



Studies on the determination of soiling and cleaning behaviour of leather.

Part 2: Inter-laboratory tests with specific reference concerning the cleaning step

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(On behalf of the VGCT Commission "Leather Testing and Assessment")

*In Part 1 of this study, published in **World Leather February/March 2016**, inter-laboratory tests enabled a closer view on the test procedures on soiling and cleaning behaviour of leather and their impact on the final result. These evaluations allowed the following conclusions:*

- *When soiling, one of the cycle number variants could be renounced because the difference between 128 and 1,000 cycles lies nearly constant at a half grey scale rate.*
- *The effect of embossing observed in practice was also confirmed where a higher soiling is created at the tips of the profiles.*
- *Heat storage after soiling generally slightly impaired the cleaning result.*
- *Cleaning intensity differed in the participating laboratories. This caused a careful revision of this procedural step (this is detailed in Part 2 of this paper).*
- *The colorimetric assessment of staining (ISO 105-A04) deviated systematically and significantly from the other assessment variants. In comparison, the colorimetric assessment of change in colour (ISO 105-A05) lay about 0.5 – 1.0 rates lower.*
- *The assessment of change in colour in the upper range (starting from rate 3 – 4) proved to be more sensitive than that of staining.*
- *The visual assessment of staining was subject to greater variations than that of change in colour.*
- *The comparison of all assessment variants shows the necessity to critically examine procedural steps described in particular testing procedures. These should be revised where required.*

In this context, single procedural steps were examined more closely with regard to their impact on the final result of the test. Accordingly a mechanical cleaning step was developed, optimised and validated.

The investigation

From the first stage of the investigations, it became obvious that the cleaning stage in the procedures used for assessing soiling and cleaning behaviour of leathers was problematic. Optimisation was required as great differences in the intensity of cleaning pigmented leather surfaces between laboratories were observed. The description of the requirement for manual cleaning is difficult, and offers scope for improved design to the performer.

Procedures used in the investigation

Five laboratories participated in the inter-laboratory trial for validation of a rationalised mechanical cleaning step. Except for the cleaning step, all experiments were performed according to VDA 230-212. In the test specimens (*diameter 150mm*) of two leather types were used:

Sample 1: fine embossment, grey,

Sample 2: coarse embossment, beige.

Soiling of all specimens was performed by Laboratory 4. Here, 1,000 cycles were effected with soiling cloth EMPA, with 128 rubs over the whole surface of the specimen before storing side by side in the dark in standard atmosphere (23°C, 50% *relative humidity*). Subsequently, the specimens were airtight packed and shipped to the other participating laboratories.

For each leather type, the laboratories received two specimens (*P1, P2*) that were then stored for 24 hours in the dark under standard climate conditions before cleaning.

Afterwards, the soiled specimen was stuck to a suitable board by means of a double-faced adhesive tape. This composite was fixed in the rub fastness tester according to ISO 11640 without stretching.



On every specimen the leather was cleaned along two rub tracks (*duplicate determination*) with a 0.5% Texapon solution (*sodium lauryl ether sulphate solution, CAS-no. 9004- 82-4*). This is shown as *Panel 1*:

For each rub track, five felts were required. Before using, four of the felts (*F1 to F4*) were wetted with Texapon solution and then squeezed so that an amount of 1.0g cleaning solution remained in the felt. The fifth felt (*F5*) was used in the dry state.

The assessment of the rub tracks was performed both visually according to ISO 105-A02, and instrumentally according to ISO 105-A05 after drying (24 hours, standard climate) using the unsoiled edge region of the specimen as reference.

After drying the felts were assessed both visually according to ISO 105-A03, and instrumentally according to ISO 105-A04 against a felt pre-treated with Texapon solution (1.0 g/felt) and dried as reference. The dry felt F5 was assessed against an original dry felt.

Assessment of results

As stated, with the intent to minimise and even eliminate variations within the soiling step, the soiling of all specimens was performed in Laboratory 4. In this case, the number of assessment variants was reduced, being a deviation from the original inter-laboratory test on soiling and cleaning behaviour.

The results of two leather specimens taken from both Samples 1 (*fine embossment, grey*) and Sample 2 (*coarse embossment, beige*), which were then subsequently tested in five of the participating laboratories, are summarised respectively in *Panels 2* and *3*.

