



PLATFORM FOR PROFESSIONAL CLEANING

THE ABC OF MICROFIBRE

Answers to **B**asic **C**laims about microfibre systems

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FOREWORD

In the 90s it was a revolution; today it is an established method for professional cleaning: the microfibre system.

At the beginning, it was a method that prompted lots of questions, because the microfibre system – the term actually says it – isn't just about new cleaning cloths and mops. The material demands a whole different method of cleaning. What's more: without the right logistics and laundering, you will not achieve optimal results.

Manufacturers promised the most fantastic results for lower costs. Was that too good to be true? And what about hygiene?

In order to clear up all the uncertainties, in 2006 VSR published the first version of *The ABCs of Microfibre, Answers to Basic Claims about microfibre systems*. A revision of a number of items followed in 2011.

In the present version of June 2020, we have refreshed the text and sharpened the focus. Have a look at the Table of Contents and you'll see there's an answer to every question you might have. Is your question missing? Get in touch with us. We'll make sure that you get an answer to your question and we'll revise this reference work yet again.

A note for the reader: each answer is made up of two parts: a short, succinct answer to the question posed, and a more extended explanation for the interested reader. In addition to answers to frequently asked questions, this document contains a final section on best practices for microfibre systems.

The Board of VSR

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CHAPTER 1

AN INTRODUCTION TO MICROFIBRE

1.1 What is microfibre?^{1, 20}

Microfibre is a synthetic fibre that is thinner than any natural fibre. The fibre has sharp angular edges when seen under high magnification, and the structure is such that it traps and holds oil and dirt well. Because the fibres are so thin, their fine texture is better at getting into nooks and crannies. Moreover, a microfibre cloth simply has more threads per gram. That means more fibres in contact with the surface and more surface area of the fibre to bind dirt for greater mechanical cleaning capacity. Narrow pores between the fibres retain water and oils by capillary working (see section 2).

Expressed in numbers, microfibre is 1 dtex^a or less,^b which means that a microfibre cloth 10 kilometres long would only weigh 1 gram. The fibres are therefore thinner than 12 micrometres, considerably thinner than even the thinnest natural fibres.

Material	Thickness in dtex	Diameter in micrometres ^b
Flax and wool	3 – 6	17
Cotton	1,5-2,5	14
Silk	1,2	12
Microfibre	1 maximum	less than 12
Human hair	700-1000	300

Table 1: Fibre thickness of natural materials and microfibre

You sometimes see references to ultramicrofibre,^{35, 36, 46} with a diameter of approximately 3 micrometer.⁴⁷ This assumes that regular microfibre is 3 to 5 micrometres in diameter. We are treating both these here as one category with no significant difference.

Microfibre has very fine fibres

But that is not the whole story. Natural fibres are rounded when seen in cross section under high magnification. The microfibre used in cleaning materials consists of two components: a core fibre, and within that finer split fibres. These are sharp-edged, angular fibres and multi-sided filaments with space in between (see figure 1).

Both components – often a polyester for the fine fibres and a polyamide such as nylon for the faceted filaments – are water repellent but attract and retain oils. And because the fibres are

^a 1 dtex, or decitex, is equal to 1 gram per 10,000 metres. An older measurement denier, 1 gram per 9,000 metres. Sometimes you see 'dtex 156 f 256', i.e. the original fibre (dtex 156) split in 256 single threads. For full splitting this works out to 156/256 = 0.6 dtex.

^b The upper limit for microfibre is clearly 1 dtex. A number of sources only count fibres less than 1 dtex as microfibre, while others also include 1 dtex with microfibre.

^c 1 micrometre is one thousandth of a millimetre, i.e. one millionth of a meter.

split so fine, they can take up a lot of oil. It should be mentioned that there are lots of variations in the composition and thickness of microfibre, and these have a noticeable influence on the quality of the materials.

1.2 How do you recognise microfibre?

Hard evidence can only be obtained with an electron microscope, which can be used to make photographs like those in figure 1. You can't see on the outside of a product whether it contains microfibre, and there's no evidence without an electron microscope.

Cleaning cloths have been sold (and probably still are) labelled as microfibre cloths that don't really contain any microfibre.¹ The core fibres are used to make other materials, but they have not been split, or hardly at all.

In use you can expect microfibre products to leave a cleaned surface absolutely dry and without streaks, provided you make sure the product is moistened according to the manufacturer's instructions.

Figure 1: Overview photo of top quality woven microfibre material. In the upper left are the solid warp threads, in the lower right the microfibre weft threads. Most core fibres (diameter 18 micrometres, so officially not microfibre) are split into filaments with a height of 8 micrometres and a thickness of 5 micrometres (see detail, see figure 2). Those are the real microfibrils. These photos were made with an electron microscope by TNO research institute in Rijswijk, the Netherlands.

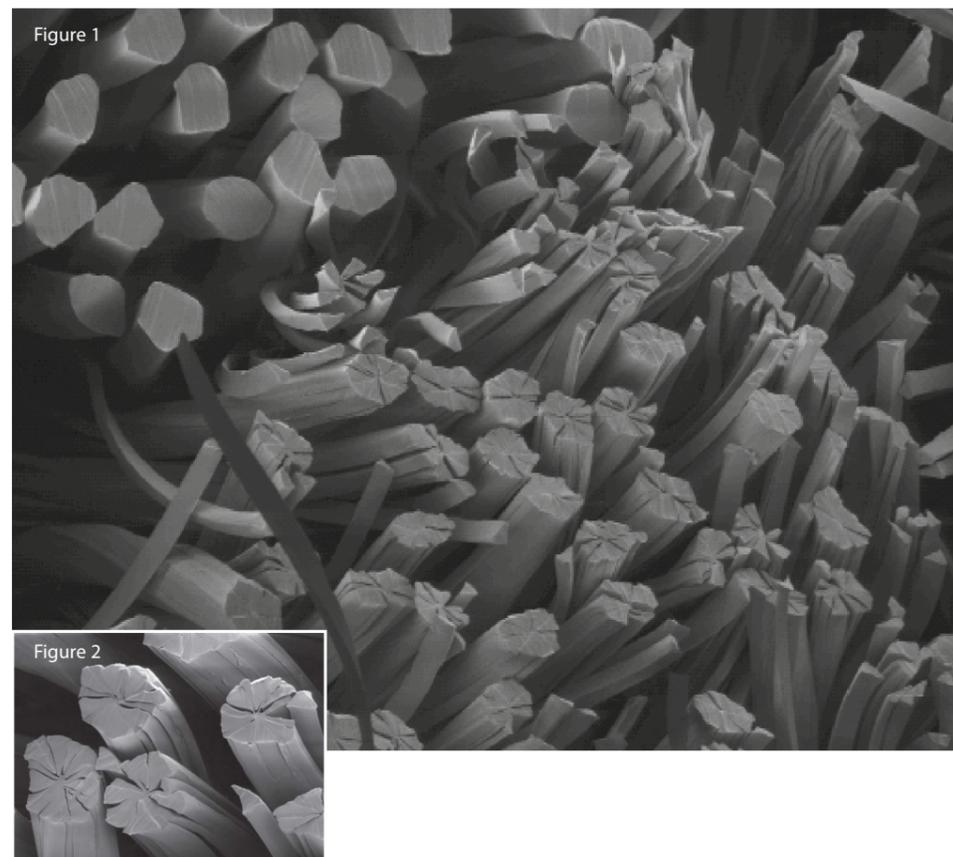


Figure 2: Cross section of microfibre fibres.

