

IKW Recommendation for the Quality Assessment of the Product Performance of All-Purpose Cleaners 2014

German Cosmetic, Toiletry, Perfumery and Detergent Association (IKW)*

Foreword

1. Remit

IKW member companies make their expert knowledge of the products they manufacture available to the general public; this is done in the form of quality assessment recommendations. These are intended to enable a qualified testing of the products by the manufacturers themselves and by test institutes. Quality characteristics are described that need to be fulfilled by the products concerned in order to achieve the effects expected by consumers and manufacturers.

2. Environment

Companies working within the framework of the IKW want optimal quality standards for their products. Their aim is a consistent orientation to sustainability as a guiding principle, preparing to successfully face the future in a constantly changing world. This commitment to sustainability as a guiding principle is built up on experiences expressed in numerous exemplary initiatives. Taking as starting points the Declaration of Rio 1992, »92+10« of Johannesburg and the Agenda 21, sustainability is understood as a balanced linking of economic, social and ecological aspects, with a view to meeting the needs of the present without compromising the ability of future generations to meet their own needs.

With this in mind, quality assessment recommendations help to encourage company staff to act responsibly toward humans and the environment in product development and manufacture. They also serve consumers who can expect efficient, safe and environmentally sound products.

3. Assessment of Test Results

The recommendations describe which qualities are relevant to a given product and how such qualities can be measured. It should be noted that every finished product has a certain efficacy spectrum in its intended use; this spectrum is largely determined by consumer expectations as to each individual quality characteristic – so that in each product some characteristics are deliberately emphasized while others will be less important. Moreover the desired combination of product properties is subject to constant change, depending on the latest technical possibilities and new consumer habits.

Quality assessment recommendations must not impair such developments. Consequently for each product only one overall result is valid to determine whether the product meets the quality recommendations or not. Emphasis on isolated test criteria is not admissible and may be misleading.

4. Requirements

With regard to composition, packaging and labelling, inter alia, the following statutory requirements must be observed in their existing versions or to the extent that they still apply, respectively:

- German code on foodstuffs, consumer items and animal feed (Lebensmittel-, Bedarfsgegenstände- und Futtermittelgesetzbuch – LFGB)
- German chemicals act (Chemikaliengesetz – ChemG)
- German dangerous substances ordinance (Gefahrstoffverordnung – GefStoffV)
- German detergents and cleaning products act (Wasch- und Reinigungsmittelgesetz – WRMG)
- Detergents Regulation (EC) No 648/2004
- German ordinance on pre-packaged products (Fertigverpackungsverordnung – FPV)
- German ordinance on the transport of dangerous goods by road (Gefahrgutverordnung Straße – GGVS)
- German ordinance on the transport of dangerous goods by rail (Gefahrgutverordnung Eisenbahn – GGVE)

Voluntary Agreements:

- Ban of chlorinated organic solvents, from 1 January 1988
- Ban of musk xylene, from 31 December 1993
- Ban of alkyl phenol ethoxylates (APEO), from 14 January 1986
- Ban of EDTA
- Ban of triclosan

1. Introduction

All-purpose cleaners, as well as hand dishwashing products and sanitary cleaners (bathroom and toilet), are the most frequently used cleaning products in households. They are usually applied in diluted form to clean floors and surfaces (large surface applications) or they are used as concentrated products to remove persistent soiling and dirt stains (selective application).

All-purpose cleaners are preparations consisting of various surfactant mixtures, water soluble solvents and complexing agents. They also contain additives such as perfumes and colourants as well as preservation auxiliaries. Formulations are available as standard products and/or concentrates. Usually, formulations are neutral to alkaline. These recommendations are for such products.

Consequently for the quality assessment of such widely marketed and much observed products a straightforward, reproducible and practice-orientated test method is desirable, both in external comparative testing and in product development. For developing such a method, a working group composed of experts from companies manufacturing cleaning agents and from test institutes was constituted within the German Cosmetic, Toiletry, Perfumery and Detergent Association (IKW).

2. Aim

The mandate of the working group was to update the IKW recommendation for the quality assessment of the product performance of all-purpose cleaners dating back to the year 2004 (I). The updated recommendation wants to enable qualified testing of the products by the manufacturers themselves and by independent test institutes.

