BÜFA

*New chemistry.*

# Spotting guide

Professional stain removal

Cleaning

# Introduction

Professional stain removal (spotting) means cleaning high quality textiles without damaging the fibres. Stain removal serves to maintain the value of the garment and is carried out before or after the actual cleaning of the textile. The challenge is to harness the power of chemistry while respecting the durability of dyes and fibres. Fabric knowledge, process engineering and chemical expertise are essential.

# 1. Basic chemical knowledge

## a) Surfactants

Surfactants are chemical compounds that reduce surface tension and are therefore used as washing-active substances.

Surfactants always consist of a hydrophobic part (water-repellent) and a hydrophilic part (water-attracting). This combination enables the stains to be removed from the textile.

**Surfactants are classified according to the charge properties of their hydrophilic part:**

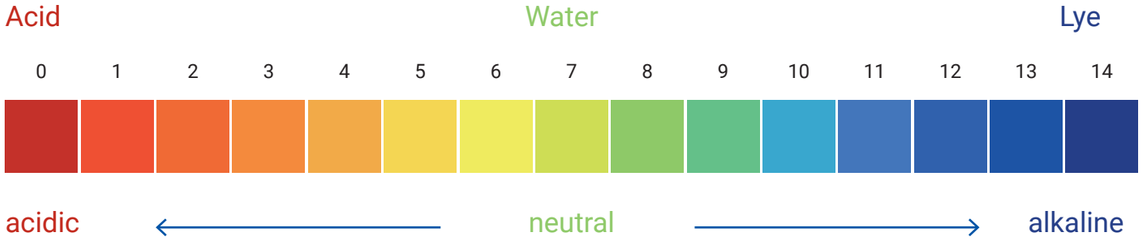
- anionic surfactants (negative charge)
- cationic surfactants (positive charge)
- non-ionic surfactants (no charge)
- amphoteric surfactants (positive and negative charges)

Only anionic surfactants are used in spotting and brushing agents anionic surfactants are used as they have the highest water-binding and dirt-carrying capacity. Due to their identical negative charge to the textile, mutual repulsion takes place and greying of the textile is prevented.

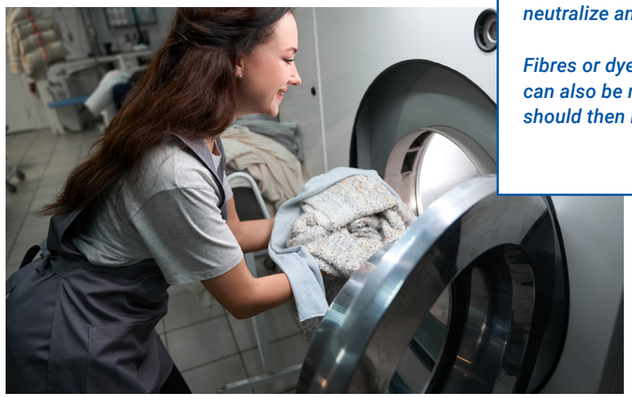
For this reason, never use a cationic product with a positive charge (e.g. cationic detergent) for pre-brushing. Anionic detergent may also be unsuitable for this purpose if they contain certain finishes or antistatic agents that can also be absorbed by the fabric and cause greying.



## b) pH values




The pH value (=describes the H+ concentration in an aqueous solution, oxonium) is expressed on a scale of 0-14 and gives an indication of the strength of acidic and alkaline solutions.



***When spotting, care must be taken to ensure that alkaline and acidic products are rinsed out after each application, otherwise the products will neutralize and no longer be effective.***

***Fibres or dyes that are sensitive to acids or alkalis can also be neutralized in this way. The product should then be rinsed out with water.***

# 2. Knowledge of goods

## a) Fiber types

The following fiber types are distinguished:

| Natural | | | | |
|---|---|---|---|---|
| **Plant-based** | Seed fiber:<br>Cotton | Stem fibers:<br>Flax, linen, hemp, jute, ramie | Leaf fibers:<br>Manila, sisal | Fruit fibers:<br>Kapok, coconut |
| **Animalistic** | Sheep wool:<br>Merino, crossbred, cheviot | Camel hair:<br>Camel, llama, alpaca, vicuna, guanaco | Goat hair:<br>mohair, cashmere, tibet | Silk:<br>Mulberry, tussah |
| **Mineral** | Asbestos, glass fibers, metal fibers, carbon fibers | | | |

| Chemisch | |
|---|---|
| **Cellulose** | Cupro, viscose, modal, acetate, triacetate |
| **Synthetic** | Polyamide (PA)<br>Polyester (PES)<br>Polyacrylic (PAC)<br>Polyvinyl chloride (PVC)<br>Polyurethane (PU)<br>Polypropylene (PP)<br>Elastane (EL) |

## b) Fiber detection

Fibers can be detected by visual/haptic assessment (visual and grip test) or by a burn test.