1.3 What kind of microfibre materials are there?

There are cloths in all sizes and colours. The cloths may be knitted, woven or non-woven. In addition to cloths, there are floor pads, mops and other cleaning equipment available. Quality is measured in the percentage of microfibrils, weight per square meter and longer technical lifetime. The manufacturer should give detailed information about the applications of the material, how

it should be used and how it should be washed. Manufacturers also often indicate the technical lifetime in number of washings. In addition to re-useable cloths, disposable cloths have also gained a place in the market.

Most microfibre cleaning materials are for damp use (i.e. slightly moist). They are produced in different colours for use in cleaning interiors and sanitary facilities. Sometimes separate cloths are used for cleaning glass dividers and mirrors.

Microfibre materials for dry use

In general, microfibre products are used when damp. But for certain cleaning applications the products can be used when dry, for example, for removing dust from floors with a smooth surface.

1.4 What is a microfibre system?

A microfibre system is a method of cleaning with washable microfibre materials and cleaning equipment combined with proper instructions for use. Proper use includes: cleaning different types of surfaces; logistics (infrastructure) for collecting, washing and distribution; washing; storage; and supervision of use, washing and storage.

Incidentally, it is also the case with traditional cleaning systems – mopping and spraying – that washing instructions and logistics are important, as are training and monitoring.

What's new about the microfibre system is that all materials have to be washed after use and no suds or cleaning agents need to be used. Because this represents a big difference from traditional methods, the need for instruction and monitoring is more marked.

Without instructions microfibre cloths don't do their job right

In practice, sometimes the term 'microfibre system' is only used for the range of materials and equipment. Watch out for this because without instructions, infrastructure or monitoring, these materials don't do their job right.

It's up to the manufacturer of microfibre materials to supply instructions for using and washing along with the product. You should also expect that they help in setting up the infrastructure and system for quality control.

CHAPTER 2

HOW DOES MICROFIBRE WORK?

2.1 What is the difference between the way microfibre materials work and other cleaning mops and cloths?

Microfibre materials have a unique property that is really the combination of three factors:

- 1) strong capillary action,^d
- 2) very fine split fibres (see section 1.1),
- 3) larger spaces between the fibres. This means that dirt is absorbed and retained in three different ways.

Moreover, thanks to the finer fibres, the fibre density of microfibre materials is much greater. This means that a microfibre cloth has superior mechanical cleaning properties compared to a traditional cloth, provided the microfibre cloth is used properly.

One important aspect is damp use (i.e. slightly moist) of the microfibre cloths, which leave surfaces nearly dry.

Capillary action

Capillary action is not an unknown in cleaning. Capillary action refers to the capacity of porous spaces in sponges, textiles or paper towels to absorb moisture. The fibres attract fluids and so pick up the dirt they carry.

Capillary action is stronger if the fibres are close together. The denser the fibres – as with microfibre – the greater the effect. The capillary action of a microfibre cloth is therefore much greater than that of a traditional cloth.

Capillary action combined with microfibre

Capillary action in itself does not remove attached surface dirt. But microfibre's unique structure is capable of doing that. The tiny, wedge-shaped fibres can get into surfaces much better than round fibres, including getting into the crevices and irregularities in the surface, and are much better at forcing out attached dirt.²²

A microfibre cloth also has more fibres per square centimetre than a traditional cloth. One wipe brings ten times the number of fibres in contact with the surface than, for example, cotton. This increased mechanical action in part explains why it works better.^{37, 38}

^d Capillarity (or capillary action) is a phenomenon in physics. It means that fluid is drawn up into a tube (hollow space) against the force of gravity. Such tiny tubes are called capillaries. The finer the capillaries, the higher the water can be drawn up.

Dirt adhesion

When attached dirt has been loosened by the fine structure of the microfibre, the loosened particles are retained by the microfibre material in three ways: by the capillary action (for very fine fluid containing oily residues); by the wedge-shaped spaces of the core fibre; and by the space between the fibres. Dirt particles are caught in the complex fine structure of the cloth, which thus allows better dirt retention.

Surface left nearly dry

Finally, an important effect of cleaning with microfibre is that surfaces are left nearly dry. Some moisture is left, but these are droplets so small that no streaks are visible. That is again thanks to the fine structure. It may also be that water is attracted more strongly by the capillaries in the microfibre than by the cleaned surface. For this to work effectively, the capillaries must not be filled already, that's why the cloths should be used damp but not wet.

2.2 How do dry microfibre materials work?

Dry microfibre products are used particularly for floor maintenance and dusting. Dusting is only removing dust particles and not spot removal. That's why microfibre materials are used in a dry state when dusting.

Microfibre mops become electrically charged by friction from contact with a surface. The dust particles are attracted by the electric field and become bound to the cloth. Think here for example of television screens and monitors that are also electrically charged and always become dusty quickly. Dusting with microfibre has a similar effect, but with the opposite purpose of making the surface dust free.

There are spaces where you want to avoid this type of static electricity, such as rooms where electronics are being developed. In such cases, it's important to keep the fabric damp. That's because moisture deactivates this adhesive force.

^e Bij bepaalde typen doeken kan een lichte droogstreepvorming op treden. Gebreide weefsels verwijderen bepaalde vlekken beter, maar laten makkelijker droogstrepen achter. Dit is inherent aan de structuur van het materiaal.

CHAPTER 3 HOW ARE MICROFIBRE MATERIALS USED IN PRACTICE?

As soon as the microfibre material has the required dampness (whether by moistening on the spot or by the washing process), microfibre materials are ready to use. When microfibre material dries out or becomes too soiled during use, it's put into a special washing bag and a new damp microfibre cloth or mop is used until this too becomes dry or soiled and is also put into the mesh laundry bag. At the end of the cleaning, all the microfibre cloths and mops collected in the mesh laundry bags are washed.

Damp cloths remove dust and dirt practically completely

Damp cloths remove dust⁴ and dirt¹⁹ nearly completely, while dry cloths do roughly half of this. Moreover, the dry method causes more dust to get into the air.⁴ This is not healthy for the person cleaning and less effective because the dust will later settle back on the surfaces that have just been cleaned.

Incidentally, the damp method is sometimes referred to in the English language literature as 'dry' because no buckets of water are used.¹⁰ However, water is in fact used to make the cloths and mops damp.

3.1 Should you use microfibre materials wet or dry?

The answer is: not dry and not wet. It is recommended to use the cloths slightly damp (moist) cloths (dusting with dry cloths being an exception.)

3.1.1 Floor cleaning

It is often recommended for floor cleaning to dust first with dry (microfibre) materials or a disposable floor cloth. Afterwards the floor can be spot cleaned or entirely mopped with a microfibre mop. The mops are used damp according to the optimal moisture level as instructed by the manufacturer. The best moisture level depends on the type of floor, type of mop used, and the type of dirt to be cleaned. A good baseline is a moisture level of 160%, that is 160 ml water per hundred grams of microfibre,⁴³ which prevents the floor from becoming wet and so also from being left slippery.