The update needs to meet the following criteria:

- Practice relevance
- Reproducibility
- Differentiation between products
- Straightforward implementation, to the highest degree possible

3. Strategy Followed by the Working Group

The work was based on the recommendation for the quality assessment of the product performance of all-purpose cleaners of 2004 (I) and on the methods described in that recommendation.

3a) Product Performance: Cleaning Performance

The methods, as described in the recommendation for the quality assessment of the product performance of all-purpose cleaners of 2004 (I), were updated. The modifications are described in the following.

Also in the present framework conditions it was once again noted that no differentiation was possible in diluted application. Therefore it is recommended to continue testing all-purpose cleaners, which are intended for diluted application, in undiluted form also in the future. By contrast, this method was found unsuitable for power cleaners intended to remove grease. For this reason, another recommendation is elaborated specifically for those products.

3b) Product Performance: Clear Drying and Streak Formation

In this method, scrubbing continues to take place with the diluted product on mirror tiles, and the scrubbing track is evaluated after drying in a comparison with water of defined hardness. This method for the determination of clear drying of all-purpose cleaners is not suitable for the testing of glass cleaners.

3c) Product Performance: Material Care

The evaluation of material care continues to rely on the stress cracking corrosion test with small plastic sticks made of different materials, based on German standard DIN 53449-3 (Testing of plastics; evaluation of environmental stress cracking (ESC); bent strip method) (II).

4. Test Principle

Product performance is determined by way of the following measuring results:

- Cleaning performance
- Clear drying/Streak formation
- Material care

For further characterisation, without assessment, the pH value and sensorial properties (fragrance, colour) are determined.

5. Description of Method

This method is not suitable for differentiating between special kitchen, grease, power or acid cleaners. It is also unsuitable

for comparing between cleaning products of different viscosity levels, because it puts products of higher viscosity at a disadvantage.

5a) Cleaning Performance in Concentrated Use

The test method to determine the cleaning performance of the concentrated product is based on a fat-dust soil dried and bonded over an extended period of time (III). This is a very persistent type of soil. Testing in diluted form has no informative value.

Preparation and Implementation

The test device is a multi-track scrub tester with cloth holder (1), preferably a Sheen 903 PG (2).

The fat-dust soil (III) consists of: (7)

- 75 % Peanut oil (e.g. Mazola)
- 23 % Kaolin 60609 (e.g. Fluka)
- 2 % Ruß (for example Gustav Grolman)

Preparation

Taking the peanut oil as a basis and using a propeller stirrer, kaolin and special black are stirred in one after the other, followed by stirring for 30 min. This type of soil must age for one month at room temperature in a closed vessel without influence of light, as it is too easy to remove if used immediately. For test purposes 20 % of the above soiling is diluted, under stirring, with 80 % isopropyl alcohol.

The Following Use Periods are Intended:

- Oil: Use at most within the minimum shelf-life; keep in a cool and dark place after opening.
- Soil stock solution: After 1 month of ageing, use is possible within 12 months (storage at room temperature); if used over longer periods the soil becomes too persistent.
- The isopropyl alcohol dilution can be used for 7 days with closed storage of the sprayable soiling solution.

Stirring Times:

- The freshly prepared stock solution of soil is stirred for 30 min with the propeller stirrer, as described above.
- Renewed homogenisation

of the stock solution of soil by stirring for one hour with the magnetic stirrer.

- Stirring time to produce the isopropyl alcohol dilution is 24 h, renewed homogenisation of the isopropyl alcohol dilution prior to each use by 30 min of stirring with the magnetic stirrer in a closed bottle.

Within one measuring series only soil from one batch and of the same degree of ageing can be used.

The diluted soil is sprayed with an airbrush or in screen printing in an even layer onto a floor tile (of white or very light colour, unglazed, of low porosity; e.g. 8) on a surface of 8 x 26 cm (208 cm²), using a stencil (Fig. 1). Suitable tiles need to fulfil the following criteria:

- The soil needs to adhere evenly on the tile.
- After 10 to 25 strokes a cleaning result of value 2 needs to be achievable with the standard cleaner; with water the test soil must not come off the tile at this number of strokes (cleaning result < 1).
- In this testing method, the test result needs to be reproducible in four tiles; the place of testing needs to be randomisable in validation.