This indicated that the cleaning step was reasonable when performed in this manner as the results became more consistent. Only Laboratory 1 shows a systematic deviation, but, however, the assessments from this laboratory were generally more severe than the other participants. The cause for this deviation could lie in cleaning performance (*felts F1 and F2 removed less dirt*) as well as in assessment. This still has to be elucidated.

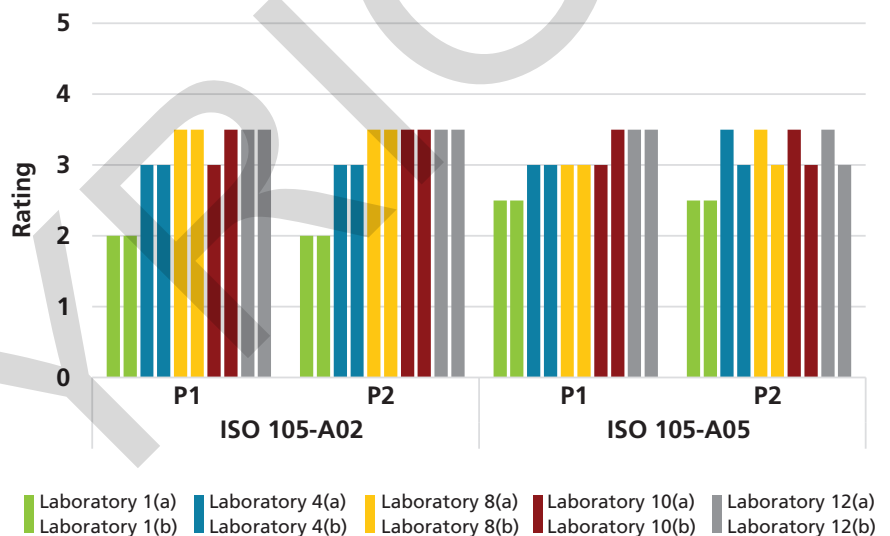
The felt assessment for the beige, coarse embossed leather as assessed for surface cleaning in *Panel 2* is summarised in *Panel 4*.

The felt assessment for the grey, finely embossed leather as assessed for surface cleaning in *Panel 3* is summarised in *Panel 5*.

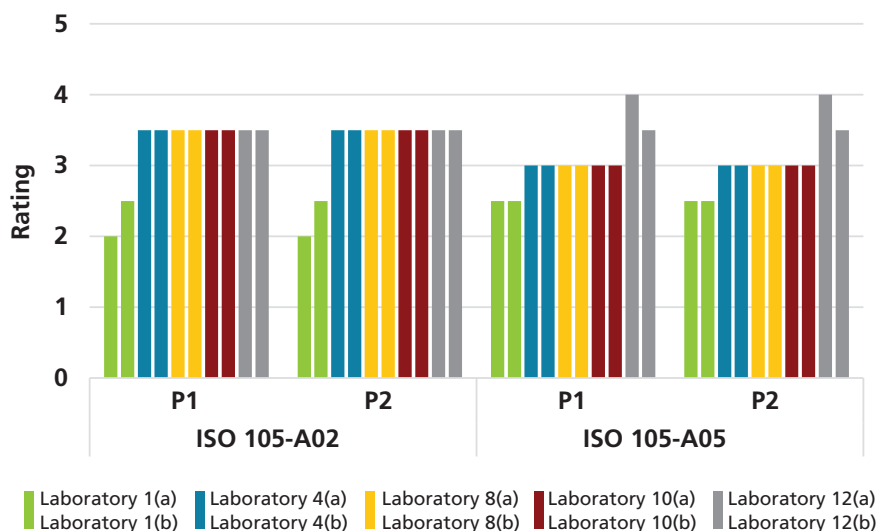
Panel 1: Rub tracks after effected cleaning. Leather Sample 2 (beige) with coarse embossment.



Panel 2: Assessment of cleaned surfaces of the grey leather. Sample 1 (grey) with fine embossment. (Reference: Panel 4).



Panel 3: Assessment of cleaned surfaces of the beige leather. Sample 2 (beige) with coarse embossment. (Reference: Panel 4).





Panel 4: Assessment of the grey leather felts (ISO 105-A03, ISO 105-A04) used for cleaning. Sample 1 (grey) with fine embossment. (Reference: Panel 2).

