

Recommendations for the Quality Assessment of Bathroom Cleaners*

Quality recommendations issued by the Industrieverband Körperpflege- und Waschmittel e.V. (IKW – The German Cosmetics, Toiletries, Perfumes and Detergents Association), Department of Cleaning and Maintenance Products, Frankfurt am Main (version 2002)

Foreword to these recommendations

1. Objective
2. Environment
3. Assessment of test results
4. Regulations and voluntary agreements (packaging & labelling)
5. Further development

1. Objective

The IKW member companies make their knowledge of the products they manufacture available to the general public in the form of quality recommendations. The IKW charged the »Cleaning and Maintenance Products Committee« (Fachausschuss Putz- und Pflegemittel – FP) with the development of these quality recommendations. The Cleaning and Maintenance Products Committee consists of experts from competing companies in the industry. This ensures the neutrality of the committee. The »Recommendations for the quality assessment of bathroom cleaners« are to enable a qualified evaluation of such products by the companies themselves, consumers, and test institutes. Quality standards are laid down and must be met by the products in question in order to achieve the performance levels expected by consumers and manufacturers alike.

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2. Environment

The defined objective is directly linked to the efforts of the manufacturers of cleaning and maintenance products to attain optimal quality standards for their goods.

The cleaning and maintenance products industry sees the realisation of this aim as an integral part of the international initiative »Responsible Care«. Basically this initiative stands for the commitment to continuously improve health and environmental protection and obviously includes the pursuit of a lasting and future oriented – sustainable – development. Furthermore it requires that natural resources are used in a sparing and efficient manner such that the needs of the present generation can be met without impairing significantly the development options of future generations.

Against this background the 'recommendations for quality assessment' issued in this paper serve to encourage staff in the industry to act responsibly towards fellow mankind and the environment in the development and manufacture of products whilst ensuring that consumers can expect efficient, safe and environmentally compatible products.

3. Assessment of test result

The quality standards determine which qualities are relevant to a given product and to what extent these qualities must be present. It should be noted that each finished product has a certain spectrum of quality characteristics largely oriented to consumer expecta-

tions. Consequently for individual products some properties will be emphasised whilst other properties are less important. Moreover the desired combination of product characteristics is subject to continual change, depending on developments in technology and changing consumer habits. Recommendations on quality must not hinder such developments. Therefore, whether or not a product meets the recommended quality can only be looked at overall. Highlighting isolated test criteria is inadmissible and may be misleading.

4. Regulations and voluntary agreements

The composition, packaging and labelling of a product must, at least, comply with the latest versions of the following regulations wherever applicable:

- The German foodstuffs and commodities act (Lebensmittel- und Bedarfsgegenständengesetz – LMBG)
- The German chemicals act (Chemikaliengesetz – ChemG)
- The German dangerous substances ordinance (Gefahrstoffverordnung – GefStoffV)
- The German detergents and cleaning products act (Wasch- und Reinigungsmittelgesetz – WRMG)
- The German surfactant ordinance (Tensidverordnung – TensV)
- The German ordinance on pre-packaged products (Fertigpackungsverordnung – FPV)
- The German ordinance on the transport of dangerous goods by road (Gefahrgutverordnung Straße – GGVS)

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- The German ordinance on the transport of dangerous goods by rail (Gefahrgutverordnung Eisenbahn – GGVE)
 - The EU recommendation of 13 September 1989 regarding the labelling of detergents and cleaning products as well as voluntary agreements
 - Voluntary agreement on the IKW recommendation for the phasing-out of APEO of 14 January 1986
 - Voluntary agreement on the IKW recommendation for the phasing-out of EDTA of December 2000
 - Procedural rules for communicating particulars pursuant to § 9 of the German detergents and cleaning products act (WRMG) of 5 December 1988
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5. Further development

The IKW »Cleaning and Maintenance Products Committee« is aware that future developments of the products themselves, in raw materials, or changes in consumer habits, may necessitate updating these recommendations.

The recommendations given here replace the 1988 version of the quality norm for bathroom cleaners. They take into account changes in the market situation and focus on the most frequent types of soil to be found in bathrooms.

Definition

Household bathroom cleaners are liquid products for the cleaning of surfaces made of ceramic materials, porcelain, glass, enamel, plastics or metal.

