



INNOVHUB  
STAZIONI SPERIMENTALI  
PER L'INDUSTRIA

innovazione e ricerca

SSOG

STAZIONE SPERIMENTALE  
PER LE INDUSTRIE DEGLI OLI  
E DEI GRASSI

SEDE OPERATIVA:

Via Giuseppe Colombo, 79 - 20133 Milano

Tel +39 02 7064971 - Fax +39 02 2363953

sales.innovhub@mi.camcom.it

www.innovhub-ssi.it

# Performance test

Washing performance evaluation for a washing machine with automatic dosage

**INNOVHUB-SSI**

Dr. Davide Mariani

Ref. Report n. S-SSOG-2001857

Drawn up for: **CANDY-HOOVER GROUP S.R.L.**



## 1. Testing purpose

The aim is to compare the washing performance of dedicated detergents on a washing machine with automatic dosage ("WashPass") with the performance of a market leading traditional detergent used under standard conditions, i.e. with a non-auto-dosing washing machine.

The comparison has been carried out using the cycle "ECO 20°C" on the same Candy washing machine: an auto-dosing WashPass model when using dedicated detergents; a non-auto-dosing Rapid'O model when using traditional detergent. In order to check the impact of the washing system (water, temperature, mechanical action from the selected cycle) on performance, a baseline test has been carried out on the same machine using only water.

The traditional detergent used for comparison with WashPass is commercially available in Italy as "\*\*\*\*\*" [brand and model redacted].

## 2. Products and dosages (Table 1)

Products	Dosages
WashPass dedicated detergent	Dynamically auto-dosed
Traditional detergent	55 ml

## 3. Operational parameters for the washing test (Table 2)

Parameters / Devices / Materials	
Washing machines	Candy
Washing temperature	20°C
Washing load	4.5 Kg, 100% white cotton
Washing cycle	Eco 20°
Washing water hardness	25 +/- 2 °F
Cycle duration	
Spin speed	
Number of independent iterations	4
Standard samples used	See Table 3
Evaluation methodology	Colorimeter-based

## 4. Instrumental evaluation

Instrumental measurements have been carried out with a MACH 5 colorimeter with the following settings:

- + Colorimetric space: XYZ
- + Standardization: Specular Component Included reflectance
- + Tristimulus value: Absolute Y
- + Standard lamp / observer: D65/10°
- + Geometry: diffused d/8°
- + Specular Component Included



INNOVHUB  
STAZIONI SPERIMENTALI  
PER L'INDUSTRIA

innovazione e ricerca



STAZIONE SPERIMENTALE  
PER LE INDUSTRIE DEGLI OLI  
E DEI GRASSI

SEDE OPERATIVA:

Via Giuseppe Colombo, 79 - 20133 Milano

Tel +39 02 7064971 - Fax +39 02 2363953

sales.innovhub@mi.camcom.it

www.innovhub-ssi.it

## 5. Procedure

The monitors containing standard samples (table 3) were inserted into the washing machine drum after being attached to elements of the standard load with non-metallic staples.

**Table 3**

<i>code</i>	<i>Soil type</i>	<i>Fabric support type</i>
E-111	Blood	Cotton
PS-01	Blood, aged	Polyester
CS-01	Blood, aged	Cotton
W-10Z	Chocolate	Cotton
PS-68	Chocolate ice cream, aged	Polyester
CS-02	Cocoa	Cotton
CS-26	Corn starch, colored	Cotton
PS-37	Full egg with carbon black	Polyester
CS-37	Full egg, with carbon black	Cotton
CS-08	Grass	Cotton
E-164	Grass	Cotton
CS-67	Mustard	Cotton
W-30C	Pigment/lanolin	Polyester
CS-27	Potato starch, colored	Cotton
CS-17	Fluid make up	Cotton
CS-216	lipstick	Cotton
SS-216	Lipstick, diluted, red	Silk
PS-216	Lipstick, diluted, red	Polyester
WS-216	Lipstick, diluted, red	Wool
W-10B	Pigment/olive oil	Cotton
CS-06	Salad dressing	Cotton
SS-06	Salad dressing with natural black	Silk
PS-06	Salad dressing with natural black	Polyester
WS-06	Salad dressing with natural black	Wool
PS-32	Sebum BEY with carbon black	Polyester
SS-32	Sebum BEY with carbon black	Silk
WS-32	Sebum BEY with carbon black	Wool
CS-32	Sebum BEY with carbon black	Cotton
C-05	Blood, milk, less ink	Cotton
P-10	Pigment, oil, Milk (POM) form. AS-10	Polyester
W-10	Pigment, oil, Milk (POM) form. AS-11	Wool
S-10	Pigment, oil, Milk (POM) form. AS-12	Silk
W-10SG	Tomato beef sauce	Cotton
CS-15	Bill(blue)berry Juice	Cotton
W-10WB	Blueberry juice	Cotton
E-122	Red Wine Aged	Cotton
W-10J	Tea	Cotton
W-BC-03	Tea for bleach(low temperatures)	Wool
W-10TE	Clay	Cotton



