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A new concept in foot borne contamination control

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Compared with the development that has taken place in clean room technology, and the clothing worn by those working in clean rooms and all other areas where contamination control is necessary, very little advancement has been made in the effective control of foot borne contamination.

First, let us consider the main methods that have been available. The majority of these methods can be split into four basic types:

1. Removal of contaminated footwear, or the use of over shoes
2. Impregnated rugs
3. Brushing the footwear, with or without the use of vacuum
4. Cassettes containing disposable sticky mats.

Until recently, clean areas have used one, or a combination , of the above methods, though some have used none at all, either because management chose not to be aware of the problem, or because the various methods were found to be too costly or of little benefit.

It is worthwhile going over some of the problems that the users of the above methods, have experienced, in order to determine why these various procedures did not produce the required results.

1. Overshoes and the change of shoes

Overshoes can be used to enclose the contaminated footwear of the personnel entering the clean area, or alternatively, they can be allocated a separate set of so-called “clean shoes”, which are kept in the changing room immediately outside of the clean area. In practice, these “clean shoes” are often as contaminated with fine particle of dust as normal footwear, and even when they are clean, or overshoes are used, contamination is immediately picked up form the floor area, where the change of footwear occurs. It is an everyday practice to see personnel putting on overshoes and immediately seeing the foot return to the same spot, where the contaminated footwear rested a short while before. The problem is not totally solved when a bench barrier is used, whereby the clean footwear is only placed on the clean side of the bench. Such a system still leaves two problems. The first is that a considerable amount of contamination is generated inside the clean area, from the personnel working there, and from the work that is being done. As the eventual traffic flow of the personnel, who are inside the clean area, is towards the entrance/exit area. There will be a build-up of contamination just inside the door of the clean are. New people, entering the clean room, will pick up this contamination on their clean shoes and transfer it back to the work site. Secondly, it is impractical to fit overshoes to wheeled traffic, which is entering the clean area and therefore a totally separate system of control would be necessary for areas where wheeled traffic is in use.

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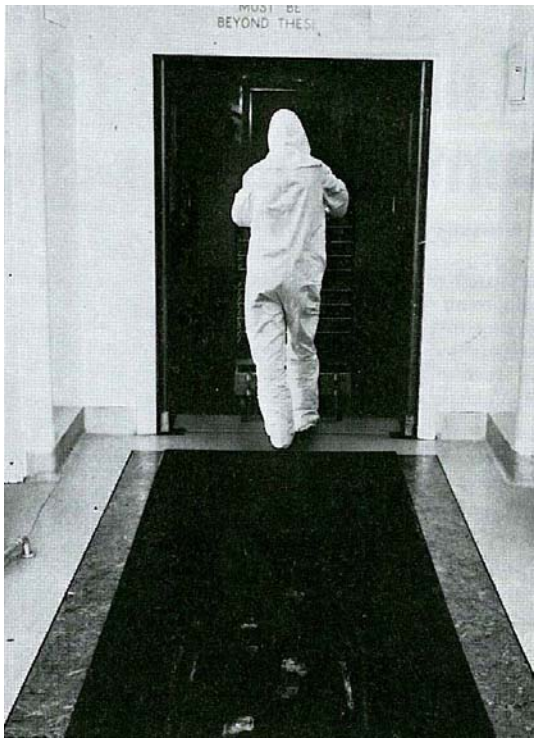
Examples of contamination control screens in use

In a hospital environment



In industrial use

2. Impregnated rugs

Rugs, which are laundered or hovered on a regular basis, can be suitable for the control of gross contamination, but are not recommended for the immediate entrance to the clean areas. The rugs themselves tend to disintegrate, thus providing a further source of contamination. Secondly, the gross contamination, which is removed by the rugs, can be subsequently ground into fine dust particles by heavy traffic. These fine particles may then become airborne, or alternatively are picked up on the soles of the shoes, or on trolley wheels, and carried into the clean area. These impregnated rugs may therefore be used at the main entrances to buildings, or in the corridors, but should be kept well away from the clean area.

3. Brushing with or without a vacuum

A number of systems were developed for inserting the contaminated footwear into a brushing mechanism. Ideally, a suction tube is attached to the back of the brushes in order to carry away the released contamination. This system has similar problems to the overshoes, such as its inability to cope with wheeled traffic, and again, having cleaned their shoes, the personnel step back onto the contaminated floor. A further point is that this system is not foolproof, and

personnel, in a hurry, often neglect to use the brushes.