Prior to soiling, the tiles must be wiped with alcohol and then rubbed dry; adhering wax must be removed. Important: each tile may be used only once.

The quantity of soil to be applied is 0.35 +/- 0.02 g per tile; it is determined by difference weighing on the tile. Scales used for this purpose must have a precision of +/- 0.01 g (Fig. 2). In screen printing 1.10 + 0.05 mg/cm² (0.23 + 0.01 g) are applied. Tiles printed upon in this process do not require reweighing.



Fig. 1 Application of test soil, using a stencil.
(Source: Werner & Mertz GmbH, Mainz)



Fig. 2 Weighing of tile with test soil.
(Source: Werner & Mertz GmbH, Mainz)



Fig.3 Application of test cleaner.
(Source: Werner & Mertz GmbH, Mainz)



Fig.4 Test apparatus during the scrubbing process. (Source: Werner & Mertz GmbH, Mainz)

using multi-track scrub testers, fourfold measuring is made with randomised placing (**Tab. 1**). Measuring takes place without additional bearing weights: the bearing mass (stamp, bar, stretching frame, cloth and 5 g of cleaning solution) should be between 350 g and 400 g (**Fig.4**).

A suitable number of strokes is determined in a pre-test in

order to have a clear differentiation; the scrubbing speed is 20 strokes/minute (1 stroke = one to-and-fro movement). The reference cleaner is adjusted as standard with at least 8 strokes (ideally 10–25 strokes) to cleaning value 2 (**Fig. 5**). After-treatment of tiles takes place immediately after cleaning with running cold water (moderate spray jet) with constant

After evaporation of the isopropyl alcohol (ca. 60 min) the soil is burnt on at 100°C over 24 h in the circulating-air drying cabinet (e.g. Heraeus type UT 6200 or Memmert ULE/SLE 800) where the plates are placed individually next to each other on the grates. In multi-layer drying cabinets, it is essential to leave sufficient space between the plates to enable an even air circulation. The temperature profile must be measured, and the charging process must always be performed evenly. After cooling down to room temperature the plates are stored for 24 h at room temperature for conditioning; then they can be used for up to 14 days if stored in an up-right position in the laboratory.

The preparation of these test plates is the crucial part of this method and requires special care, particularly in respect of temperature control and temperature constancy inside the hot cabinet.

The comparative assessment of the cleaning performance is made, using an automatic multi-track scrub tester, by scrubbing with a cloth onto which the test substance is pipetted (**Fig.3**).

Within one measuring series the multi-track scrub tester must not be changed.

The cloths, preferably article no. 02010100 by the company Fa. Wecovi (3), are selected by mean cloth weight +/- 1 g (e.g. 17–19 g/20–22 g/23–25 g uncut); cloths that display strong inhomogeneities against the light are sorted out. Homogeneous cloths of one weight range are cut, without any further preparations, to ca. 13 x 10 cm and used.

After inserting the cloth and attaching it, 5 ml of product are evenly pipetted on. When

Products A, B, C, W = water					
Track		1	2	3	4
Plate 1:	A	B	C	W	
Plate 2:	B	A	W	C	
Plate 3:	W	C	A	B	
Plate 4:	C	W	B	A	

Tab.1 Test set-up clear drying behaviour/streak formation; 3 products and water.

