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Test Report

Applicant：Biotek Environmental Science Ltd. (BES Group)

Report NO. ：107SA04464

Address of applicant：

Date Received：2018/10/30

Name of Article：BioSure Professional IDS (Model :EOS7170 Series)

Completion date：2019/02/01

Article Expiry Date：

Date Issued：2019/02/26

Sample Description：

Items	Unit	Result	LOQ/LOD	Method
(1).Custom-desiged program		see attachment。（8 page）		
(2).Sensory evaluation		see attachment。		Sensory evaluation--Triangle test

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Authorized Representative:

Report No. ： 107SA04464

Applicant ： Biotek Environmental Science Ltd. (BES Group)

Name of Article ： Evaluation of Antimicrobial Efficacy of Ice Making Machine with IDS (Ice Disinfection System) / BioSure Professional IDS (Model: EOS7170 Series)

Test Method ： 1.AOAC 990.12 Aerobic Plate Count in Foods

2.AOAC Offical Method 991.14 Coliform and Escherichia coli Count in Foods

Evaluation of Antimicrobial Efficacy of Ice Making Machine with IDS (Ice Disinfection System)

Test procedure ：

1. Set up ice making machine that has been running properly for 4 months with IDS attached to supply dissolved ozone for sanitation within the ice machine. Make sure the ice making machine and IDS unit both operate normally.

2. Prepare 75 mL bacterial suspension of *Escherichia coli* BCRC 10675 at a concentration of 5.5×10^7 CFU/mL. Dispense the bacterial suspension into the tank of the ice making machine with a volume of 7500 mL water. The final bacterial concentration is approximately 5.5×10^5 CFU/mL. Take sample immediately from the tank and perform plate count to confirm the bacterial load of the tank water.

3. Perform tests for total aerobic count and *Escherichia coli* on the samples collected from the swab of the designated sampling site S1 (surface of water distributors), S2 (surface of the water tank at 1cm below the maximum water level) and the sample S3 (tank water) and S4 (ice produced from the machine) for day 1, 7, 14, 21 and 28.

4. Use ozone gas detector to monitor the concentration of ozone in the off-gas in real-time.

Results ：

As shown in Table 1, the ice making machine (Figure 1) was inoculated with bacterial suspension of *Escherichia coli* BCRC 10675 at a concentration of 5.5×10^5 CFU/mL. After the IDS had been operated for 1, 7, 14, 21 and 28 days, samples were taken from the swab of the designated sampling site S1 (Figure 2), S2 (Figure 3), the tank water (Figure 4) and the ice produced from the machine (Figure 5) and tested for total aerobic count and *Escherichia coli*. Test results showed non-detectable for both total aerobic count and *Escherichia coli*. The antimicrobial efficacy was calculated as more than 99.999 %.

Conclusion ：

Instant antimicrobial effects can be found once the IDS is attached to the ice making machine. Throughout the operation of IDS for 1 month in total, the antimicrobial efficacies of both the interior water supply and the surface of the ice machine are maintained at more than 99.999%.

Table 1. Results of antimicrobial efficacy test for ice making machine with IDS after inoculation of *Escherichia coli* at a concentration of 5.5×10^5 CFU/mL.

Item	Ozone off gas level (ppb)	Day (code)	Total aerobic count (CFU/mL)	*E.coli* (CFU/mL)	Antimicrobial efficacy[1] (%)
Tank water (bacterial load after the inoculation of *E.coli*)	-	2018.11.7	-	**5.5×10^5**	-
IDS start-up					
S1 :	0	$T_{D0.5}$	Non-detectable	Non-detectable	>99.999
S2 :	0	$T_{D0.5}$	Non-detectable	Non-detectable	>99.999
S3 :	0	$T_{D0.5}$	Non-detectable	Non-detectable	>99.999
S4 :	0	$T_{D0.5}$	Non-detectable	Non-detectable	>99.999
Continuous operation of IDS					
S1 :	0	T_{D1}	Non-detectable	Non-detectable	>99.999
S2 :	0	T_{D1}	Non-detectable	Non-detectable	>99.999
S3 :	0	T_{D1}	Non-detectable	Non-detectable	>99.999
S4 :	0	T_{D1}	Non-detectable	Non-detectable	>99.999
S1 :	0	T_{D7}	Non-detectable	Non-detectable	>99.999
S2 :	0	T_{D7}	Non-detectable	Non-detectable	>99.999
S3 :	0	T_{D7}	Non-detectable	Non-detectable	>99.999
S4 :	0	T_{D7}	Non-detectable	Non-detectable	>99.999
S1 :	0	T_{D14}	Non-detectable	Non-detectable	>99.999
S2 :	0	T_{D14}	Non-detectable	Non-detectable	>99.999
S3 :	0	T_{D14}	Non-detectable	Non-detectable	>99.999
S4 :	0	T_{D14}	Non-detectable	Non-detectable	>99.999
S1 :	0	T_{D21}	Non-detectable	Non-detectable	>99.999
S2 :	0	T_{D21}	Non-detectable	Non-detectable	>99.999
S3 :	0	T_{D21}	Non-detectable	Non-detectable	>99.999
S4 :	0	T_{D21}	Non-detectable	Non-detectable	>99.999
S1 :	0	T_{D28}	Non-detectable	Non-detectable	>99.999
S2 :	0	T_{D28}	Non-detectable	Non-detectable	>99.999
S3 :	0	T_{D28}	Non-detectable	Non-detectable	>99.999
S4 :	0	T_{D28}	Non-detectable	Non-detectable	>99.999