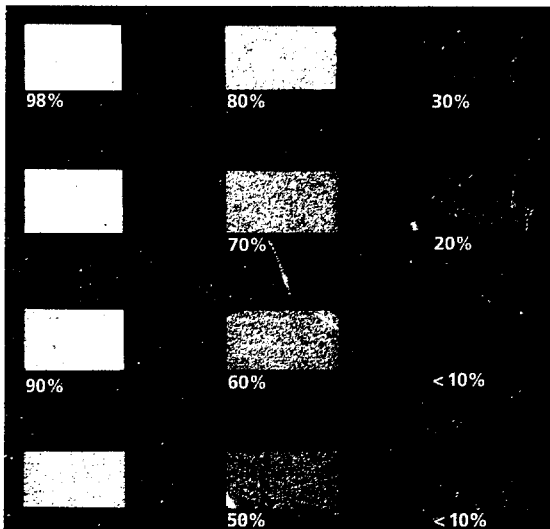
To remove specific bathroom soils - e.g. limescale, lime soap, grease - they can contain acids, complexing agents, surfactants, perfumes and solvents and possibly also antimicrobial additives.

Bathroom cleaners are usually marketed as ready-for-use trigger products, concentrates or aerosol products. Furthermore, current specialist bathroom cleaners can also be performance tested against these recommendations.

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Product characterisation	Testing
1. Details on packaging	
1.1 Product description, including brand name	
1.2 Manufacturer and/or distributor	Pursuant to statutory requirements
1.3 Labelling of dangers/warnings/ingredients	Pursuant to statutory requirements
1.4 Instructions for use	Pursuant to statutory requirements As instructed by the manufacturer
2. General physical/chemical properties	
2.1 Appearance	Organoleptic evaluation (viscous, clear, turbid)
2.2 Application	For trigger spray products, the handling, product discharge rate, and spray/foam characteristics are to be assessed
2.3 Colour	Organoleptic evaluation
2.4 Odour	Organoleptic evaluation
2.5 Reaction (pH value)	Using an electric pH meter in undiluted product
2.6 Stability	
2.6.1 Storage stability	After 1 year of storage at temperatures at which the product is usually stored, the product should not exhibit any major change in properties. Test: 14 days of alternating temperatures +5°C/+30°C, alternating every 12 hours
2.6.2 Heat stability	Following 3 months of storage at 40°C, on cooling to 20°C the product should not exhibit any major changes in properties.
3. Performance tests	
3.1 Determination of the lime scale removal properties	To determine the lime scale of the product in as realistic situation as possible, different conditions must be taken into account. Flat surfaces, e.g. bathtubs/washbasins, enable long exposure times whilst vertical surfaces, e.g. wall tiles/shower walls, allow only product-specific exposure times. This is taken into account by the various test procedures. It should be noted that the tests are to be carried out at temperatures between 20°C and 23°C.
3.1.1 Preparation of test plates	The test objects are slabs of white Carrarra marble sized 75x150x5 mm (supply source 1). Prior to testing marble slabs are degreased with ethanol. Any residues are removed under running water with a brush. The slabs are dried at 105°C for at least 1 hour to constant weight. After cooling down, the slabs are weighed out on an analytical balance (precision + 1 mg). A slab shall only be used for one experiment, i.e. one immersion for ready-to-use bathroom cleaners (horizontal surfaces) or five immersions (vertical surfaces); for concentrated products one immersion.
3.1.2 Ready-to-use bathroom cleaner (trigger products)	