Norwegian research confirms the effect of damp cleaning

Norwegian research into the removal of dirt from hospital floors confirms that micro-organisms and organic dirt are most effectively removed if the mop is damp or wet.²⁸ This removes about two-thirds of the micro-organisms and 90% of the dirt. Dry cloths do a poor job at this, even if the floor has been sprayed with water and cleaning agents.²⁸ It is even better to damp mop first and then clean with dry cloth³² (see also section 5.1).

Optimal moisture level reduces recontamination

VSR commissioned Terpstra⁴³ to find out what the optimal moisture level is for microfibre floor mops. In general, the wetter the mop, the better the cleaning action, but also the more the dirt that is spread around.

There is an optimal moisture level where cleaning is effective and re-contamination remains limited. The precise value of that optimal level seems to depend on the floor, the mop and type of dirt, but a good place to start is a moisture level of 160%, or 160 ml water per hundred grams of microfibre mop.⁴³

You can test in practice whether it is better with a different moisture level, usually between 120% and 200%.⁴³ Avoid making the floor wet and leaving it slippery.

Dry microfibres for floor maintenance

As already explained in section 2.2, there are microfibre materials for floor maintenance that have to be used dry and often contain only microfibre. Dry microfibre do not conduct electricity but become charged ('static') when they are rubbed on a surface. This attracts dust particles like a magnet.

3.2 Do you have to keep wringing out a microfibre cloth?

We advise that you do not rinse the cloth or mop in a bucket of water, with or without cleaning agents, or under running water.

Rinsing and wringing out a cloth has little effect on the amount of dirt particles that it can absorb and wastes time, water and cleaning products.

Because of the properties of microfibre already discussed, the materials retain dirt better than other cleaning cloths or mops. To get the cloths clean, a wash at 60°C is sufficient.

Moreover, rinsing and wringing is hard on hands (because of constant immersion in water) and on wrists (because of the strength required for wringing).

Cloth stays too wet

Moreover, there's a big chance that the cloth will stay too wet. This makes it less effective and the chance of leaving streaks (method error) is increased. There is no use for which rinsing and wringing are advised. If surfaces are so dirty that cloths reach capacity quickly, then it is not recommended to use microfibre cloths, or to go over it again for a final clean.

3.3 Should you use chemical agents with microfibre?

Chemical agents, meaning detergents or liquid cleaners, are not much use.^{1,2}

There's a simple reason for that: for chemical loosening of dirt you need at least a few seconds and in practice the contact time between the cloth and surface is much shorter.

This applies to cleaning with traditional cloths as well as to cleaning with microfibre. In both cases the cleaning agent has little effect on removal of dirt¹ or attracting dust.⁴ The 'chemical' in the cleaning water is bad for the environment, your wallet, your hands (eczema), and if the dosage is too high, also bad for the cleaning results. Too much cleaner leads to streaks.

The reason that microfibre cleans so much better than traditional cloths is due to the high concentration of very fine fibres on the surface area of the cloth/mop. This physical property magnifies the mechanical action of cleaning on dirty surfaces and spots (section 2.1).

Some heavy soiling can't be removed with microfibre only. When cleaning sanitary facilities, extra chemicals are in fact necessary to remove calcification, as well as to clean the toilet bowl and urinal. The reason that the cleaning agent works effectively here is that the surface with the chemicals have time to soak in. This holds for spots like dried coffee or chocolate milk, too, and particularly for oily dirt such as skin secretions (sebum) it can be useful to use a cleaning agent⁴³. You do need to give it time to soak in.

3.4 Do you have to rub hard with microfibre?

You are not recommended to rub surfaces vigorously. Let the cloth do the work!

You seldom have to use a lot of effort, which makes heavy work for cleaning staff and can damage the soft materials.^{1,2} The advantage of microfibre is in fact that, due to the unique structure of the fibres, you can let the cloth do the work.

If the mechanical action of the cloth itself is not enough, we can fall back on extending the cleaning time and/or using a cleaning agent. For tough spots it's better to apply cleaning agents or wet the spot, then finish the rest of the room, and finally go back and remove the spot (or possibly combine the two methods). Another method would be using a hand-pad or special spot removal sponge, if permitted.

3.5 Is the microfibre system suitable at all times and all places?

Cleaning with microfibre materials is not suitable for every situation.

In the following situations, the use of microfibre systems is not advised:

- if the space is regularly used by third parties where following instructions and quality control are difficult to monitor;
- if the facilities for washing and storage cannot be realised, contracting out to a washing service is not feasible, or the microfibre system cannot be realised due to other reasons;³⁹
- for worn or rough surfaces,³⁹ which destroy the fibres;
- for very rough hard floors microfibre flat mops are not sufficient, although materials are being developed to solve this problem.

Washable microfibre is not recommended where large amounts of waste have to be disposed of, for wet or industrial cleaning situations, including blood and other body fluids.³⁹ Disposable materials work better in such instances.

Logistics always need attention

In every situation, there will always be the transporting of clean and dirty cloths. This logistics is difficult to achieve in key buildings, areas with small residential groups and extensive objects.

Some heavy soiling can't be removed with microfibre

Microfibre cloths are not miracle cloths. Lime stains and other heavily soiled areas cannot be removed with a microfibre cloth.

3.6 Is periodic maintenance also needed when using microfibre?

Microfibre systems also need periodic maintenance

Microfibre materials do not prevent wear of the polymer layer on floors. Also, microfibre does not miraculously remove dust from objects that are not included in the daily cleaning schedule.

CHAPTER 4 MICROFIBRE IN COMPARISON WITH TRADITIONAL CLEANING

4.1 Do microfibre materials remove dust and dirt better than traditional materials?

Yes, microfibre materials remove dirt and stains more effectively and completely than traditional materials.^{1,2,4,7-12,17,19,22} The pre-conditions are that the cloths must have the right moisture level for use and be changed as needed..

Various studies have shown:

- microfibre cloths leave less dust behind on a surface in comparison with oil impregnated cloths (by a factor of 2 to 3);¹
- better dust removal in a large retailer (93% of surfaces);¹⁸
- removal of troublesome spots in a quarter to half the time compared to traditional damp cloths;^{1,2}
- fine dust completely removed from hard surfaces without stirring more dust up into the air;³ with normal use;

If the cloth is too wet, then the cleaning action is partially lost.^{1,2}

4.2 Does use of the microfibre system lead to an improvement in cleaning quality?

Yes, experience has shown that quality control with, for example, VSR-QMS, achieves better results after switching to microfibre.^{8,18} As well as good stain removal, fewer so-called method errors are made. There are fewer dry stains and less streaking because cleaning agents have not been used and dirt adheres better to the fibres.

Documented examples:

- Switching over by a Norwegian office led to: an improvement in visible quality, more than halving the amount of dust left behind, and a decrease of 30% of the dust in the air.⁸
- Switching over by a large retailer in Great Britain led to a measurable improvement.¹⁸
- In a test, British Intensive Care Units switched from traditional cleaning by nursing staff to cleaning with microfibre cloths by cleaning staff. This led to an increase in the number of 'clean' surfaces from 58% to 90%.³⁸ This was measured by the ATP method, which gives a level for organic contamination.

