and cleaned surfaces from different equipment, surface types and industry sectors.
The results show a large reduction in RLU after cleaning with typically post-cleaning values range from 4 - 30 RLU.
Microbial contamination was also correspondingly reduced.
See Appendix 1 that contains extracts from the publication; Table 7.2 , 7.3 and 7.5.

In their book entitled “How to Clean. A management Guide”, Dillon and Griffith (1999) showed how to validate a cleaning programme using ATP bioluminescence.
The reduction of ATP corresponded with the different stages of cleaning.
RLU values of <100 were clearly associate with cleaned surfaces.
The marginally cleaned zones gave results between 100 and 1000 RLU with Fails >1000 RLU. In comparison with the Hygiena systemSURE, the equivalent RLU values are <10 = Pass and >100 RLU = Fail
Microbial contamination was also correspondingly reduced.
See Appendix 2 that contains extracts from the publication; Fig 6.4.

Appendix 1: Extract from Kyriakides and Patel review paper

Kyriakides, A. L and Patel, P. D (1994) Luminescent techniques for microbiological analysis of foods. In; Rapid Analysis Techniques in Food Microbiology (ed P. D. Patel) Pages 196 -231. Blackie Academic and Professional , Glasgow.

Table 7.2 Levels of ATP on clean and unclean surfaces [a]

Surface	ATP bioluminescence result (RLU)[b]	
	Unclean	Clean
Cheese fermenter[c]	323	8
Cheese conveyor[d]	2359	29
Meat slicer[c]	9577	14
Milk road tanker[c]	1052	4

[a] All results are after subtraction of instrument and reagent background; swabbing area 10 cm × 10 cm; source: Kyriakides (unpublished data).
[b] Biotrace HMK and M3 luminometer.
[c] Stainless-steel.
[d] Synthetic.

Table 7.3 ATP bioluminescence hygiene assay of brewery cask racking filling heads demonstrating the ability to detect product residues, not detectable by traditional techniquesa

Filling head	ATP result (fmol ATP/swab)[a]		Plate count (cfu/swab)	
	(Precleaning)	(Postcleaning)	(Precleaning)	(Postcleaning)
4	440	9	<10	<10
8	106	6	<10	<10
12	2685	11	<10	<10
16	2398	5	<10	<10
18	2220	6	<10	<10

[a] Assays using Lumac 2010a; source: Simpson *et al.* (1989).
[b] ATP results calculated from relative light units using internal standardisation (1fmol=1 × 10^{-15} mol).

Table 7.5 Rapid identification of sources of contamination using ATP bioluminescence[a]

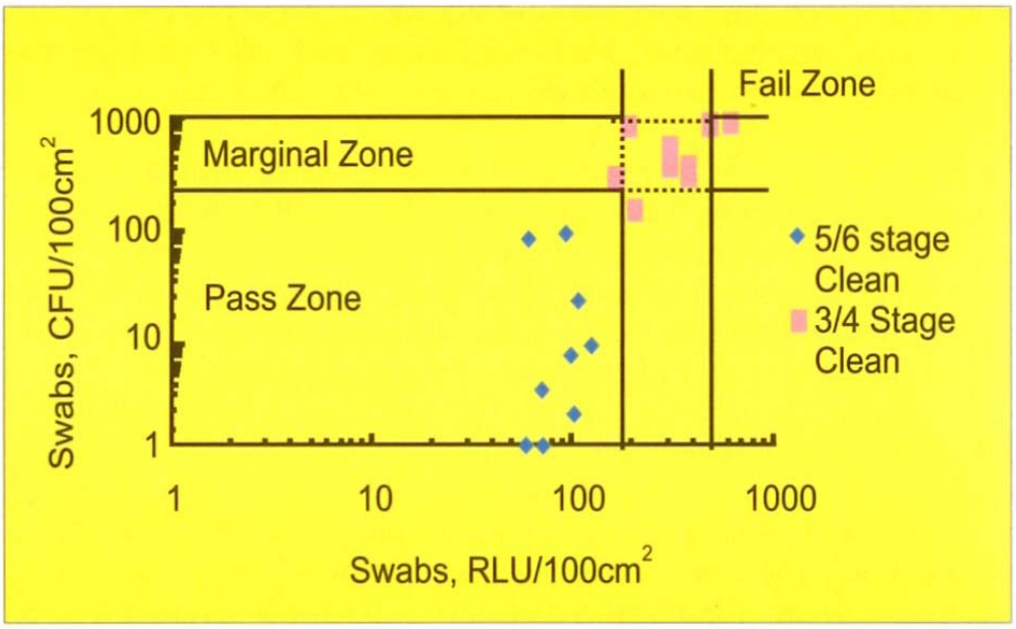
Surface	ATP bioluminescence result (RLU)[b]	
	Cleaned before remedial action	Cleaned after remedial action[c]
Valve (prefilling heads)	463	3
Filling head 1	13	0
Filling head 2	18	0
Filling head 3	24	0
Filling head 4	14	0

[a] All results after subtraction of instrument and reagent background; source: Kyriakides (unpublished data).
[b] Biotrace HMK and M3 luminometer.
[c] Remedial action involved disassembly of valve, full manual clean and reassembly.

Appendix 2: Extract from Dillon and Griffiths “How to Clean”

Dillon M and Griffith C (1999) How to Clean. A management Guide. Publish M D Associates Grimsby UK

Fig 6.4 Validating a Cleaning Programme using ATP Bioluminescence (in RLU's) and Microbiological Swabbing (cfu)



Notes on Figure 6.4 Validation of a Cleaning Programme

Stainless steel contact surface was evenly inoculated with ice-cream, contaminated with 1 x 10^6 of a mixed inoculum, left in contact for 1 hour.

3 stage clean: Initial rinse, detergent wash, final rinse
4 stage clean: as above plus 60 minute dry
5 stage clean: as 3 stage + terminal disinfectant + rinse
6 stage clean: as 5 stage + 60 minute dry

Each point is mean of 5 determinations.