Product characterisation	Testing
3.1.2.1 Horizontal surfaces	<p>250 ml of the cleaner are transferred to a suitable cuvette (measurements e.g. height 170 mm, width 100 mm, depth 20 mm). Then a test slab is totally immersed for 10 minutes in the cleaner.</p> <p>Then the treated marble slab is rinsed under running water and any adhering residues are brushed off, followed again by drying at 105 °C to constant weight and weighing. The quantity of dissolved calcium carbonate is determined by the difference in weight. The determination of the de-scaling power of a product is carried out using 5 marble slabs and always using fresh cleaning solution.</p>
3.1.2.2 Vertical surfaces	<p>250 ml of the cleaner are transferred to a suitable cuvette. Then the test slab is totally immersed for 10 seconds in the cleaner. As the next step, the test slab is immediately removed and placed vertically in a stand intended for this purpose. Here it is essential to make sure that the product can run off without forming a pool at the base of the marble slab. Exposure time in the vertical position is 10 minutes. After that the test slab is rinsed for 30 seconds under running water before the slab is once again immersed in the cleaner.</p> <p>Five immersion cycles are carried out, each with fresh cleaner. The thus treated marble slab is then rinsed under running water and adhering residues are brushed off, followed again by drying at 105 °C to constant weight and weighing. The quantity of dissolved calcium carbonate is determined by the difference in weight.</p>
3.1.3 Bathroom cleaner concentrates	<p>250 ml of the cleaner are transferred to a suitable cuvette. Then a test slab is totally immersed for 10 seconds in the cleaner. Then the test slab is immediately removed and placed vertically in a stand intended for this purpose. Here it is essential to make sure that the product can run off without forming a pool at the base of the marble slab. Exposure time in the vertical position is 10 minutes. The thus treated marble slab is rinsed under running water and adhering residues are brushed off, followed again by drying at 105 °C to constant weight and weighing. The quantity of dissolved calcium carbonate is determined by the difference in weight. The determination of the de-scaling power of a product is carried out using 5 marble slabs and always using fresh cleaning solution.</p>
3.1.4 Assessment	<p>The quantity of dissolved calcium carbonate is a measure of the de-scaling power of the cleaner.</p>
3.2 Determination of the cleaner's ability to remove lime soaps	<p>For this test high-gloss white ceramic tiles (15 x 15 cm, z.B. Villeroy & Boch), (supply source 2) are initially cleaned with a mild abrasive cleaner, rinsed with water and wiped with ethanol. Subsequently the tiles are dried for 1 hour at 180 °C in a preheated drying cabinet and then weighed.</p> <p>The test soil is a calcium stearate suspension of the following composition:</p> <ul style="list-style-type: none"> 85.0 % ethanol, 96 MEK denatured 5.0 % calcium stearate, fine (supply source 3) 9.8 % water, demineralised 0.2 % soot / special black 4 (supply source 4) <p>Ethanol is made ready and calcium stearate is stirred into it. Then water and soot are added. The suspension is placed in an ultrasonic bath for 10 minutes and subsequently homogenised over 3 minutes with a Turrax (ca. 5000/min).</p>



Photographic chart: Assessment lime soap removal

- 3.3 Compatibility with materials
- 3.3.1 Stress fracture corrosion test with plastic rods, based on DIN 53449 T 1-3

The suspension is applied onto the tiles from a distance of ca. 25 cm with an airbrush pistol, e.g. Badger model 150 with jet L. As a consequence of adjusting the airbrush system some of the ethanol will be blown out by the compressed air (recommended pressure 2 bar). Therefore the quantity to be applied should be determined in pre-tests.

The tiles are dried for 1 hour at room temperature and then stored for 1 hour in a horizontal position in a preheated circulating drying oven at 180 °C to melt the calcium stearate. Cooling is allowed to take place for approx. 1 hour in the switched off and slightly opened drying oven. The effectively applied mass of calcium stearate is calculated by another weighing and by determining the difference in weight compared with the empty, dried tile. According to the mass of the 5 % calcium stearate suspension to be applied (= 5 g), in the test only tiles are used onto which 0.25 ± 0.02 g of calcium stearate have been melted. Before testing the tiles are stored for at least 24 hours at room temperature.

The prepared tiles can undergo an ageing process. For comparative tests prepared tiles from the same batch should be used.

Testing is carried out in the form of a five fold determination. For this purpose 0.5 ml of undiluted cleaner are placed with a pipette on an area of 3 x 2 cm on the tile. The exposure time is preferably 2.5; 5; 7.5; 10 to maximally 30 minutes. Subsequently the tile is rinsed under running water, and the loosened calcium stearate is removed mechanically by wiping a moist, fine-pored viscose sponge (90 x 40 x 40mm) once across the surface of the tile without applying any pressure (**supply source 5**). Then the tile is rinsed with fully demineralised water and dried at room temperature.

The time that the test cleaner needs to achieve a cleaning performance of 90- 100 % is recorded. After drying the cleaning performance is visually assessed by three observers for each measuring point, estimating the soil removal in percent. To reduce variations of assessments, it is recommended that observers are trained using suitable evaluation samples.

The **photographic chart** shows examples of the percentage cleaning performance.

The cleaning performance for each of the five exposure times is arrived at from the mean value of the three observations per measuring point.

To evaluate the total cleaning performance achieved, the average percentage soil removal is plotted graphically against the cleaning time.

A comparison of the cleaning performance against time provides evidence on the efficacy of the test cleaner.

A stainless steel pin (dowel pin DIN 6325 Tol.: m6 3x10) is inserted in to the hole drilled (drill 2.7 and reamer 2.9 H7) in to the plastic rod using a tool such as, a rack press type 5 (**supply source 6 +7**). It is essential to insert the pin vertically.

The test rods are briefly immersed in the test medium. Adhering test medium is not removed. Immerse again after 24 hours. At intervals of 24 hours the immersion process is repeated on 5 consecutive days. The occurrence of stress cracks is to be evaluated and documented in tabular form in the defined intervals (4 hours, 1 day, and subsequently every 24 hours).

The test ends after 14 days.