4.3 Is a microfibre method faster and more efficient than the rinse and wring method?

Yes, and it's a percentage improvement in productivity in multiples of ten. This is probably not just due to the method. The attention given to cleaning staff when the system is set up in combination with the nice new materials has a motivating effect. The trap here is that, when the management relaxes its attention, production also declines.

A few documented examples:

- Switching over by a Norwegian office led to an improvement in visual quality, more than halving the amount of dust left behind, and a decrease of 30% of the dust in the air.⁸
- A hospital in Great Britain: the microfibre system is more user friendly, faster, and delivers visibly cleaner results compared to the traditional method. This left time for cleaning higher level surfaces.¹⁸
- Large retailer in Great Britain: productivity improvements of up to 41% (toilets).
- A hospital in Great Britain: productivity improvements of 24% (hallways) to 32% (hospital wards), explained for a significant part by the reduction in time needed for 'water management': filling, cleaning and emptying, as well as carrying around, buckets.
- Homecare in the Netherlands.¹³ Efficiency improved by 14%, but floor cleaning was a bit less efficient than the traditional housekeeping system. The reason seems to be lack of familiarity with the new system, or insufficient experience and instruction.

Part of the greater efficiency can be explained by paying greater attention to cleaning⁸ and increased motivation because staff have been given new materials to work with. It is possible to achieve better results in all cleaning systems with good guidance and coaching of cleaning staff.

The precise gains that can possibly be made in any situation depend on the building and its use, the cleaning current system, and the way the microfibre system is put into place. It is therefore impossible to make general pronouncements on this subject.

4.4 Is it true that microfibre cloths leave no streaks?

Yes, use of a microfibre cloth with the right moisture level should leave a surface dry and without streaks after cleaning.

If that is not the case, then the cloth was probably too wet, too dirty, or too much cleaning agent was in the water. Or the surface is too dirty. When changing from the rinse and wring method to microfibre, there is a chance of streaks left on floors at the beginning. This is because damp mops absorb part of the build up of residue. As time passes, the dirty film will disappear and there won't be any more streaking.

4.5 How long can you use one microfibre cloth or mop for?

That depends on the degree of dirtiness, the surface and the quality of the microfibre product.

For best use of cloths, it is recommended that they be folded according to the folding method. In healthcare institutions, it's customary to use a clean cloth for each room in order to prevent contaminated particles and micro-organisms from being transported from one room to the next.

4.6 Can you postpone periodic maintenance work when using the microfibre system?

No documented answer is available for this question.

Periodic work in sanitary facilities should certainly not be postponed.

4.7 How long do microfibre materials last?

That depends on the quality of the cloth, use, and the washing process. The manufacturer should give a guarantee for use, always on condition that the materials are used, washed and dried according to its directions.

There are known cases where the original cloths were used daily for seven years. There are also known cases where the cloths were no longer useable after being put in the dryer once at a too high setting. In short, general predictions are not possible.

The British National Health Service has indicated that in healthcare institutions, 75 to 100 uses (and washings) is standard.³⁹ One American facilities manager gives the technical lifetime of microfibre mops as 16 months and 500 washings; that's ten times longer than traditional mops, which wear out faster due to repeated wringing.⁴⁰

CHAPTER 5 MICROFIBRE AND HYGIENE

5.1 Do microfibre cloths remove all bacteria?

The microfibre method removes bacteria at least as good if not better than traditional methods. But the result is still a 'housekeeping' clean of the surface. Microfibres cannot replace the use of disinfectants.

In laboratory test situations, bacteria can be very effectively removed by damp microfibre cloths. Less than one in ten thousand of the bacteria will remain behind.^{6,7,19} But this is in a laboratory; in practice the situation is different.

It has also been determined that ultra-microfibre cloths remove significantly more bacteria from various surfaces than traditional cloths.⁴⁵

Other studies show that more bacteria remain for each hundred bacteria³⁷ when using damp microfibre cloths.

Cloths with an open structure get better results

There are big differences in the microfibre cloths supplied by different manufacturers. Cloths with an open structure are better than conventional microfibre cloths; a smooth, tight structure is not as good.³⁷ Dry microfibre cloths have no effect at all on microorganisms and incidentally they don't do anything for organic dirt either.³⁷

Practical testing confirms improved results due to microfibre

This assessment gives a good picture of the testing results. For toilet cleaning, one in ten bacteria remained, while the rinse and wring method seemed only to move the bacteria around.⁵ One British hospital recorded a decrease in the number of bacteria.²¹

Floor mops reveal a similar situation. In one Norwegian hospital, two-thirds of bacteria were removed in the best circumstances, and in the US up to 95% were removed using a microfibre cloth plus cleaning agent, equal to using a conventional mop in combination with disinfectant.⁴⁴

It has been regularly shown that microfibre materials remove at least as much if not greater amounts of microorganisms and dirt than conventional materials,³⁹ but not a single study demonstrated 'sanitizing' (fewer microorganisms by a factor of one thousand), let alone surface disinfection (by a factor of one million).

5.2 What is the role of microfibre in cross contamination?

Cross contamination can be prevented by changing the cloth or water for each room or other logical division of space. Start with the cleaner areas and work towards the more contaminated ones in order to limit the spread of germs as much as possible.

There is less chance of cross contamination with microfibre because the cloths are not rinsed and re-used in the next space. Clean materials are used for each space. Microorganisms therefore don't have a chance of being spread around by the rinse water or the rinsed cloth (both excellent breeding grounds for bacteria).

Traditional mopping with water even causes an increase in the number of viable colony-forming groups on the floor's surface. The result is then related to a less healthy indoor environment.⁴ Microfibre materials are used with less water and so this is much less of a problem.

Always follow the instructions

In order to maintain the positive effect of microfibre, it's important to keep following the instructions for the system. If you stop doing this, microfibre can also become a spreader of contamination to a sterile location.^{31,37} For some bacteria this is not a big problem, but it is for others.³¹ The type of cloth used also appears to be important.³⁷ Thus the watchword is: work from clean to dirty. And regularly change to a clean cloth.

Some bacteria are not removed by washing

One source of concern is that spores of certain disease-causing bacteria can also hide out in microfibre cloths and are not eliminated by routine washing.³⁵ Spores are bacteria in a protected dormant state, which allows the bacteria to survive even extreme circumstances. When the circumstances become favourable, then the bacteria become active again. Luckily, spore formation is uncommon

Using remedies such as washing at high temperatures or disinfecting cloths with chlorine bleaching lye (sodium hypochlorite) have the disadvantage of damaging the microfibre. In section 6 you can read how to wash microfibre in order to retain the effect of the microfibre system.

5.3 Should you store microfibre wet or dry?

Microfibre materials can be stored wet or dry, depending on what they are used for and the type of location. Cloths that have been through the centrifuge have exactly the right degree of dampness provided the rotation speed and time are set correctly. For normal use, centrifuge and then store damp until use is recommended, provided the cloths are washed daily.