4. Sticky mats

As against most of the above systems, the sticky mats do provide some sort of a barrier at the immediate entrance to the clean area. Practical problems that have been experienced with these systems, relate to the size of the mats, the cost, the frames and the possible transfer of the adhesive into the clean area. Most tests have shown that each foot needs at least three times on the mat, in order effectively to remove contamination, and likewise, trolley wheels should rotate three times on the surface of the mat. Most mats are between 3-5 ft in width, which means that only a proportion of the contamination is removed. The cost of the system is obviously dependent upon the frequency with which the contaminated layers are removed. Prices for the different systems do vary, but an annual cost for removing the layers once per day might be between US$1,000 and US$1,500. To improve efficiency, the layers are often removed more frequently then this, and tests in some hospitals have shown that the system is only of value when the layers are removed every 11/2 hours. Costs then become prohibitive. The sticky mats are normally contained within a metal or plastic frame which is often stuck to the floor. This frame can provide an area where contamination and bacteria is harboured, as the actual frames are not easy to clean. Many clean room operators have noticed that potions of the adhesive layer can be transferred into the clean area, thus providing unsightly and possible harmful contaminated areas within the clean room.

Having discussed some of the problems that have been experienced by the cleaned room operators, let us look at what we require from an effective from an effective method of footborne contamination control.

Bearing in mind that we not only wish to prevent contamination from being carried into the clean area, but also need to trap that contamination which is generated within the clean room, and possibly even extending into the clean room itself. This area, or Screen, should have the ability to trap and hold all contamination; it should not be contained in a frame; its surface should be washable, in order that the contamination can be readily removed; it should not be affected by the normal cleaning agents and disinfectants that are used in industry and hospitals; it must be simple and easy to clean, such that the task can be carried out by the normal cleaning staff; once the contamination has been trapped by the Screen, it should remain there until the Screen is cleans; the mechanism, by which the contamination is trapped, should not be a surface treatment but rather an inherent property of the material itself; the Screen should have a low profile and adhere to the smooth floor of its own accord, even under heavy traffic conditions, but at the same time the Screen must be readily removable for the general cleaning of the floor.; the colour of the Screen should be such that the dirt is readily visible, in order that the system can be shown to be effective, as well as indicating when cleaning is necessary; finally, the system must have a long active life, and preferably this should be at least one year.

Bearing in mind these criteria, the Dycem Contamination Control Screen was developed from a specially formulated high-friction plastic material.

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A little less than two years ago, Dycem Plastics Limited launched the Contamination Control Screen, with each Screen being constructed from at least six 120cm x 60 cm (4ft x 2ft) Sections. The Screen Sections are laid edge to edge at the entrance to the clean area, thus forming a total barrier for footborne contamination. Obviously, the ideal size of the Screen is a function of the clean room standards, clothing worn by the operators, and the environmental conditions at the entrance to the clean room.

The property of the plastic material is such that it not only provides an extremely effective trap for all dust and contamination, but at the same time the high-friction properties enable the clean underside of the Screen to adhere to the smooth floor. Because of this, no frame is required which, as we have seen above, is an important feature.

The Screens are a dark blue colour, whereby the dust on the surface is readily visible. This not only gives psychological barrier, whereby those entering the clean room become aware of the problems of footborne contamination but also visibly demonstrates when cleaning is necessary.

Cleaning of the Screens is quickly carried out by washing with detergent and was where and if necessary, a disinfectant can be added to the water, or where the screens have become contaminated with polish or other such substances, they can be cleaned with most industrial solvents or ammonia-based detergents. After washing, the Screens can be rapidly dried with a wet vacuum unit, or with a hand squeegee, and upon drying the active properties return.

These Screens are now well proven in many different fields, and carry manufacturer’s guarantee of one year.

Some problems were experienced in the primary traffic areas of hospitals and pharmaceutical companies. With the very heavy wheeled traffic that was constantly moving across the Screens combined with the practical difficulties of cleaning the underside of a large number of Sections, it was found that some sections could be displace d and eventually cause an inconvenience to traffic. Because of this we have developed the new Continuous Screens for use in primary traffic areas. (The individual sections remain ideally suited for secondary traffic control.) The standard sizes of these new Screens are either 3 or 4m in length, with the width being kept at 1.2m. Longer Screens are also available for specialised uses. These continuous lengths provide a very much neater system, have entirely overcome the problem of heavy wheeled traffic, and because the gasps between the sections have been eliminated the cleaning process is very much more simple and quick. In fact, the Dycem Screens can now be cleaned in the same way the surrounding floor area is cleaned.

Most users have estimated that the cost of the Dycem Screens is as little as one this of the cost of the sticky mat system, whereas the surface area, for trapping the contamination may be two or three times greater.

Independent test, by clinical authorities in the UK and in West Germany, have proven the suitability and efficiency of the Screen as a cross-infection control system, and the product is now widely used in many countries in all clean areas, such as electronics industry, precision engineering, the photographic market, hospitals, the

pharmaceutical industry, the aerospace industry and research laboratories, etc.

It should be emphasised that the Dycem Screen system was not developed to cope with gross contamination, and recent developments have shown that it is most efficient when used down-stream of a product, such as Astro-Turf or the 3M Nomad mats. These are ideal for removing gross contamination, such as mud and grit, with the Dycem Screens being used to remove the more harmful fine particles of dust.

Many customers-including large international companies –have found during the last two years that the Dycem Screens provide the most efficient method of footborne contamination control.