Note：(1) Antimicrobial efficacy (%) = (a - b) / a x 100 %
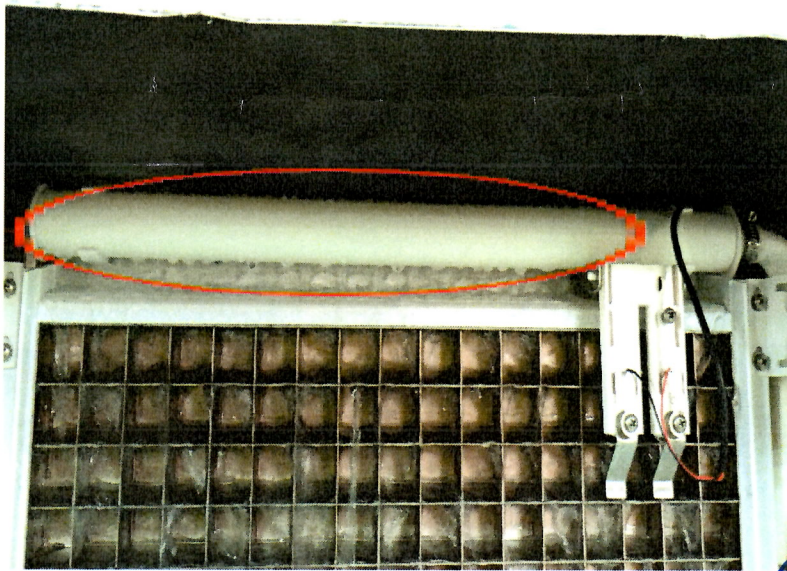
Figure 1. Ice making machine.

Figure 2. S1 represents the surface of water distributors.

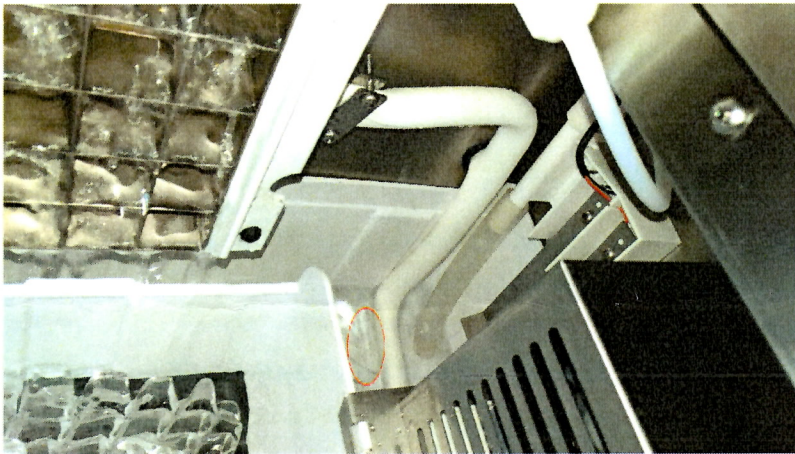Figure 3. S2 represents the surface of the water tank at 1cm below the maximum water level.

Figure 4. S3 represents the tank water in the ice making machine.

Figure 5. S4 represents the ice produced by the ice making machine.

Sensory Evaluation Report

I. Test sample

1. Ice making machine (provided by the applicant)：Scotsman C0630。
2. Ozone disinfection system (provided by the applicant)：BioSure Professional IDS (Model: EOS7170 Series)。

   Ice produced by the ice making machine after three ice making cycles was taken for sensory evaluation as sample A. The ice machine was then operated with IDS - turned on. After three ice making cycles with the operation of IDS , ice was taken for sensory evaluation as sample B.

II. Sensory evaluation testing method

Panelists：Food Industry Research and Development Institute (FIRDI) staff. 7 males and 15 females aged 25～50 years. A total of 22 participants were selected and qualified to be the trained-tasting panelist.

III. Sensory evaluation method

Sensory evaluation was conducted according to the triangle test in BS ISO 4120-200. Sample A and sample B were both coded with a three-digit number. Sample A was coded as 642 or 385 while sample B was coded with 531 or 859. Half of the panel was presented with the order combination AAB and the other half ABB. Three cups were placed in a triangle with one ice cube in each cup (Document 1). Panelists were instructed to identify the odd sample and specify the difference if desired. The questionnaire for the sensory evaluation was shown in Document 2. The significance of difference between samples was established based on the table of minimum numbers of correct judgments for triangle test as shown in Document 3.