In Dutch hospitals and care facilities you are not permitted to store microfibre materials in a wet or damp state.¹⁶ The reason is that microorganisms could grow and multiply and the cloths could become a source of contamination. In Norwegian hospitals the cloths are stored cooled,²⁸ which limits the growth of bacteria.

The cloth can become a source of harmful bacteria

Even if the cloths have been disinfected by washing, they can become contaminated again when being taken out of the washing machine, or when being sorted and packed. In time the microorganisms grow into colonies and a cloth can become a source of harmful bacteria. But this does not apply to microfibre materials.

Moistening in the workplace also an option

The cloth can be moistened in the workplace with a spray bottle or by dunking in clean water and putting through a wringer, or wetting according to instructions. In the first of these, the cleaning staff member has to really know exactly how damp the cloth should be. Wringing out by hand is strictly forbidden. This can lead to skin damage¹ and excessive strain to the wrists.

For flat mops there are also various systems of moistening, such as by sprinkling with water and putting through the wringer, or using a spray system that is in, or attached to, or integrated into the handle. Such solutions are good from the perspective of hygiene but take more time for water management. The bucket system is not as good from an ergonomic perspective.

5.4 Are there rules about hygiene?

If a microfibre system is used improperly this may lead to unhygienic situations – both for the cleaner and for the space that has to be cleaned. Therefore, always follow the hygiene rules, which are particularly important when laundering the materials.

- Launder wet cloths (whether used or unused) daily according to the instructions (for more about washing microfibre see section 6). Pack them up for transport to the washing machine such that they can't contaminate anything by contact.³⁹
- Separate clean and dirty laundry. Use separate laundry baskets with separate colours for the dirty and washed cloths, and preferably store them in separate rooms.
- Wash cloths and mops separately.
- Ventilate the area where the cloths are store and washed. The humidity should not in normal use rise above 70%, but preferably be about 60%. If outside temperature permits, it should not be any higher than 27°C, but preferably 25°C. Minimum temperature is 19°C. This is in consideration of staff working conditions.
- Staff should wear gloves, preferably disposable gloves, when loading the washing machine in order to prevent cross contamination. After loading, the gloves should be removed properly and thrown away, and hands properly cleaned. Before unloading the clean laundry, hands should be cleaned again. Gloves are not needed for this action.
- To reduce the risk of cross contamination the use of a colour coding system for cloths, mops and materials is an essential basic requirement. The use of a standardized system e.g. the BICSc colour coding scheme is advised.

CHAPTER 6 WASHING MICROFIBRE MATERIALS

6.1 In-house or contract out?²³

This point has to be carefully considered before the microfibre system is introduced, and it depends to a great extent on the particular situation.

Advantages of contracting out

Contracting out the washing of microfibre materials has the advantage that the professional laundry takes over collecting, distributing, transporting, stock maintenance and purchasing. This is a considerable lightening of staff duties.

No further investment in washing machines, dryers or microfibre materials are then needed. Moreover, the quality of the laundering process is guaranteed.

Disadvantages of contracting out

The disadvantages are that the dirty laundry will be lying around for a long time and start to smell. Because clean cloths will not be used immediately, they also have to be dry. That is what healthcare institutions want, but in other places this means that cloths have to be moistened right before use. This takes time.

The background of the materials is unknown (it won't be certain that the same materials will come back again). You can solve this with sewn-in chips or good arrangements with the laundry service. You might need a very large stock of materials.

In some drying processes, it can become hotter than 90°C. This damages the microfibrils and they lose their special properties. This should be avoided at all times

More control when doing laundry in-house but also more vulnerable

Those who do laundry in-house have more control over the number of clean cloths available and the time when they become available. But at the same time, when you wash yourself you are more liable to staff sickness or leave.

When considering the financial aspects, look for hidden costs for transporting, loading and unloading machines, storage space and the like.

Microfibre materials that are to be used in highly qualified cleanrooms must also be washed, dried and packed up under cleanroom conditions. Contracting out to a specialised laundry is unavoidable in this case.

6.2 Which washing machine should I choose?²³

Choose preferably a professional washing machine with one or two programmes (for cloths and mops). Preferably with a unit for dosing the detergent and designed for high-voltage power current. If this can't be realised, then in some cases a regular household washing machine can be used.

Coordinate the capacity of the machine with the amount of materials to be washed. Remember that it is better to underload than overload a machine because of the heavy soiling of the microfibre cloths.

A dosing unit helps prevent dosing errors in detergent. High-voltage current makes it possible to run the machine faster. Using a timer, the cloths can be taken out of the machine right before the cleaning task begins.

Household machines not recommended

Household machines are not recommended because their washing capacity is too small and the capacity of their drainage systems is not designed to accommodate large amounts of dirt, which means the pump breaks down more quickly and the machine becomes dirty. Moreover, household machines have the disadvantage that they do not maintain the necessary washing temperature for the entire washing cycle. Household machines can be used if you are only washing cloths and/or a very small number of mops.

6.3 Which washing cycle should be used?²⁵

The washing cycles of professional machines have to be set up by technical experts (sent by the manufacturer of the washing machine and/or the dosing installation). Sufficient (pre) rinsing of the laundry is required. According to the governmental Working Group on Preventing Infection (WIP) guidelines, the washing cycle should at least be set at 60°C. It should run for at least 50 minutes because chlorine bleach cannot be used. When using a household machine, choose the longest cycle, the maximum number of rinses, and set the washing machine for the heaviest cycle with the highest temperature that is permitted according to the labels on the cloths.

Used microfibre materials are much dirtier than ordinary laundry simply because microfibre absorbs and retains more dirt. That means: more rinsing, a higher washing temperature and a longer cycle. In order to get a wash that is hygienically clean, you have to have the water at 60°C or higher for at least 50 minutes. Hotter is better: at 90°C ten minutes is sufficient.^f Manufacturers may have different times and temperature settings for their machines that get better washing results.

6.4 Can any laundry detergent be used?

No, the laundry detergent must not contain the following: fatty acid soap, quads, fabric softener, zeolite, or bleach. The wash water should not have a high alkaline level (pH 10).

^fThe general formula is: $t > 250 / (T - 55)$, i.e. the laundry has to wash t-minutes at a minimum temperature of T °C in order for disinfection to occur. For T = 60°C you need: $t > 250 / (60 - 55) = 50$ minutes, and for T = 80°C you need: $t > 250 / (80 - 55) = 10$ minutes. Remember T is the actual temperature, which is often lower than the measured temperature. That's why the recommendation is to wash for 10 minutes at 90°C.

Fatty acid soap and possibly quads, too, and fabric softener cause deposits on the fabric surface which block the pores and capillaries. Zeolite and bleach damage the fibres, the former by tearing and the latter by chemical reaction, which have also been seen in electron microscope images.⁴⁸ The manufacturer ought to recommend a laundry detergent.

6.5 How much detergent should you use?

When using professional machines, follow the dosing instructions given by the manufacturer of the microfibre. When using household machines, follow the instructions on the packaging of the detergent. Automatic dosing is preferable.

In the latter case, find out the local hardness of the water and use the dose that is indicated for heavily soiled laundry. Never increase the dose because that will backfire by allowing too much detergent to remain in the fabric.