For a burning test, fibers are carefully plucked from the textile with the fingers and twisted into a thread structure. This is then burned with a gas lighter (match changes odor).

| Fiber type | Visual ad grip test | Burning test<br>Flame | Smell | Backlog |
|---|---|---|---|---|
| **Wool** | Weak to strong gloss \| Bounce elasticity \| Weak to strong crimp | Flickering, slowly burning | Burnt horn or hair | Black crumbs, grindable |
| **Cotton** | Slightly shiny to dull \| smooth and cool to the touch \| uncrimped | Luminous, fast burning | Burnt paper | White light ash |
| **Silk** | Raw and wild silk = lack-luster and brittle to hard to the touch \| Pure silk = noble sheen and soft, smooth, crispy feel | Almost flameless; aggravated silk (e.g. metal) flames up | Burnt horn or hair | Carbonized, friable melt \| aggravated silk remains scaffold |
| **Viscose** | Hardly possible, as the appearance of wool or silk should be conveyed | Bright, fast burning to hissing | Burnt paper | White fly ash |
| **Acetate** | Shine, feel and crease resis-tance similar to silk | Almost flameless, melting | Acetic acid | Small, tough, dripping lump |
| **Polyacrylic** | Handle similar to wool, but more brittle, low elasticity | Burns bubbling with soot formation | stinging | Slag-like, hard, not completely grindable ash |
| **Polyamide** | Handle similar to silk, smooth glossy surface | Does not burn, but melts | – | Glassy, hard and not grindable |

## c) Fiber characteristics

**Wool**
- Tends to felt; the finer the more sensitive
- Risk of felting increases in combination with water, alkali, temperature and mechanics
- Neutral water (pH 7) is already recognized as alkaline = risk of felting
- pH value is 5 and therefore reacts least in slightly acidic solutions
- Can absorb up to 30 % moisture from the air = risk of felting
- Can be easily molded at moist heat of 100 °C, thus “Shape ironing” possible
- Above 60 °C and at low humidity, the wool is damaged
- From 100 °C dry heat = loss of hygroscopically bound water = yellowing and heat creasing

**Cotton**
- Resistant to mechanical influences
- Increased resistance when wet
- Sensitive to acids and insensitive to alkalis
- Very sensitive to oxidative bleaching agents (chlorine bleach) and less sensitive to reductive bleaching agents
- Largely resistant to temperatures

**Silk**
- Similar to wool
- More sensitive to strong acids (destruction possible with metal-weighted silk) and more resistant to strong alkalis than wool
- Dyes often only have a limited fastness to use
- Extremely sensitive to abrasion; roughened areas appear as brightening; it is best to use a cloth instead of a brush
- Always carry out a hem test before spotting
- Moire effect is only water-resistant to a limited extent, which is why many moire fabrics (= fabrics with grain) cannot be wet-spotted
- Do not spot dark shining silk due to the poor color fastness, if possible, only dry clean or wet clean

**Viscose (regenerated cellulose)**
- More sensitive to acids and less sensitive to alkalis than cotton
- Viscose is more sensitive to mechanical stress than cotton
- Wet strength is the weakest point of viscose
- Sensitive to higher temperatures
- When bleaching agents are used, the same applies as for cotton
- With viscose fabrics with a linen structure, there is a risk of loss of gloss when spotting; if stain treatment is unavoidable, the mechanical stress should be kept to a minimum and the processing area should be dried
- Wet strength of viscose is low
- Higher temperatures during spotting should be avoided