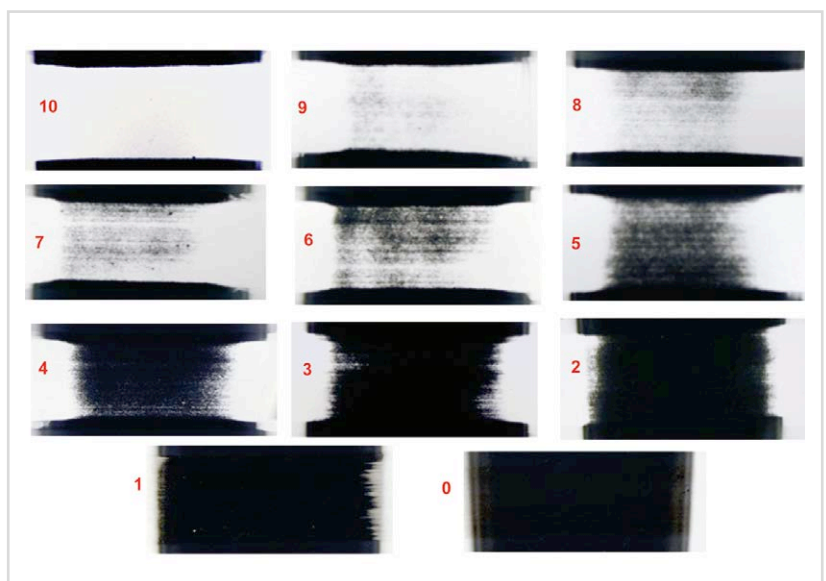


Fig.5 Assessment scale. (Source: Henkel AG & Co. KGaA, Düsseldorf)

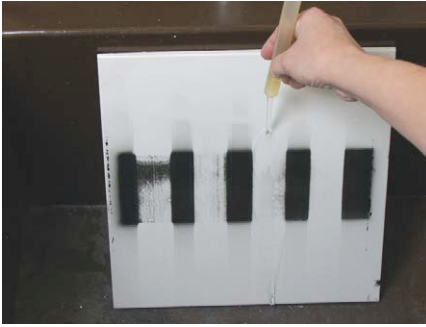


Fig. 6 Rinsing of tiles after the scrubbing process. (Source: Werner & Mertz GmbH, Mainz)

1. Stock solutions:

- Solution 1: 800 mmol/l NaHCO_3 (67.2 g/l);
- Solution 2: 154.2 mmol/l $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (38.0 g/l);
- Solution 3: 446.1 mmol/l $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ (65.6 g/l).

2. Preparation of water 16.8 °d:

50 ml each of solutions 1, 2, 3 are poured into a receptacle with 7 l of demineralised water and filled up with more demineralised water to 10 l. Prior to use of the synthetic water, the pH value is adjusted to 7.5 with HCl or NaOH.

Preparation Specification water 16.8 °d.

water hardness (**Fig. 6**). Plates dry standing upright at room temperature.

The assessment is made visually by way of inspection, in a comparison with an assessment scale (**Fig. 5**).

If the minimum number of strokes is not reached, the burn-on time should be extended by some hours. Should this not bring the desired result, there is the possibility of increasing the burn-on temperature in 5°C steps (to maximally 120°C). If this does not bring the desired result, either, the soil should be prepared once more with a different peanut oil.

Notes on the Implementation

The number of times scrubbed should correspond to the number of strokes that was determined in the pre-test with the standard cleaner (**Formulation**, page 6) (ideally between 10 and 25 strokes). If a test product achieves full cleaning before that number of strokes (ranks 9 to 10), the number of strokes is to be noted down; it constitutes the quality characteristic in the comparison with the other tested products. But this test is only valid if at least four strokes were necessary.

The assessment consists of the number of strokes and of the cleaning performance achieved with them.

Reproducibility

Reproducibility needs to be good as regards the ranking of different products. Obviously the absolute number of strokes per product or per plate varies.

Assessment of Cleaning Performance

The plates are inspected by at least 3, but preferably 5, experienced persons in an independent assessment, with no knowledge of the respective product.

A statistical evaluation, stating the error margin, needs to be carried out.

Determination of Sequence and Significance Check

A significance check is to be carried out. Depending on the chosen test design and the data situation (comparison in pairs

of two products, multiple comparison of several products), several statistical tests are available for the evaluation of results (cp. **I**).

Description of the Result for Cleaning Performance

The result may be described only in connection with relevant test conditions, because the achieved cleaning performance depends on the number of times scrubbed. Cross-comparisons with grades from different tests are not permissible.

5b) Clear Drying/Streak Formation

All purpose-cleaners are used most frequently in diluted form. Therefore it is important to achieve drying without residues to the largest extent possible.

Preparation and Implementation

The test device is a multi-track scrub tester with cloth holder (1), preferably a Sheen 903 PG (2).

Products are tested on mirror tiles (9): In preparation of the test they are wiped with ethanol and then rubbed dry.

Cleaners to be tested are, according to manufacturer's instructions, diluted with water 16.8°d German hardness (**Preparation Specification**) and homogenised. Cleaner dilutions may be used at most for one working day. Prior to further use they must be again homogenised.