6.6 Can you wash cloths and mops together?

No, keep these materials separate.

Mops are much more heavily soiled than cloths and therefore require a different laundry cycle. Professional machines use different washing processes for flat mops and cloths.

6.7 Are there requirements for the dryer and the drying cycle?

Yes, when drying the temperature must not under any condition become too hot. In certain kinds of dryers (especially condensation dryers) temperatures can occasionally get too high. For cotton this isn't a problem, but synthetic cloths can become deformed or even melt, which means they can no longer be used.

Consult the manufacturer of the materials. They should give washing instructions, if it is not given on a label on the cloths themselves. Pictograms show which drying cycle should be used (internationally standardised). These pictograms are also given with instructions for dryers, making it easy to choose the right programme.

6.8 What kind of facilities are required?

Ventilated spaces for separate storage of dirty and clean materials. And if laundry is being done on the premises, space, water, electricity and sufficient drainage capacity for the washing water and extraction of humidity.

- The space must be well ventilated (see section 5.4) for storing the dirty materials temporarily, and also for placing the required machines, where applicable.
- Clean materials have to be stored in a separate space, preferably in closed containers.
- If the materials will be laundered (and dried) on site, you need access to water and electricity (preferably high-voltage power).
- Water drainage has to be at least 75 mm diameter for a professional washing machine.
- Hot air dryers have to ventilate directly to the outside; existing ventilation systems can rarely handle the extra humid air.

6.9 Does washing affect the microfibre's efficiency?

Yes, in the long term it does. Ask the manufacturer for the guaranteed number of washes

Some cloths shrink when laundered, but this does not appear to influence the effectivity.^{19,1} Washing and drying cause unavoidable wear and tear, which makes the material less effective.³³ Ask the manufacturer for the guaranteed number of washes.

6.10 Can you clean and disinfect at the same time with a microfibre cloth?

Disinfectants work best on surfaces where there is no dirt. Moreover, disinfectants need time to soak in, while microfibre cloths are intended to leave a dry surface. There are products on the market that disinfect a visibly clean surface and have an effective action without prior cleaning. A microfibre cloth may be used for disinfecting, but then the full action of the microfibre will not be exploited. It should also be taken into account that a number of disinfectants should not be used with microfibre cloths (chlorine preparations in particular are a bad combination with many types of microfibre materials).

CHAPTER 7 MICROFIBRE'S EFFECT ON HUMAN HEALTH, THE ENVIRONMENT, AND OTHER MATERIALS

7.1 Can microfibre cloths damage the skin?²⁴

No, when used properly no damage is caused to the skin. It is important that the cloths are not wrung out by hand and that proper protective measures are taken.²⁴

People who work with water often run a greater chance of getting contact dermatitis or eczema. At least one third of cleaning staff have this problem, even if it is often not recognised or reported. Dermatitis arises because the natural oily upper layer on the skin dissolves in water. The unprotected layers below dry out and are more susceptible to reactive inflammation.

Whether microfibre cloths are more or less harmful than other cleaning cloths is unknown.²⁴ On the side of microfibre is the fact that they are not used with detergents, which can dissolve the oil layer on the skin. Against microfibre is the fact that the cloth itself is very oil absorbent.

A microfibre with the right level of dampness contains so little water that in general it is not designated as 'wet cleaning'. The use of gloves is generally determined by the location of work and/or the type of dirt or soiling that has to be removed.

Preventing eczema

Prevent or limit outbreaks of eczema when carrying out wet cleaning or for people with a greater sensitivity by following the following steps.²⁴:

- Never wring out microfibre cloths.
- Do not wear rings when cleaning.
- Wash hands with lukewarm water (preferably without soap, or with only a little soap), rinse well and dry them completely dry.
- Wear gloves, when needed, preferably disposable ones.
- Use a skin cream to moisturise the skin after washing hands. Apply regularly in a thin layer, including between the fingers, on the fingertips and the back of the hand. Choose an unscented hypoallergenic cream.
- Treat outbreaks of eczema immediately. Go to the company doctor as soon as the fingertips are cracked, the skin feels dry or rough, becomes reddish with a tendency to flake, the nail bed swells up, or tiny blisters the size of pinheads appear on the side of the fingers.¹

Healthcare workers who have cracked skin or eczema often find using alcohol-based hand sanitizer painful. You should temporarily use soap and water to wash your hands. As soon as the cracks disappear, it's better to go back to using alcohol-based hand sanitizer, because the oils in alcohol-based hand sanitizer ensure that the cracks don't return as fast. For cuts on your hand, a waterproof plaster may be the solution.

People with contact dermatitis can still use alcohol-based hand sanitizer. Some brands are better tolerated when you have eczema than others. Ask your supervisor whether you can try out different kinds. It's advisable for people with contact dermatitis/eczema to moisturise their hands six times a day (50% vaseline, 50% cetomacrogol cream FNA). There are very few people who are allergic to alcohol-based hand sanitizer.

Limit exposure to agents in cleaning products

Another idea is to limit possible exposure to the agents in cleaning products. The body can absorb such substances through the skin and by breathing them in. This may – in the long term – cause eczema and respiratory problems for cleaners who have to work with them all the time.³⁰ That's why it makes sense to try to limit exposure to these substances, which is easy to do by not using any cleaning products.

If the use of chemicals is desired, prevent your hands from getting wet as much as possible by using smart working methods or wearing gloves. Do not dose more of the product than is strictly necessary and make sure you have good ventilation.

7.2 Do microfibre systems provide an ergonomic advantage?^{13, 26}

Yes, the Plan of Approach created for the Health & Working Conditions Covenant for Cleaning Personnel advises the use of microfibre cloths and microfibre flat mops to lighten the work cleaning staff have to do.²⁶

Thanks to the high concentration of very fine fibres, you don't need as much force to wipe a cloth over a surface when microfibre is used correctly. At the same time, the microfibre cloth removes spots more easily. This improves posture at work, especially important for back posture^{26, 29, 41} and upper arms,⁴¹ and this holds even though not all cleaning staff follow the method completely.

Using the materials in a dampened state is also a plus ergonomically. A microfibre cloth or mop that is too wet has absorbed moisture in all the many finest filaments. It then takes more force to wipe the wet microfibre cloth across a surface than it would for an ordinary wet cloth.^{1, 2, 3}

Further advantages for staff health are in the reduced need to drag buckets of water around. Wringing out cloths or pressing mops^{13, 29, 40} are also not necessary. Cleaning staff experience the work as lighter²⁶, and without exception do not want to go back to the old system.^{29, 48}

Biggest gains come in combination with training

The biggest gains are found when the introduction of microfibre is accompanied by training, which forms part of a total concept. This training has a lot to do with ergonomics. The advice given when training staff work with microfibre systems is to give a lot of attention to this topic. It must be said that ergonomics is important for all cleaning systems.

7.3 Does the introduction of microfibre systems influence staff motivation?

Without a doubt. This is evident not only from anecdotal examples,⁸ but also from surveys.¹³ The new materials, the professional image, including all the extra equipment, are all factors that have a motivating effect on personnel. In time that effect fades away,¹³ because of familiarity.

The extra instructions and attention from managers when the system is introduced has a motivating effect. This is also something that can be achieved very well without introducing a new microfibre system.