**Acetate**
- Solubility test is possible, as fibers dissolve in acetone
- Not resistant to solvent-based spotting agents containing ketones such as acetone
- Sensitive to acids and alkalis
- Changes in surface structure due to simultaneous exposure to moisture and heat
- Less sensitive to oxidative bleaching agents than viscose or cotton
- Great care must be taken when using all spotting agents: Always carry out a hem test
- Be careful with the steam gun above 100 °C
- Do not iron above 120 °C and without pressure
- Acetate dyeings are also unresistant to perfumes and deodorants; any damage caused by this can no longer be removed

**Polyacrylic fiber**
- Largely insensitive to spotting agents
- Is a thermoplastic fiber, i.e. damp heat causes permanent deformation of the fiber
- Do not use a steam gun for spotting
- During the drying process, do not dry above 50 °C

**Polyamide fiber**
- Largely insensitive to spotting agents
- Dissolves in inorganic acids; be careful with rust removers
- Is thermoplastic, therefore deforms when exposed to high heat (burn holes due to ash!)
- Maintain sufficient distance with the steam gun

**Llama, cashmere, mohair, alpaca etc.**
- Comparable to sheep's wool
- The presence of moisture increases the risk of felting extremely

**Flax or linen, cupro, modal**
- Comparable to cotton

**Polyester**
- No adverse effects when spotting
- But be careful with the steam gun, high temperatures can cause fiber changes

# 3. Stain detection

## a) General

The first step is to look at the textile.
Light spraying with clear water
makes stain detection easier:

**Wet-bound stains**
absorb moisture
and appear darker.

**Grease-bound stains**
repel water and the
stains have contours
with some shine.

Stains that are pre-treated or already removed before cleaning or washing can no longer be fixed by the heat during the drying process.

## Further distinguishing features

**Edge shape**

**Edge shape**:
Sharp dark edges:
blood, protein, starch,
varnish, tar,
oil paint and glue

**Handle**

*Hard* **handle**:
Lacquers, oil paints
and adhesives

*Stiff* **handle**:
Blood, protein and
starch

**Colour**

**Colour:**
- *Yellow/brown stains:* tannin, coffee, tea, rust, tobacco juice, sugar, urine, mustard, perfume and blood
- *Blue stains:* ink, ballpoint pen, Indian ink, paint and berries
- *Green stains:* Dyes, ballpoint pen, ink, grass and India ink
- *Red stains:* ink, ballpoint pen, lipstick, nail polish, India ink, blood, red wine
- *Black or gray stains:* tar, road grime, graphite, fly dirt, grease and ink

**Odor**

**Odor:** If still perceptible, then typically with sweat, perfume, urine

**Position**

**Position:** Position on the textile (e.g. sweat stains, urine stains)

## b) Assignment

The number and type of stains is almost unlimited. Nevertheless, it is possible to group stains, whereby stains also occur across groups (e.g. coffee with milk and sugar), so that both alkaline and acidic spotting agents can be used.

### A) Stains containing starch and sugar

There are 2 types of sugar, which are slightly different in their chemical structure and properties:

- Monosaccharides (simple sugars) e.g. fructose and glucose
- Disaccharides (disaccharides) e.g. cane sugar, beet sugar and malt sugar
- When exposed to heat above 100 °C, they turn yellow and brown (caramelization).
- Monosaccharides can react chemically with protein fibers (wool, animal hair, silk). This results in the formation of a yellow-brown compound (melanoidin stain), which is promoted by ageing and the effect of heat above 50 °C and can sometimes no longer be completely removed.

Starch
- e.g. cereal, potato and rice starch
- Starch is a vegetable product and is found in many foods. Some starch is soluble in water, some can also swell in water.
- Starch stains do not cause any problems when spotting. In exceptional cases, however, enzymes must be used to break down difficult-to-remove starch into sugar.

Stain removal > always before cleaning with alkaline spotting agents such as Benzafix B or SpotX Blood. Acidic stain removers and heat (steam gun) fix the stains.

### B) Protein-containing stains

e.g. leftover food, blood, milk, egg

- Protein can be of plant or animal origin and is found in many foods. When fresh, protein is water-soluble and can be washed out.
- Protein stains coagulate after just 72 hours or when exposed to acid or heat above 40 °C.
- Old and coagulated protein stains must be broken down with the help of enzymes.
- The iron content of the blood can oxidize in old stains. In such cases, the stains should first be treated with a blood remover and the remaining iron content removed with a rust remover (rinse out alkaline blood solvent first).