IV. Results

Sample A and sample B were tasted by 22 trained panelists. In 22 trials of a triangle test, 6 panelists gave correct judgments. However, 12 correct judgments were required for significance at the 5% probability level. As a result, no significant difference was found between sample A and sample B ($p>0.05$).

V. Conclusion

There is no significant difference ($p>0.05$) between the ice produced by ice making machine with and without the operation of IDS.
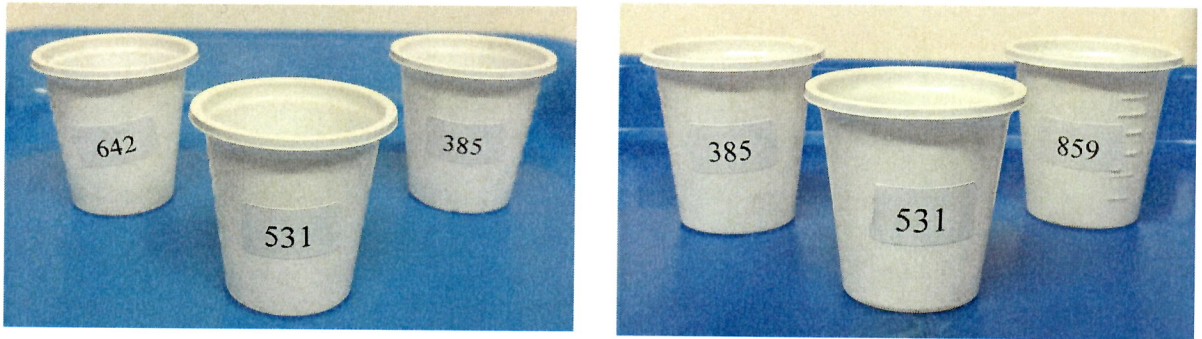
Figure 1. The order combinations of the coded samples. Half of the panel was presented with the order combination on the left and the other half on the right.

Triangle test

Name:_____   Date:_____

Sample:_____

Instructions: Three coded samples are presented below. Two of these samples are
identical while the other is odd or different. Indicate the code of the
odd sample by placing a "√" mark and specify the difference under the
appropriate column. Please taste each coded sample in order and rinse
your mouth with water between samples.

Sample code	Odd sample	Difference
_____	_____	_____
_____	_____	_____
_____	_____	_____

Comments:

Table 10.II.11 — Significance in triangle tests ($p = 1/3$)
(Source: Roessler *et al.*, 1978)

Number of test subjects or judgements	Minimum correct judgements to establish significant differentiation for a level of error of:			Number of test subjects or judgements	Minimum correct judgements to establish significant differentiation for a level of error of:		
	$\alpha = 0.05$ (*)	$\alpha = 0.01$ (**)	$\alpha = 0.001$ (***)		$\alpha = 0.05$ (*)	$\alpha = 0.01$ (**)	$\alpha = 0.001$ (***)
5	4	5	—	53	24	27	29
6	5	6	—	54	25	27	30
7	5	6	7	55	25	27	30
8	6	7	8	56	25	28	31
9	6	7	8	57	26	28	31
10	7	8	9	58	26	29	31
11	7	8	9	59	27	29	32
12	8	9	10	60	27	29	32
13	8	9	11	61	27	30	33
14	9	10	11	62	28	30	33
15	9	10	12	63	28	31	34
16	9	11	12	64	29	31	34
17	10	11	13	65	29	32	34
18	10	12	13	66	29	32	35
19	11	12	14	67	30	32	35
20	11	13	14	68	30	33	36
21	12	13	15	69	30	33	36
22	12	13	15	70	31	34	37
23	12	14	16	71	31	34	37
24	13	14	16	72	32	34	37
25	13	15	17	73	32	35	38
26	14	15	17	74	32	35	38
27	14	16	18	75	33	35	39
28	14	16	18	76	33	36	39
29	15	17	19	77	33	36	39
30	15	17	19	78	34	37	40
31	16	17	19	79	34	37	40
32	16	18	20	80	35	37	41
33	16	18	20	81	35	38	41
34	17	19	21	82	35	38	42
35	17	19	21	83	36	39	42
36	18	20	22	84	36	39	42
37	18	20	22	85	36	39	43
38	18	20	23	86	37	40	43
39	19	21	23	87	37	40	44
40	19	21	24	88	38	41	44
41	20	22	24	89	38	41	44
42	20	22	24	90	38	41	45
43	20	23	25	91	39	42	45
44	21	23	25	92	39	42	46
45	21	23	26	93	39	43	46
46	22	24	26	94	40	43	46
47	22	24	27	95	40	43	47
48	22	25	27	96	41	44	47
49	23	25	28	97	41	44	48
50	23	25	28	98	41	45	48
51	24	26	28	99	42	45	48
52	24	26	29	100	42	45	49