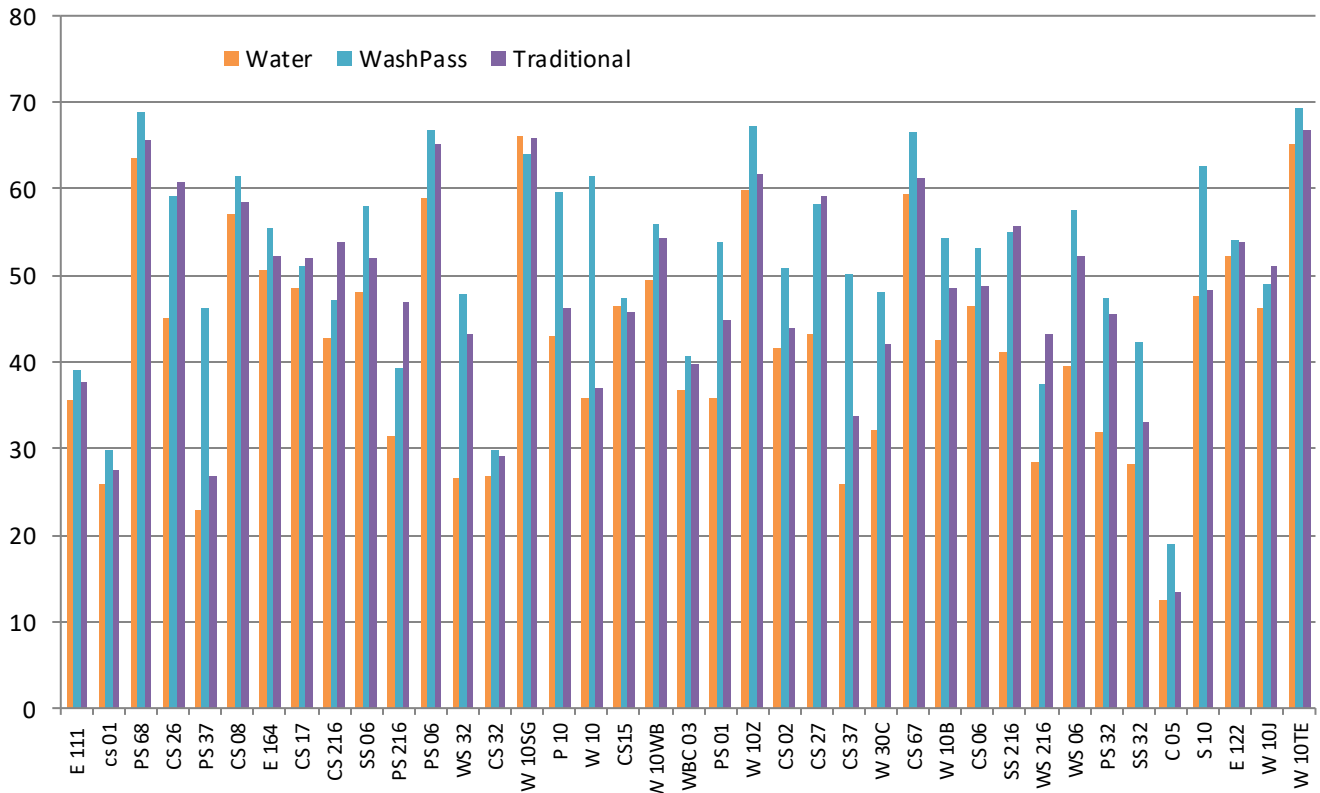
## 6. Results

Table 4: average Y values

Area no.	Water		WashPass		Traditional Detergent	
	Average(Y)	Std. Dev.(Y)	Average(Y)	Std. Dev.(Y)	Average(Y)	Std. Dev.(Y)
E 111	35.64	0.71	39.14	1.40	37.70	0.77
CS 01	25.82	0.58	29.86	0.73	27.50	0.45
PS 68	63.46	1.22	68.98	0.11	65.56	0.32
CS 26	45.02	0.5	59.10	0.31	60.68	0.40
PS 37	22.90	0.46	46.30	1.21	26.90	0.74
CS 08	57.08	0.76	61.40	1.05	58.42	1.43
E 164	50.68	0.68	55.50	1.14	52.30	1.24
CS 17	48.52	0.95	51.14	0.29	52.00	0.14
CS 216	42.66	0.72	47.12	0.16	53.90	0.44
SS 06	48.00	0.67	58.06	0.34	51.92	0.53
PS 216	31.40	1.83	39.40	0.16	46.82	0.31
PS 06	59.06	1.32	66.74	0.28	65.18	0.60
WS 32	26.70	4.52	47.80	0.81	43.26	0.40
CS 32	26.82	0.84	29.80	0.07	29.18	0.88
W 10SG	66.10	0.58	64.00	1.56	65.88	0.55
P 10	43.08	1.13	59.66	0.52	46.34	0.84
W 10	35.86	0.5	61.56	0.26	36.90	0.76
CS 15	46.38	0.43	47.40	2.42	45.74	0.98
W 10 WB	49.36	1.04	55.96	1.18	54.22	1.36
WBC03	36.84	1.21	40.68	0.90	39.70	0.90
PS 01	35.88	2.16	53.96	1.59	44.90	1.61
W 10Z	59.84	0.48	67.30	0.74	61.76	0.21
CS 02	41.60	0.64	50.92	1.68	44.02	0.56
CS 27	43.12	0.31	58.24	0.59	59.28	0.43
CS 37	25.98	1.82	50.12	1.44	33.84	1.19
W 30C	32.12	1.20	48.10	0.32	42.14	1.75
CS 67	59.52	0.72	66.66	0.26	61.18	0.52
W 10B	42.52	0.37	54.36	0.59	48.50	0.45
CS 06	46.58	0.41	53.24	0.36	48.82	0.37
SS 216	41.12	2.04	55.02	0.77	55.60	0.79
WS 216	28.54	1.47	37.48	0.16	43.34	0.55
WS 06	39.64	0.75	57.58	0.08	52.26	0.54
PS 32	31.96	3.3	47.40	0.83	45.56	1.53
SS 32	28.22	0.48	42.38	1.14	33.10	0.38