Stain removal > alkaline spotting agents such as Benzafix B, SpotX Blood or Oldozyme AP. For blood also SpotX Rust

### C) Tannin stains

e.g. coffee, tea, wine, fruit juices, ice cream

- Tannin (tanning agent) is a compound that is able to convert animal skin into leather (tanning process). During this process, the tannin reacts chemically with the skin protein.
- Tannin stains are often difficult to recognize when fresh. Heat, strong alkaline solutions and ageing cause these stains to turn yellowish brown and become fixed to wool, silk and hair (protein fibers).
- To improve the spotting effect, work with a little heat (steam gun). Fixed stains can be removed by bleaching with sodium percarbonate.

Stain removal > Acidic spotting agents such as Benzafix C or SpotX Tan

### D) Grease and paint stains

e.g. tar, oil and varnish paints

- The stains in this group are insoluble in water and can only be dissolved in solvents.
- Pre-spotting is also recommended here, as otherwise the metal abrasion (pigment dirt) contained in the grease will be fixed to the fabric. Any metal abrasion remaining after pre-spotting can be treated with rust remover.
- In the case of oil and paint stains, only the binding agents are removed by dry-cleaning, but the pigments are fixed to the fabric. Dye residues can then only be removed by bleaching.
- Water-based paints that are fully polymerized after the water has evaporated, can no longer be removed with a spotting agent.
- When spotting paint stains, they should be soaked up or rinsed out with the help of a cloth. Care should be taken to ensure that sufficient distance is maintained when using the steam gun to avoid fixing the paint pigments due to excessive heat.

Stain removal > Spotting agent with organic solvents such as Benzafix A, SpotX Ink or SpotX Color. As a pure post-spotting agent, SpotX Resin can also be used. When using the steam, keep a sufficient distance to reduce the heat.

### E) Chemical and oxide stains

e.g. rust, medication

- The removal of these stains takes time (chemical reaction between the stain and the spotting agent depending on the time) and no mechanics.

Stain removal > Rust stains are removed with strongly acidic stain removers such as SpotX Rust.
If there are discolorations or stains from medication, these can be removed with SpotX Decol.

## c) Removal

Important basic rules that should be observed when removing stains:

- If alkaline and acidic spotting agents are used in succession, the former must be rinsed out so that their effects do not cancel each other out. This does not apply to dry spotting agents.
- Do not leave the pre-treated textiles for longer than 20 minutes. Very delicate textiles should be treated last so that they can be put straight into the machine afterwards.
- Turn the pre-treated damp areas inwards so that they do not come into contact with other items of clothing.
- Stains of unknown origin should never be treated first with hot steam or acidic spotting agents due to possible fixation.
- Stains of unknown origin should never be treated first with hot steam or acidic spotting agents due to possible fixation.
- The operator should do the utmost to remove the stain, but always avoid damaging the goods.

### Dissolve

The principle of dissolving a stain applies:

**The same dissolves into the same!**

The stain, once dissolved in water, will also dissolve again with suitable aqueous spotting agents.

- e.g. sugar dissolves with the aqueous SpotX Blood, but not with the solvent-based SpotX Resin; the stain that was once dissolved in organic solvents also dissolves again with suitable organic spotting agents.
- e.g. all-purpose adhesive dissolves in SpotX Resin, but not in SpotX Tan.
  A water-based stain (e.g. beer) can only be removed by a treatment with water (moisture) + brushing agent during textile cleaning.

### Softening

Softening of a stain is necessary if the stain is hard and adherent. Depending on the type of stain, softening can be carried out with a brushing agent such as Devantol Super or a spotting agent.

- e.g. tar > Benzafix A or SpotX Ink
- e.g. blood > Benzafix B or SpotX Blood

Basically, softening ensures that insoluble components of a stain (e.g. carbon pigments) are coated and thus made removable.

### Mechanical action

The mechanical action on the stain serves to crushing and removal of the stain substance.

The mechanical treatment of stains is carried out with spotting brushes and spatulas. It is used to break up stain substances so that the chemicals can work better.

### Degradation by enzymes

The treatment of stains with enzymes is used for stubborn starch and protein stains.

The stain is moistened and Oldozyme AP is applied undiluted to the stain area. Rinse with cold water after approx. 1 hour. Subsequent mechanical treatment is necessary.