The comparative assessment of clear drying behaviour and streak formation is carried out using an automatic multitrack scrub tester, by scrubbing with a cloth onto which the test substance is pipetted.

The cloths, preferably article no. 02010100 by the company Wecovi (3), are selected by mean cloth weight +/- 1 g (e.g. 17–19 g/20–22 g/23–25 g uncut). Cloths that display strong inhomogeneities against the light are sorted out. Then the cloths are washed once with liquid detergent and twice without (programme hot wash/coloured laundry 60°C, initial water hardness constant, ideally 14–18°d) (also see description of results of clear drying/streak formation). The liquid deter-

Ingredient	Conc. (%)	% tel quel	% Active substance
Water, fully demineralized	100	ad 100.00	100.00
Sodium hydroxyde, aqueous solution	45	1.74	0.78
Alkylbenzene sulfonic acid C10-13	ca. 97	6.00	6.00
Fatty acid C12-18 (e.g. Edenor K12-18)	100	1.00*	1.00*
Fatty alcohol ethoxylate C 12-18, 7 EO (e.g. Dehydol LT 7)	100	4.00	4.00
Fatty alcohol ether sulfate C12-14, 2 EO, Na salt (e.g. Texapon N70)	70	4.29	3.00
Methylisothiazolinone/Benzisothiazolinone (e.g. Acticide MBR1)	14	0.1	0.014

Preparation: Take approx. 3/4 of the water as a basis, add NaOH, add alkylbenzene sulfonic acid and stir for at least 15 min. Add fatty acid and stir for at least 10 min. Add fatty alcohol ethoxylate and stir for ca. 10 min. Add fatty alcohol ether sulfate and stir until fully dissolved. Control pH value (target value: 9.3 +/- 0.3); if this target is not met, adjust with NaOH. Add preservative, add remaining water, stir for 10 min.

Appearance: yellowish, clear

Formulation IKW standard all-purpose cleaner. (* Spelling error corrected on February 6, 2017)

Ring test with 6 products and water on a mirror tile, visual assessment by ranking. Only fill-out the yellow area with rank scores 1 (best) to 4 (worst) per tile. In case of equal performance divide scores over products.

Laboratory: _____ Date: _____ Evaluator 1: _____

Mirror Tile	Track 1		Track 2		Track 3		Track 4		Total Rank Scores*
	Product	Rank	Product	Rank	Product	Rank	Product	Rank	
1	7		6		5		3		
2	4		7		6		1		
3	1		2		7		5		
4	6		1		3		2		
5	2		3		4		7		
6	3		5		1		4		
7	5		4		2		6		
8	7		6		5		3		
9	4		7		6		1		
10	1		2		7		5		
11	6		1		3		2		
12	2		3		4		7		
13	3		5		1		4		
14	5		4		2		6		

*should add-up to 10 for each separate tile

Totale Rangbewertungen Evaluator 1

	Mirror Tiles 1 to 7	Mirror Tiles 8 to 14	Total
Product 1			
Product 2			
Product 3			
Product 4			
Product 5			
Product 6			
Product 7			
SUM**	70	70	140
**should add up to:			

Tab.2 Test design for randomised placing/evaluation 6 products and water: Clear drying/streak formation of all-purpose cleaners: evaluation chart for rank scores.

gent used should be clear. Dosage of the detergent for »normally soiled loads« according to manufacturer's instructions. Subsequently the cloths are dried for at least 18 h at room temperature, hanging down vertically without clothes pegs. After complete drying the cloths are cut – e.g. with the help of a stencil – to 13 x 10 cm, once more selected by mean cloth weight +/- 0.1 g and used.

After inserting and attaching the cloth, 5 ml of diluted product (use concentration as recommended on the label) are evenly pipetted onto the cloth. When using multi-track scrub testers, measuring is made with randomised placing (Tab.1), with water 16.8°d simultaneously running to enable a comparison (Tab.2). Measuring takes place without additional bearing weights. The own weight of the cloth holder is 350–400 g.