C 05	12.60	0.42	18.90	1.45	13.46	0.11
S 10	47.64	0.38	62.70	0.40	48.28	1.09
E122	52.18	0.62	54.10	0.35	53.76	0.74
W 10J	46.24	0.45	49.06	0.83	51.20	1.02
W 10TE	65.30	0.89	66.74	0.52	69.28	0.19



## 7. Histogram



## 8. Data elaboration

Reflectance data, in terms of Y values, were used to run the following elaboration:

- For each sample the best performing product (BP) was identified, and the two other resulting values were sorted in descending order;
- Performance deltas were calculated between the BP and the second-best result, as well as between the BP and the worst performer;
- The performance increase between the BP and the second-best was determined, and measured as a percentage of the interval between the best and worst performer;
- In the final column (WashPass vs. Traditional) data were expressed in positive terms when the difference was favorable to WashPass, and in negative terms when favorable to traditional detergent.
- The average BP improvement for each area and the overall average were calculated.



PROTEASE	WASHPASS	TRADITIONAL	WATER		WASHPASS - TRADITIONAL
	E111	39.14	37.70	35.64	0.41
cs 01	29.86	27.5	25.82	0.58	0.58
P 10	59.66	46.34	43.08	0.80	0.8
W 10	61.56	36.90	35.86	0.96	0.96
S 10	62.70	48.28	47.64	0.96	0.96
PS 37	46.30	26.90	22.90	0.83	0.83
CS 02	50.92	44.02	41.6	0.74	0.74
CS 37	50.12	33.84	25.98	0.67	0.67
CS 08	61.40	58.42	57.08	0.69	0.69
C 05	18.90	13.46	12.60	0.86	0.86
E 164	55.50	52.30	50.68	0.66	0.66
PS 01	53.96	44.90	35.88	0.50	0.5
W 10Z	67.30	61.76	59.84	0.74	0.74
<b>Protease Avg.</b>					<b>72 %</b>