Alternatively, the entire textile can be immersed in warm water (approx. 35 °C) and 5 ml Oldozym AP / l water for several hours. Then rinse well by hand and allow to dry.
Always wear gloves when working with enzymatic products. Acids and alkalis have a disruptive effect.

### Chemical conversion

A chemical conversion of the stains (time reaction) takes place e.g. with SpotX Rust = strong acid. In the event of colour changes, neutralize immediately with an alkaline product, e.g. SpotX Blood.

### Procedure for stains of unknown origin

Benzafix A, SpotX Ink oder SpotX Resin
(solvent based remover)

- Rinse with cold water or allow to evaporate (due to wettability or butyl acetate).

Benzafix B oder SpotX Blood (alkaline spotting agents)

- Work cold, then rinse with cold water and neutralize.

Benzafix C oder SpotX Tan (acidic spotting agents)

- Time reaction that can be accelerated by heating with a steam gun.

SpotX Rust (strongly acidic spotting agent)

- Chemical reaction that requires time and no mechanical action. The reaction can be accelerated by heating with a steam gun. Then neutralize.

If necessary, bleach with an oxidizing agent (e.g. sodium percarbonate) or SpotX Decol (mild reducing agent).

### Remarks

If yellowing occurs, the textile should be treated with an optical brightener or bleach. Perspiration or perfumes in deodorants can damage dyeings.
These edges can no longer be removed.

### Procedure for colour transfer

- Wash washable textiles with 2-4 ml Reoxal / l liquor in the pre-wash cycle at 30-60 °C.

# 4. Use of bleaching agents

## a) General

Bleaching agents can be used as an effective tool for removing stains. However, they should only be used if only limited success has been achieved with conventional stain removers. In some cases, stains are only lightened with spotting agents but not completely removed. In such a case, further treatment with bleaching agent is recommended.
Bleaching agents do not remove any stain substance, but make the stain invisible by oxidizing (adding oxygen) or reducing (removing oxygen) the stain substance. The use of conventional spotting agents is often safer for the textile fabric and the dyeing than the use of bleaching agents, which is why bleaching agents are only used as a last resort.

## b) Types

There are two types of bleaching agents:

- **Oxidizing agents** are best suited for organic stains e.g. food residues, grass, fruit, wine, body excretions etc.
- **Reducing agents** are very suitable for synthetic colour stains.

← increasing reduction power — increasing oxidizing power →

| strongly reducing | weakly reducing | neutral | weakly oxidizing | strongly oxidizing |
|---|---|---|---|---|
| Sodium dithionite<br>Redulin BUR | Sodium bisulfite<br>Thiosulfate<br>Sulphurous acid | Sodium percarbonate<br>Iodine solution | | Sodium hypochlorite<br>Potassium permanganate<br>Hydrogen peroxide |

## c) Safety precautions

First of all, the textile dyeing must be checked for colour fastness. A protruding piece of the hem of the textile can be used for this purpose. All colours that come into contact with the bleach must be tested for colour fastness.

Furthermore, the surface to be treated must be rinsed with water before applying the bleaching agent in order to

- remove residues of spotting agents
- ensure that the pH of the fabric is neutral
- break the surface tension and thus allow the bleaching agent to penetrate deeply.

A towel should be placed under the processing area. The bleaching agent should not come into contact with metal in order to prevent color change.

Only ever apply the bleaching agent using a pipette or a working bottle with a suitable cap (drop dosage).

| Bleaching agent | pH | Risk to | Anwendung |
|---|---|---|---|
| **Sodium dithionite** | slightly alkaline | Wool, silk, spandex (Lycra), nylon, some dyes | Diluted 1:10 with water |
| **Sodium bisulphite** | acidic | some dyes | 1 teaspoon per 100 ml |
| **Sodium percarbonate** | alkaline | some dyes, fabrics with optical brighteners, wool, silk | 1 teaspoon per 100 ml, heat stain |
| **Hydrogen peroxide** | acidic | some dyes | 3% solution in water |
| **Sodium hypochlorite** | alkaline | some dyes, metallic fabrics | Diluted 1:10 with water; after rinse with antichlorine (sodium thiosulphate) and do not use acidic products (risk of chlorine gas formation!). |

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