5 strokes are performed, the scrubbing speed is 20 strokes/minute (1 stroke = one to-and-fro movement). There is no after-treatment of the tiles. The subsequent drying time is 1 hour. The evaluation can be made up to 24 h after drying. The visual inspection of the tiles takes place after complete drying, and the residues on the plates are assessed applying a scale of grades, ranging from 0–4 (0 = no residues; 4 = very strong residues). Experience shows that in a direct comparison drop residues are assessed more negatively than streaks (Fig. 7).

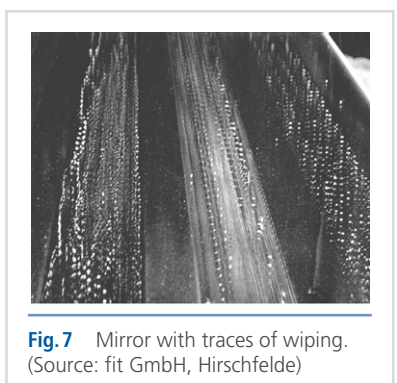


Fig. 7 Mirror with traces of wiping. (Source: fit GmbH, Hirschfelde)

The inspection is made against a homogeneous dark or black background along the scrubbing streak, with the starting point upward (Fig. 8).

For better visibility it might be necessary to tilt the tile sideways. Assessment in a light box with halogen spot lights or a standard light box with D 65 light source has proven its worth.

Assessment Criteria:

- Streaks (optical noticeability: transparent/non-transparent), density
- Drops (number, size, optical noticeability: transparent/non-transparent)

with an assessment scale ranging from 0 = no residues, 1 = low, 2 = medium, 3 = strong to 4 = very strong. This enables a better differentiation of similar products.

One overall grade each needs to be determined for streaks and drops, respectively. A product is to be assessed more positively if it leaves streaks rather than drops. In the assessment of residues, one third of the assessment should

refer to streak formation while two thirds should refer to drop formation.

Assessment of Clear Drying/Streak Formation

The inspection of the tiles is made by at least 3, but preferably 5, experienced persons in an independent assessment, with no knowledge of the respective product.

Determination of Sequence and Significance Check

Regarding assessment, see description under 5a.

Description of Result of Clear Drying/Streak Formation

The result may be described only in connection with the relevant test conditions. Cross-comparisons with grades from different tests are not permissible.

Note: This method is not suitable for the assessment of glass or bathroom cleaners.

5c) Material Care

Stress cracking corrosion test with small plastic sticks based on German standard DIN 53449 T 1-3 (II).

A non-rusting steel pin (dowel pin DIN 6325 Tol.: m6 3x10) is pressed in test sticks into which a hole has been drilled (drill 2.7 and reamer 2.9 H7), using a device e.g. rack and pinion press type 5 (4, 5). The pin must be inserted vertically.

The test sticks are dipped briefly in the concentrated cleaner to be tested. Adhering cleaner is not removed. Dipping is repeated after 24 h. Every 24 h the dipping process is repeated, in total 5 dipping processes. The occurrence of stress cracks is evaluated after defined periods of time: 4 h, 1 day, then every 24 h and documented in tabular form. The test ends after 14 days (see page 10).

The Following Plastics are Tested (6):

- ABS = Acrylonitrile butadiene styrene
Novodur P2MC
- PC = Polycarbonate Makrolon 3103 FBL
55/115
- PMMA = Polymethyl methacrylate
Plexiglas 8N
- POM = Polyoxymethylene Hostaform 13031 XAS
- POM = Polyoxymethylene Hostaform
C 9021 GV (= glass fibre reinforced) 1/30