AMILASE	WASHPASS	TRADITIONAL	WATER		WASHPASS - TRADITIONAL
	SS 06	58.06	51.92	48.00	0.61
PS 06	66.74	65.18	59.06	0.20	0.2
CS 06	53.24	48.82	46.58	0.66	0.66
WS 06	57.58	52.26	39.64	0.30	0.3
CS 26	60.68	59.1	45.02	0.10	-0.1
CS 27	59.28	58.24	43.12	0.06	-0.06
<b>Amilase Avg.</b>					<b>27%</b>



BLEACH	E 122	WASHPASS	TRADITIONAL	WATER	0.18	WASHPASS - TRADITIONAL
		54.10	53.76	52.18		0.18
W 10WB	WASHPASS	TRADITIONAL	WATER	0.26	0.26	
	55.96	54.22	49.36			
WBC03	WASHPASS	TRADITIONAL	WATER	0.26	0.26	
	40.68	39.70	36.84			
W 10J	TRADITIONAL	WASHPASS	WATER	0.43	-0.43	
	51.20	49.06	46.24			

**Bleach Avg. 6.7%**

DETERGENCY	CS 216	TRADITIONAL	WASHPASS	WATER	0.60	WASHPASS - TRADITIONAL
		53.90	47.12	42.66		0.60
SS 216	TRADITIONAL	WASHPASS	WATER	0.04	-0.04	
	55.60	55.02	41.12			
WS 216	TRADITIONAL	WASHPASS	WATER	0.40	-0.4	
	43.34	37.48	28.54			
PS 216	TRADITIONAL	WASHPASS	WATER	0.48	-0.48	
	46.82	39.40	31.40			
PS 32	WASHPASS	TRADITIONAL	WATER	0.12	0.12	
	47.4	45.56	31.96			
WS 32	WASHPASS	TRADITIONAL	WATER	0.22	0.22	
	47.80	43.26	26.70			
SS 32	WASHPASS	TRADITIONAL	WATER	0.66	0.66	
	42.38	33.10	28.22			
CS 32	WASHPASS	TRADITIONAL	WATER	0.21	0.21	
	29.80	29.18	26.82			
W 10SG	WATER	TRADITIONAL	WASHPASS	0.10	n.a.	
	66.10	65.88	64.00			
CS 17	TRADITIONAL	WASHPASS	WATER	0.25	-0.25	
	52.00	51.14	48.52			
W 30C	WASHPASS	TRADITIONAL	WATER	0.37	0.37	
	48.1	42.14	32.12			
W 10B	WASHPASS	TRADITIONAL	WATER	0.49	0.49	
	54.36	48.5	42.52			

**Detergency avg. 3%**

COCKTAIL	CS15	WASHPASS	WATER	TRADITIONAL	0.61	WASHPASS - TRADITIONAL
		47.40	46.38	45.74		0.61
CS 67	WASHPASS	TRADITIONAL	WATER	0.77	0.77	
	66.66	61.18	59.52			

**Cocktail Avg. 69%**



INNOVHUB  
STAZIONI SPERIMENTALI  
PER L'INDUSTRIA

innovazione e ricerca

SSOOG

STAZIONE SPERIMENTALE  
PER LE INDUSTRIE DEGLI OLI  
E DEI GRASSI

SEDE OPERATIVA:

Via Giuseppe Colombo, 79 - 20133 Milano

Tel +39 02 7064971 - Fax +39 02 2363953

sales.innovhub@mi.camcom.it

www.innovhub-ssi.it

MECHANICAL REMOVAL	W 10TE	TRADITIONAL	WASHPASS	WATER		WASHPASS - TRADITIONAL
			69.28	66.74	65.30	0.64
					<b>Mechanical Avg.</b>	<b>-64%</b>

MANNANASE	PS 68	WASHPASS	TRADITIONAL	WATER		WASHPASS - TRADITIONAL
			68.98	65.56	63.46	0.62
					<b>Mannanase Avg.</b>	<b>62%</b>

**Global average: 25% overall improvement** in favour of WashPass

Dr. Davide Mariani  
Detergents and Surfactants Dept.  
Innovhub-SSI  
Milan - Italy