The following plastics are tested:

ABS	Novodur P2MC
PC	Makrolon 3103 FBL 55/115
PMMA	Plexiglas 8N
POM	Hostaform 13031 XAS
POM	Hostaform C 9021 GV 1/30

(**supply source 8**)

Product characterisation

Testing

The selected materials are subject to changes and can be adapted to new trends accordingly.

Explanation of the evaluation:

- 1 = no change
- 2 = starting point of crack / small crack
- 3 = continuous crack
- 4 = break

Time window	Assessment	Cleaner
0 – 7 days	1	Recommended
0 – 7 days	2	Limited suitability
7 – 14 days	1	Recommended
7 – 14 days	2	Suitable

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ability

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Limited suit

Sketch:

Plastic test rod Stainless steel pin



3.3.2 Corrosion test on small galvanised plastic plates

The test plates are briefly exposed to the test medium by way of immersion. Adhering test medium is not removed. Immerse again after 24 hours. At intervals of 24 hours the immersion process is repeated on 5 consecutive days. Changes occurring to the surface are evaluated and documented in tabular form against the defined intervals (4 hours, 1 day, and subsequently every 24 hours).

The test ends after 14 days.

Assessment:

For a cleaner to be recommended there should be no evidence of corrosion on the surfaces after 14 days.

If traces of corrosion can be seen on the surfaces, it must be determined whether they can be removed by polishing with a soft cloth.

The following surfaces are tested:

Brushed steel

Chrome

Fine Brass

Satinox

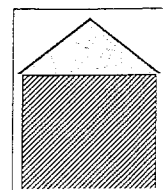
(supply source 8)

Abbreviations used in the evaluation:

- AG 0 = no attack
- AG 1 = ca. 1 % attack
- AG 2 = ca. 3 % attack
- AG 3 = ca. 10 % attack
- AG 4 = ca. 30 % attack
- AG 5 = > ca. 50 % attack

(AG = attack)

Sketch Small plastic plates:
Test surface (hatched) 6 x 6 cm



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Supply source 1

Carrara marble slabs 75 x 150 x 5 mm
(Carrara-Marmorplatten)
Naturstein Hubert Kohlenberg
Oberer Hang 3
40699 Erkrath
Germany
Phone +49 (2104) 932 152
Fax +49 (2104) 932 151
(Type Bianco CD, keyword: IPP Test).

Supply source 2

High-gloss white ceramic tiles 15 x 15 cm
(Hochglänzende, weiße Kacheln)
Villeroy & Boch AG
Postfach 10120
66688 Mettlach
Germany
Phone +49 (6864) 810
email: www.villeroy@boch.de

Supply source 3

Calcium stearate, fine
(Calciumstearat, fein)
Riedel-de Haen
Sigma-Aldrich Laborchemikalien GmbH
P.O.Box 100262
30918 Seelze
Germany
Phone +49 (5137) 82 38-0
Fax +49 (5137) 82 38-120
email: Riedel@sial.com

Supply source 4

Soot, special black 4 art. no. 26411
(Ruß, Spezialschwarz 4 Art.-Nr. 26411)
Degussa AG
Weißfrauenstr. 9
60311 Frankfurt am Main
Germany

Supply source 5

Viscose sponge, fine pored, 90 x 40 x 40 mm, art.
no. Z 14700
(Viskoseschwamm feinporig, Artikel Nr. Z 14700)
Fa. Spontex Deutschland GmbH
Postfach 100 905
41009 Mönchengladbach
Germany

Supply source 6

Dowel pin DIN 6325, 3 x 10
Tol: m6 art. no. 2520310
(Zylinderstift DIN 6325, 3 x 10
Tol: m6 Art.-Nr. 2520310)
Fa. Würth
Postfach
74650 Künzelsau
Germany
Phone +49 (7940) 15-0
Fax +49 (7940) 15-1000
email: info@wuertth.com

Supply source 7

Rack press type 5
(Zahnstangenpresse Typ 5)
Schmidt Feintechnik GmbH

Feldbergstr. 1
Postfach 14 65
78112 St. Georgen /Schwarzwald
Germany
Tel: +49 (7724) 89 90
Fax: +49 (7724) 89 91 01
email: info@schmidt-feintechnik.de

Supply source 8

Plastic test rods, galvanised small plastic plates
(Kunststoff-Prüfstäbe, galvanisierte Kunststoff-
plättchen)
Kunststofftechnik Buzzi GmbH
Vor Heubach 4
77761 Schiltach
Germany
Phone +49 (7836) 96 830
Fax +49 (7836) 96 832
email: info@kst-buzzi.de

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und Waschmittel e.V.
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