Because there are no cleaning agents and no scent, the microfibre system sometimes encounters resistance from customers (in homecare), end users (in offices and healthcare institutions), and among cleaning staff themselves.¹³ A training course,¹³ preferably given by colleagues,¹⁵ appears to be effective in removing this resistance.

7.4 Do health problems decline with the use of microfibre systems?

That might be expected based on sections 7.2 and 7.3, but there is no statistical evidence.

For ergonomic gains and motivational gains, see sections 7.2 and 7.3.

In addition to advantages already mentioned, the absence of scent and detergents is better for people who are sensitive to such things. Another gain that is often mentioned is that floors are left less wet and therefore less slippery, which is safer for cleaners and for users.²⁷

7.5 Does staff absence due to sickness decline with the microfibre system?

There are no hard data on this.

Ballemans says that the decline in cleaners' sickness absence is 'a known effect', but does not provide any support for this statement. It is also not found elsewhere. It must be concluded that there are a wide variety of influences that can affect sickness absence (a new boss, threatening unemployment, seasonal influences, the home situation). A large reference group and a complex study would be needed to demonstrate whether this is in fact true.

7.6 Do microfibre cloths damage finishes more than other cloths?

No, that is not necessarily the case, as long as force is not used when cleaning. And that is seldom or never required. Let the cloth do the work.

This is not given as a disadvantage in a survey among VSR members, an indication that even repeated normal use of microfibre cloths don't result in any problems.

Let the cloth do the work

Scandinavian and German research does show that dry microfibre cloths leave scratches on plexiglas (polyacrylic materials).^{1, 9} Damp cloths can sometimes cause more damage than

traditional materials in long-term usage and in lab tests¹ under considerable pressure. This can be seen on varnished wood, and also on stainless steel and desktops.

In normal situations you don't have to exert a lot of pressure when working and thus there won't be any damage.¹ From an ergonomic perspective, too, it is much better to let the cloth do the work and not to use any extra pressure.

Material damage is also very unlikely with flat mops

There are no data about the material damage that may be caused by flat mops. Because flat mops are partially composed of microfibres and can be used without extra force, it is very unlikely that problems would arise.

Remember that microfibre flat mops are used only to clean the floor and not for maintenance. This means that the required floor maintenance has to be carried out in a different way. First apply one or more layers of protection and maintain these by regularly rubbing down and spraying

7.7 Is the microfibre system better for the environment?

That is often asserted, but it is difficult to prove. Both traditional and microfibre systems have advantages and disadvantages for the environment. A comparison of the environmental impact of microfibre systems with existing cleaning systems gives a different score for each situation.

In order to provide a simple answer, it would be necessary to go through the entire technical life cycle of microfibre systems in comparison with existing systems for any particular situation. From production, use, and washing, to waste processing, one would have to look at what the impact is on, for example, water and energy use, particles that enter the environment, and many other aspects.

As far as we know, such a life-cycle comparison has never been carried out and the results would depend to a great degree on which system you would be comparing to microfibre.

7.8 Do microfibre systems use less water?

This remains a pressing question. A lot of water is used for washing the materials. Probably the score is different in different situations.

Polonsky suggests that 90% less water is needed for microfibre mops⁴⁰ than for traditional mops. This is because you don't have to fill buckets of water.⁴¹ But this has to be weighed against the fact that washing uses more water, which Polonsky has not included in his comparison.⁴⁰ Exactly how much can be saved depends naturally on the number of times the mop water is refreshed.

7.9 Do microfibre systems reduce the use of chemicals?

That too remains a pressing question. It's true that with microfibre systems less interior cleaning agents are used, but on the other hand, more laundry detergent is needed.

Then again: pesticides and herbicides are used for the cultivation of cotton.

Polonsky asserts that 95% less cleaning agent is used with mops because microfibre mops only need to be dampened.⁴⁰ But he doesn't say that more laundry detergent is needed for washing the mops. Quinn too records a decrease⁴¹ in the use of chemicals, but fails to supply any figures.

CHAPTER 8 MICROFIBRE AND THE EFFECT ON ORGANISATION

8.1 What are the consequences for logistics when switching to microfibre?

All the damp cloths and mops have to be collected, washed and distributed to the cleaning staff each day (whether they are used or not). This is extra work for the foreman/forewoman or site manager. Often this has to be done outside the hours that the cleaning staff are working. This has consequences for working hours and scheduling. In addition, extra facilities are needed for washing, storage and transport of the materials, depending on whether the laundry is being done in-house or contracted out.

Here follow a few logistical rules for working with microfibre systems:

- For each location it must be clear who is responsible for collecting, washing, storing and distributing the materials. This also applies to quality and process control.
- The people responsible have to be given sufficient time to carry out their duties and be at work at the times that the duties have to be carried out, particularly the times of washing and distribution.
- Consider in advance how the transition from morning to evening shift will be handled, or the transition to the weekend shift. Duties must be clearly assigned (do the morning shift staff put out materials for the evening shift staff? And if so, how much and where?). The schedule has to allow for time for consultation.
- Calculate the number of cloths and mops needed for each location. There has to be separate storage space available for dry and clean materials.
- Calculate how much laundry there will be and choose the type and size of the washing machine.
- Arrange for suitable space for storage of clean and dirty laundry, as well as for the washing machine and dryer, where applicable. Ventilation is required for the space; see sections 5.4 and 6.9.
- Devise a system for collecting the used materials.
- There have to be enough washing bags or baskets for the laundry, and for large buildings carts to collect the laundry in a central place.
- See also section 5 about hygiene for the laundry storage facilities.

8.2 How do you set up training courses, instruction and refreshers for personnel?

Training is essential. The method of working with microfibre materials is so different from traditional cleaning, let alone from cleaning at home, that training is absolutely required. This applies first and foremost to personnel who have not worked with microfibre before. Regular refreshers with instructions are also necessary, which have a motivational effect.

It appears that cleaning staff rate training courses and a chance to practice as two of the four most important aspects of switching to a total concept in homecare.¹³ Without training, they don't really believe that microfibre materials clean properly.¹³

Instructions for staff

Having instruction given by staff members themselves is very effective, as demonstrated in homecare settings.¹⁵ Try to communicate to staff members the gains for themselves: the importance of reducing physical bodily strain.¹⁵

Imposing something as an obligation often sparks resistance. Managers have a crucial role here. Certainly, when concerned with discussing things openly, addressing obstacles, and finding solutions.

Include building users in the transition to microfibre

Building users, such as nursing staff, doctors, patients, residents and visitors, are often forgotten in the transitional process. This sometimes leads to misunderstanding: 'Only cleaning with water, that's impossible!' Or: 'I don't smell anything, they must not have cleaned here.' These are common responses.

That's why it's important to explain to building users how the new cleaning method works. You can do this with folders, in-house magazines, intranet and patient booklets. Misunderstanding can lead to dissatisfaction and have consequences for cleaning staff's motivation.