The selected materials may undergo changes and can be adapted to new trends. In

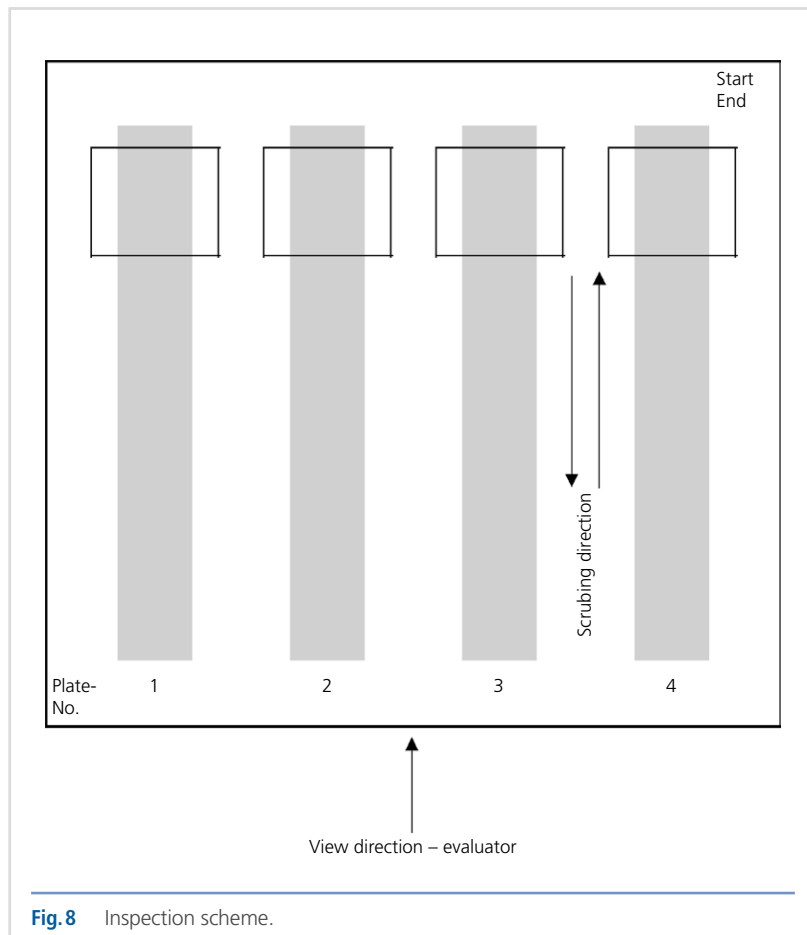


Fig.8 Inspection scheme.

the following, an explanation of the assessment (cp. Fig. 9):

- 1 = No change
- 2 = Start of crack/Small crack
- 3 = Continuous crack
- 4 = Burst

Assessment

With a recommended cleaner, after 7 or 14 days, respectively, no attack should be visible on the surfaces. If there are visible traces on the surface, it must be found out whether they can be removed by polishing with a soft cloth. If those traces can be removed with a soft cloth, there is no attack on material.

Assessment of Material Care

Test sticks are inspected, in an independent appraisal, by an experienced person with no knowledge of the respective product. The appraisal of material care should be performed and assessed separately for each tested plastic material.

Description of the Result for Material Care

The result may be described only in connection with relevant test conditions. Cross-comparisons with grades from different tests are not permissible.

5d) Product Characterisation

Documenting the external condition, colour, odour, consistency and pH value is recommended, but such documentation is not part of the quality assessment.

Supply Sources

- (1) Cloth holder – Tuchhalter: Schlosser-Service Peter Krahe
Grabenstrasse 43, 52249 Eschweiler, Germany
Tel: +49 170 2949368, Fax: +49 2473 939298
- (2) Multi-track scrub tester Sheen Wet Abrasion Scrub Tester Ref. 903/
PG: Sheen Instruments Ltd., Unit 4, St. Georges Ind. Est.,
Richmond Road, Kingston KT2 5 BQ, Great Britain
Tel: +44 208 5414333, Fax: +44 208 5493374
- (3) Cloths – Tücher Article no. 02010100: Fa. Wecovi
Am Hasenberg 52, 46446 Emmerich, Germany
Tel: +49 2822 688-46 or -47
- (4) Dowel pin – Zylinderstift DIN 6325, 3 x 10 Tol: m6, Article no. 2520310, Fa. Würth, Reinhold-Würth-Strasse 12-17, 74650 Künzelsau, Germany, Tel: +49 7940 15-0, Fax: +49 7940 15-1000
Email: info@wuerth.com
- (5) Rack and pinion press type 5 – Zahnstangenpresse Typ 5
Schmidt Technology GmbH, Feldbergstrasse 1, Postfach 14 65 78112 St. Georgen/Schwarzwald, Germany
Tel: +49 7724 899-0, Fax: +49 7724 899-101
Email: info@schmidttechnology.de
- (6) Test plastic sticks – Kunststoff-Prüfstäbe Kunststofftechnik Buzzi GmbH, Vor Heubach 4, 77761 Schiltach, Germany
Tel: +49 7836 96 830, Fax: +49 7836 96 832
Email: info@kst-buzzi.de