Lab	Grey scale rates of felts after 10 cycles																			
	A03										A04									
	F1		F2		F3		F4		F5		F1		F2		F3		F4		F5	
	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
1(a)	3.5	3.5	3.5	3.5	4	4	4	4	4.5	4.5	3.5	3.5	3.5	3.5	4	3.5	4	3.5	4.5	4
1(b)	3.5	3.5	3.5	3.5	4	4	4	4	4.5	4.5	3.5	3	3.5	3.5	4	4	4.5	4	4.5	4.5
4(a)	3	3	3.5	4	4.5	4.5	4.5	4.5	4.5	4.5	3	3.5	3.5	4	4.5	4.5	4.5	4.5	4.5	4.5
4(b)	2.5	3	3.5	4	4	4	4.5	4.5	4.5	4	3	3.5	3	4	4.5	4.5	4.5	4.5	4.5	4.5
8(a)	3	3	4	4	4.5	4.5	4.5	4.5	4.5	4.5	3	3.5	4	4	4	4.5	4.5	4.5	4.5	4.5
8(b)	3	3	3.5	3.5	4	4	4	4	4.5	5	3	3	3.5	4	4.5	4.5	4.5	4.5	4.5	4.8
10(a)	3	3	3.5	3.5	4	4.5	4.5	4.5	4.5	4.5	3.5	3	4	4	4.5	4	5	4.5	5	4.5
10(b)	3	3.5	3.5	4	4	4.5	4.5	4.5	5	4.5	3.5	3.5	4	4.5	4.5	4	4.5	4.5	5	4.5
12(a)	2.5	2.5	3	3	3.5	3.5	4	4	4	4.5	3	3	3.5	3.5	4	4.5	4.5	4.5	4.5	4.5
12(b)	2	2.5	3	3	3.5	3.5	4	4	4	4	2.5	2.5	3.5	3.5	4	4	4.5	4.5	4.5	4.5

Panel 5: Assessment of felts (ISO 105-A03, ISO 105-A04) used for cleaning the beige leather. Sample 2 (beige) with coarse embossment. (Reference: Panel 3).

Lab	Grey scale rates of felts after 10 cycles																			
	A03										A04									
	F1		F2		F3		F4		F5		F1		F2		F3		F4		F5	
	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
1(a)	1	1	1.5	1.5	2.5	3	3	3.5	3.5	4	1.5	1	2	1.5	3	3	3.5	3.5	3.5	4
1(b)	1	1	1.5	1.5	2.5	3	3	3.5	3.5	4	1.5	1	2.5	1.5	3	3	3	3.5	3.5	4
4(a)	2.5	2.5	3	3.5	4	4	4.5	4.5	4.5	4.5	2.5	2.5	3.5	3.5	4.5	4.5	4.5	4.5	4.5	4.5
4(b)	2.5	2.5	3	3.5	3.5	4	4	4.5	4	4.5	3	2.5	3.5	3.5	4.5	4.5	4.5	4.5	4.5	4.5
8(a)	2.25	3	3.5	3.5	4	4	4	4.5	4.5	4.75	2.5	2.5	3.5	4	4.5	4.5	4.5	4.5	4.5	4.5
8(b)	2.25	2.5	4	3.5	4	4	4	4	4.5	4.25	2.5	3	4	4.5	4	4.5	4.5	4.5	4.5	4.5
10(a)	2	2	3	3	3.5	4.5	4.5	4.5	5	4.5	2	2	3	3.5	4	4.5	4.5	4.5	5	5
10(b)	2	2	3	2.5	3.5	4	4.5	4	5	5	2	2	3.5	3.5	4	4.5	4.5	4.5	5	5
12(a)	1.5	1.5	2.5	2.5	3.5	3.5	4	4	4	4	2	2	3	3	4	4	4.5	4.5	4.5	4.5
12(b)	1.5	1.5	2.5	2.5	3.5	3.5	4	4	4	4.5	2	2	3	3	4	4	4.5	4.5	4.5	4.5

In each case the first two felts used (F1 and F2) took up the highest amounts of dirt, the following felts (F3 and F4) produced lower, or even no changes.

Findings from the investigation

Over and above the conclusions from Part 1 of the studies, the inter-laboratory test results demonstrated that meaningful

advantages were gained by unifying and objectifying the cleaning step. An additional amount of work was required, but the results that were obtained were fully justified.

On this basis it is advisable to adopt mechanical cleaning in the course of the revision of the standards ISO 105-A02 and ISO 105-A05. ©

Acknowledgements

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