8.3 Is quality control necessary?

Yes, of course, microfibre can also be used incorrectly and certain things might be skipped. Quality control afterwards is not sufficient to get the full potential from the microfibre system. Process control is also necessary: checking beforehand that all the conditions for proper use of the microfibre system have been satisfied. It should be said that this must be done for all cleaning systems

In a practice test, measured using the VSR QMS system, the quality of cleaning seemed to improve even though the microfibre system had not been used as it should have been. Had that been done, then the quality would have been even higher. Or it would have been possible to achieve the same quality with fewer resources.

Errors slip in quickly

The microfibre system is so different from traditional cleaning methods that errors can slip in quickly. Think here of things like: rinsing and wringing cloths, not washing materials or not washing hot enough, using a cloth for too long or not taking a clean cloth for each hospital room – it's easy to trip up. In order to limit errors creeping in, regular instruction is required, but not enough on its own.

Process control in advance allows for optimal working of microfibre systems

A process control carried out in advance – based on instructions, the logistical plan and washing instructions – establishes what is needed for optimal working with microfibre systems. A list of questions can then be drawn up based on that data. Have the staff recently received instructions? Are there detergents around that shouldn't be used with the system? Are the washing instructions correct? Have the clean and dirty cloths been separated?

Process control is carrying out a check that certain conditions required for the system to operate properly, as established for specific situations, have been met before cleaning staff get started.

This could take a number of forms. At a minimum, the site manager goes through a checklist to audit a number of staff, and perhaps a regional manager who regularly does the same for the site managers. Only by using a combination of regular instruction and process control is it possible to get an optimal return from a microfibre system.

CHAPTER 9 WHAT YOU HAVE TO PAY ATTENTION TO WHEN SETTING UP A MICROFIBRE SYSTEM

In this Microfibre ABC you have read about how to set up and put a microfibre system into practice. You now know the advantages and disadvantages. Are you thinking of setting up a microfibre system now? You then have to pay close attention not only to the quality of the product but also to the directions that you receive.

Naturally, it is the manufacturer's job to provide directions that apply to the materials supplied. Below is a list of the main points that should be handled in such directions. If good directions are unavailable, then this list is a good place to start.

9.1 Set-up

Explanation, supporting reasons and training are extremely important for successful implementation of a microfibre system. A skilful set-up can even lead to better contact between cleaning staff and other (medical) staff.³⁹ Draw up a plan of approach in order to reach this goal

In your plan lay out who is responsible for:

- purchasing
- whether laundry will be done in-house or contracted out; if the latter then also washing machine, electrical connection for washing machine, use of electricity and water, drainage, ventilation
- storage of clean and dirty cloths
- distribution and collection of cloths, and stock management
- transport of clean and dirty cloths
- instructing personnel
- process and product quality control

9.2 Preparation

- Be sure to purchase sufficient amounts of materials, including extra equipment like mesh laundry bags and if necessary, equipment for moistening.
- Arrange for all the facilities (see section 6.9).
- Buy and install (where necessary) professional washing machines.
- Decide which wash cycles will be used and who is responsible for this or which external will be hired for this service.
- If the cloths will be stored dry: buy and install a dryer. Decide which drying cycle will be used. Make sure the dryer will never at any time go above a temperature of 95°C.

- Wash all materials once before first use.
- Set up a work schedule for all cleaning tasks and for logistical tasks (collecting, washing, drying storing and distributing materials).
- Give personnel training (usually manufacturers offer possibilities, and professional training like BICSc training may also be a solution).
- Draw up a training programme and checklist for new (and temporary) personnel. Where possible, let personnel offer the training course or a portion of a course.
- Organise process and product quality control (see section 8.3).
- Organise repeat instructions based on the results of the process control (which show what most frequently goes wrong).
- Remove all cleaning agents and equipment that do not belong in the system completely from the building.

9.3 Cleaning (damp)

- Use the materials at the level of dampness recommended by the manufacturer. If the cloths have to be stored damp, it might be a good idea to only centrifuge the cloths and then use them immediately.
- If the cloths will be dried (for healthcare, when contracting out to laundries, or in large buildings), the cloths will have to be moistened on site. The manufacturer may be able to give advice on this. At all times avoid wringing out cloths and mops by hand.
- Be careful to protect hands by regularly washing, drying and moisturizing with a thin layer of salve or enriched hand cream. See further section 7.1.
- Fold cloths two or three times, so that each cloth has eight (or sixteen) cleaning surfaces. When a surface becomes too dry or too dirty, which can be observed by the cleaning results, change to a clean surface.
- Use cloths flat (not in a ball). Place the hand on top.
- Pack up clean cloths and mops as instructed in the task description, for example:
 - o for each sanitary space (wear gloves);
 - o for each room (healthcare).
 Never use a cloth or mop a second time for a new space.
- Put dirty materials in the designated mesh laundry bag.
- Work from clean to dirty.
- Never add cleaning products (except for periodic maintenance or in other cases where cleaning products are needed for good results; this is particularly applicable to floor cleaning. Dose according to the packaging.)
- Never rinse cloths or mops in a bucket.
- Let the cloth or mop do the work, don't apply extra force. For stubborn stains: first dampen and then when the rest of the job in that space is finished, clean again. Where necessary, use a hand pad.
- Use a disposable cloth for wiping wet or heavily soiled and dirty areas.
- Never use chlorine, hydrogen peroxide or other strong alkaline products in combination with microfibres, they damage the material.
- When the task is done: put all the cloths and mops in the mesh laundry bags, tie them up, and bring them to the collection point.
- When the task is done or before a break: wash hands and moisturize with a thin layer of enriched cream, or disinfect with alcohol-based hand sanitizer gel.

9.4 Cleaning (dry)

- Never let dry dust-mops become damp when cleaning.
- Dust-mop dry floors according to the cleaning schedule.
- Where applicable, vacuum the mops with the right vacuum cleaner (with HEPA filter) before they go in the wash.
- Pack up dust-mops in mesh laundry bags and send to be laundered.⁹

9.5 Washing and drying

- Follow the instructions for washing that the manufacturer has given (by type of material).
- Never overload the washing machine (see the manual for the machine).
- Sort and wash each type separately; tip: collect the used materials (cloths, damp and dry mops) in mesh laundry bags of different colours.
- Never use laundry detergent with fatty acid soap, quads, fabric softener, zeolite, or bleach, and never use detergent with a high alkaline level.
- Dose according to the directions (for heavily soiled laundry), but do not overdose.
- For household washing machines (better not to use): set to the most intensive wash cycle. If there is an option for extra rinses, set this too. Set the wash temperature at 70°C (which in practice comes out at about 60°C).
- Centrifuge at the rpm given by the manufacturer for the time indicated. If the load will be going in the dryer, centrifuge at the maximum rpm.
- Never dry at temperatures above 95°C.
- Wash your hands, or disinfect with hand sanitizer gel, after loading and unloading the washing machine (except if the materials are going in the dryer).

⁹Collect and transport mops in a mesh laundry bag, but do not wash in the bag.

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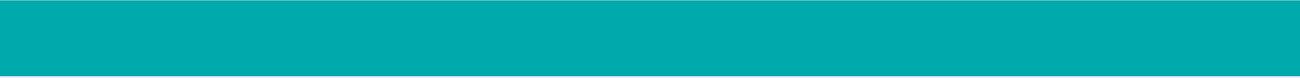
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