Time window	Appraisal	Cleaner
0-7 Days	1	Recommended
0-7 Days	2	Suitable with some reservations
0-7 Days	3, 4	Not suitable
8-14 Days	1	Recommended
8-14 Days	2	Suitable
8-14 Days	3	Suitable with some reservations
8-14 Days	4	Not suitable

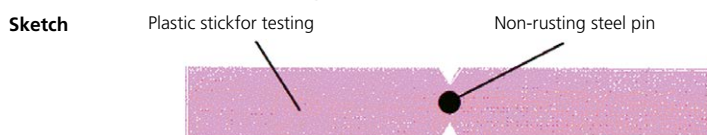


Fig.9 Assessment of stress cracking corrosion. (Source: SGS INSTITUT FRESENIUS GMBH, Taunusstein)

(7) Inputs for test soil and standard cleaner:

- Acticide MBR1:
Thor GmbH
Postfach 19 09
67329 Speyer, Germany
Tel: +49 6232 636-0
Fax: +49 6232 636-179
Email: info@thor.com
- Peanut oil e.g. Mazola:
Unilever Deutschland GmbH
Strandkai 1
20457 Hamburg, Germany
Tel: +49 40 3493-0
Fax: +49 40 3493-3595
- Kaolin 60609
Sigma-Aldrich Chemie GmbH
Eschenstrasse 5, 82024 Taufkirchen bei München
Tel: +49 89 6513-0
Email: deorders@eurnotes.sial.com
www.sigmaldrich.com/germany/Deutsche-Standorte.html
- Soot (Carbon Black)
Gustav Grolman GmbH & Co. KG
Fuggerstrasse
41468 Neuss, Germany
Tel: +49 2131 9368 01
Fax: +49 2131 9368-161
- Sodium hydroxide, aqueous solution
BASF SE
Ludwigshafen
Tel: +49 621 60-0
- Alkylbenzene sulfonic acid, C10-13
Impag Import GmbH
Fritz-Remy-Strasse 25
63071 Offenbach, Germany
Tel: +49 69 85000 80

- Fatty acid, C12-18: Edenor K12-18)
Fatty alcohol ethoxylate, C12-18, 7 EO: Dehydol LT 7,
Fatty alcohol ether sulfate, C12-14, 2 EO, Na-salt: Texapon N70,
all:
BASF SE
Postfach 13 01 64
40551 Düsseldorf, Germany
Tel: +49 211 7940-0

(8) Floor tile – Fußbodenfliese Villeroy + Boch 3135, 30 x 30 cm:

Villeroy & Boch AG
Hauptverwaltung
Postfach 1120
66688 Mettlach, Germany
Tel: +49 6864 81-0

(9) Mirror tile – Spiegelfliese 30 x 30 cm:

Do-it-yourself store quality

Literature

- I *Andreas Fitzner, Uwe ABmus,*
SÖFW-Journal/131/9-2005, pages 54–66.
- II Beuth Verlag GmbH, Burggrafenstraße 6, 10787 Berlin; www.beuth.de
- III La Rivista Della Sostanze Grasse, Vol. LXVI, Gennaio 1989, pages 21-24.

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Bereich Haushaltspflege
Mainzer Landstraße 55
60329 Frankfurt am Main | Germany
www.haushaltspflege.org

Test Design for Stress Cracking Corrosion

Monday	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday	Monday
4 h	1 d	2 d	3 d	4 d	7 d	8 d	9 d	10 d	11 d	14 d

H ₂ O	1									
	2									
	3									
	4									
	5									
	6									

Cleaner	1									
	2									
	3									
	4									
	5									
	6									

Cleaner	1									
	2									
	3									
	4									
	5									
	6									

Material:

- 1 Plexiglas
- 2 Novodur PL MC
- 3 Makrolon PC 3103
- 4 Hostaform 13031 AS
- 5 Hostaform 9021 GV 1/30

Evaluation:

- 1 – no attack
- 2 – slight cracks
- 3 – continuous crack
- 4 – burst